TECHNICAL REPORT NO. 3-666

PERFORMANCE OF SOILS UNDER TIRE LOADS

Report 2

ANALYSIS OF TESTS IN YUMA SAND THROUGH AUGUST 1962

by

C. J. Powell

A. J. Green

August 1965

Sponsored by

U. S. Army Materiel Command

Conducted by

U. S. Army Engineer Waterways Experiment Station

CORPS OF ENGINEERS

Vicksburg, Mississippi

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Task 03

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ARMY MRC VICKSBURG MISS

FOREWORD

The tests described herein were conducted at the U. S. Army Engineer Waterways Experiment Station as a part of the vehicle mobility research program under DA Project 1-V-0-21701-A-046, "Trafficability and Mobility Research," Task 1-V-0-21701-A-046-03, "Mobility Fundamentals and Model Studies," under the sponsorship and guidance of the Directorate of Research and Development, U. S. Army Materiel Command.

Acknowledgment is made to Lt. Gen. A. G. Trudeau, former Chief of Research and Development, who directed that this test program be performed; to Mr. R. C. Kerr, chairman, and Dr. Lester Goldsmith, Dr. L. C. Stuart, Dr. Robert S. Rowe, and Mr. C. J. Nuttall, members of the ad hoc committee which recommended the research program; and to Messrs. R. R. Philippe and R. F. Jackson, U. S. Army Materiel Command, and Mr. M. V. Kreipke, Office, Chief of Research and Development, who advised in the formulation of the research procedures. Personnel of the Land Locomotion Laboratory, U. S. Army Tank-Automotive Center, and of the U. S. Army Transportation Research Command, Fort Eustis, Virginia, maintained liaison and made valuable comments and suggestions. Messrs. Nuttall and C. W. Wilson of Wilson, Nuttall, Raimond, Engineers, Inc., served as consultants and aided in the formulation of the test program, design of the test equipment, and analysis of data.

The tests were performed by personnel of the Army Mobility Research Branch (AMRB), Mobility and Environmental Division, Waterways Experiment Station, during the period November 1959 to August 1962 under the general supervision of Messrs. W. J. Turnbull, W. G. Shockley, and S. J. Knight, and the direct supervision of Dr. D. R. Freitag. Engineers actively engaged in the study were Messrs. J. L. McRae, C. J. Powell, A. B. Thompson, J. L. Smith, A. J. Green, G. T. Easley, R. D. Wismer, G. W. Turnage, and

SP-4 J. R. Wood. Mr. McRae supervised the study in Dr. Freitag's absence during the period September 1961-August 1962. Miss M. E. Smith, mathematician, participated in the analysis of data and prepared Appendix A. This report was written by Messrs. Powell and Green. Many of the plates and figures were prepared by Mr. L. J. Lanz, former Transportation Corps Liaison Officer, and Mr. Turnage.

Col. Edmund H. Lang, CE, Col. Alex G. Sutton, Jr., CE, and Col. John R. Oswalt, Jr., CE, served as Directors of the Waterways Experiment Station during this study, and the preparation and publication of this report. Mr. J. B. Tiffany was Technical Director.

CONTENTS

SUMMARY

The results of 709 single-wheel, pneumatic-tire performance tests in a desert sand placed carefully in large soil bins are analyzed. These tests were performed with a wide variety of tire sizes, loads, tire deflections, and soil strength conditions. The sand was air-dry for all tests. Actual moisture content (based on dry weight) did not exceed 1/2 percent. No attempt has been made to correlate these results with actual field performance of full-scale vehicles; however, it is proposed that this correlation work be conducted later in the study.

Basic plots of the data (one dependent variable versus one independent variable, all other independent variables constant) show the relative effect of each test variable. Scatter of individual data points has been great enough to cause concern, however. Cross plots from the basic data plots have been constructed to show the effect of tire width on performance for a given tire diameter and the effect of diameter for a given width. Graphs are presented that show the relative effectiveness of the different tires tested for the same load and deflection conditions. The tests performed indicated that tire performance improves with increasing cone index, increasing tire deflection, increasing tire diameter, increasing tire width, and decreasing load.

When most of the important independent variables are combined into a single appropriate numeric and the dependent performance variables are plotted against this numeric, a reasonable grouping of the data for all tires and test conditions can be achieved. The numeric-performance relations that have been developed to date, though not perfect, are probably good enough to be of use to the military vehicle designer. It is believed that modified numerics can be devised that will provide an even greater degree of usefulness.

PERFORMANCE OF SOILS UNDER TIRE LOADS

ANALYSIS OF TESTS IN YUMA SAND THROUGH AUGUST 1962

PART I: INTRODUCTION

Background

1. In May 1959 the Chief of Research and Development, Department of the Army, directed the Office, Chief of Engineers, to have the U. S. Army Engineer Waterways Experiment Station (WES) proceed with the investigation outlined in the document entitled "Plan of Tests, Performance of Soils Under Tire Loads." The study was initiated immediately through use of a system composed principally of a single-wheel dynamometer carriage and a series of movable soil bins. Test techniques were developed to vary the wheel slip during a run so as to allow the towed, self-propelled, and maximum-pull conditions to be defined within the usable length of the soil bins. Two soils, a desert sand and an alluvial clay, were selected as principal test soils, and procedures were developed to fill the test bins with these soils in a reasonably consistent and uniform state. A series of tires having different widths, diameters, cross sections, and structural characteristics was procured for testing. The details of the test plan and of the techniques and equipment employed are given in Report 1 of this series.[1*]

Purpose and Scope of Program

2. The tests reported herein are part of a comprehensive study of the interrelation of desert sands and loaded pneumatic tires. The broad purpose of this study is to provide results that will point the way to the selection of the proper tire size and inflation pressure for a specified load, soil condition, and degree of mobility. This report is limited to

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* Raised numbers refer to similarly numbered items in the Literature Cited following the main text of this report.

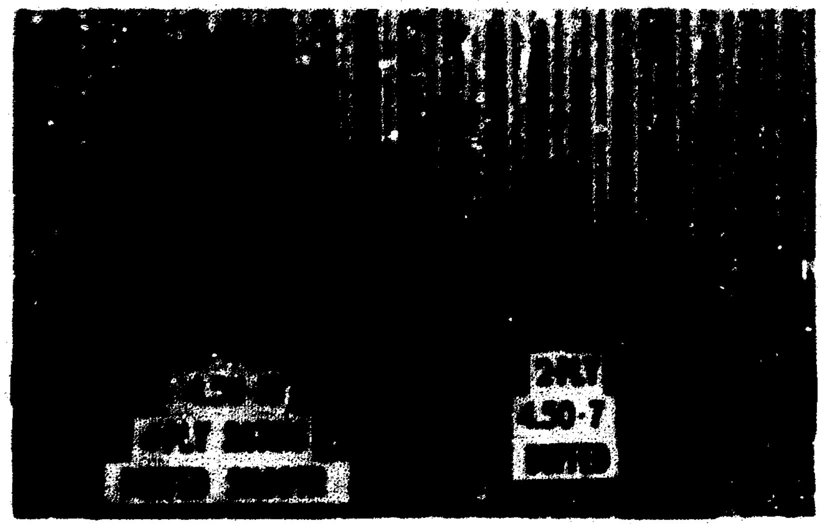
the results of tests in air-dried Yuma sand for a single pass of a single wheel. A total of 754 tests, utilizing 13 commercially available tires, was performed in Yuma sand; loads ranged from 85 to 1520 lb, tire deflections from 2 to 35 percent, and soil strength from 14 to 73 cone index in the 0- to 6-in. layer. Of these tests, 709 were used in the analysis, and the remainder were considered unsuitable because of recording or equipment deficiencies. Multiple passes of the wheel have been performed, and results of these will be included in a later report. It is recognized that the first-pass data will be of limited usefulness, but they should shed considerable light on the relative importance of the many factors that can influence the soil-tire relations. Foremost among these factors are: characteristics of the test soil, load on the wheel, and geometry of the tire including diameter, width, and deflection.

Definitions

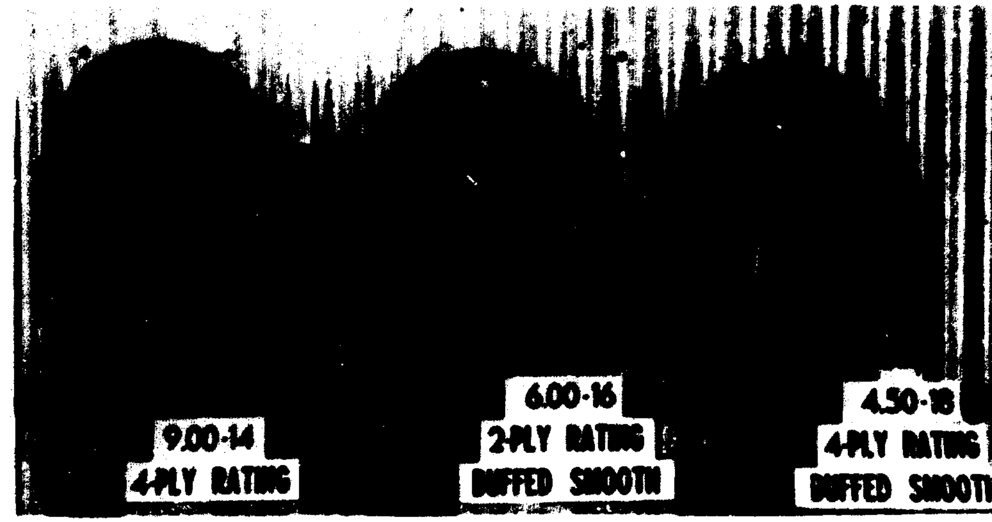
3. Certain terms used in this series of reports are unique to this study, while others are considered unique to this field of research. To facilitate the analysis of the data and the communication of the test results, these terms were rigidly defined in Report 1 of this series.[1]

Tires

4. A variety of tire sizes was used in this study. The sizes were chosen to cover a range of diameters, widths, ply ratings, and types of construction as illustrated in fig. 1. Some of these tires were supplied without tread, and the rest were buffed smooth after delivery (except one of the radial-ply tires). All were operated tubeless with the exception of the 1.75-26 bicycle tire and the 6.00-16 solid rubber tire. A complete list of the tires that have been used in the program follows, and dimensions that are pertinent to the analysis are presented in table 1. The percent deflection (δ_{MH}) values used throughout this report are based upon the loaded carcass section height as measured vertically under the axle on a level, unyielding surface, unless otherwise specified.

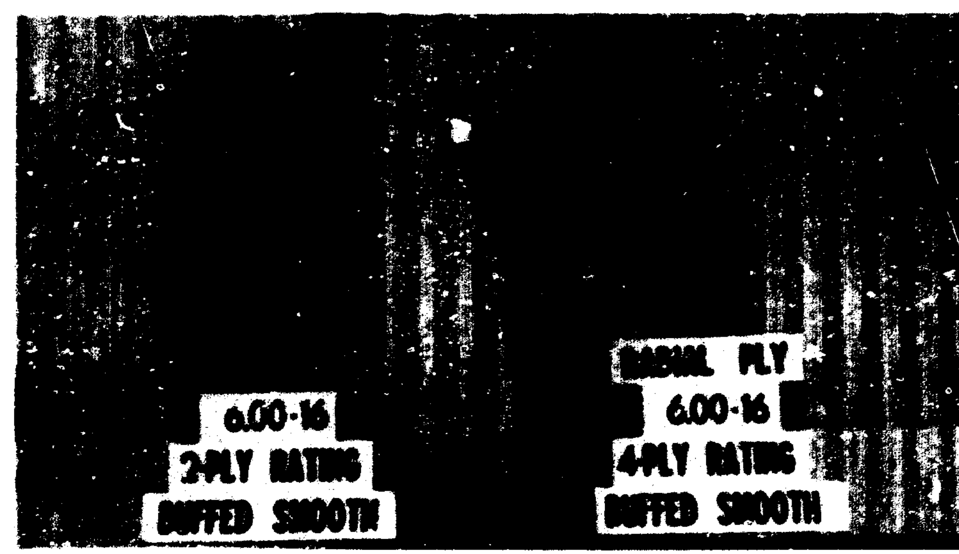


a. Diameter



b. Width

c. Ply rating



d. Carcass construction

Fig. 1. Selected tires illustrating individual variables

Tires Used in Program

1.75-26, bicycle tire, buffed smooth

4.00-18, 2-PR,* buffed smooth (originally motorcycle-tire tread)

4.50-18, 4-PR, buffed smooth (originally motorcycle-tire tread)

6.00-16, 2-PR, buffed smooth (originally automobile-tire highway tread)

6.00-16, radial ply, buffed smooth (originally directional bar tread)

6.00-16, radial ply, with directional bar tread

6.00-16, solid rubber tire, buffed smooth (originally nondirectional bar tread)

9.00-14, 2-PR, supplied without tread

9.00-14, 4-PR, buffed smooth (originally automobile-tire highway tread)

9.00-14, 8-PR, supplied without tread

5.00-12, 2-PR, buffed smooth (originally directional bar tread)

4.50-7, 2-PR, buffed smooth

4.50-18, 4-PR, buffed smooth, mounted in dual configuration

16x15-6R, 2-PR Terra-Tire, supplied without tread

* PR indicates the ply rating specified by the manufacturer.

Soil Characteristics

5. The desert sand used in these tests was obtained from the top 12 in. of the sand dunes near Gray's Wells, California (17 miles west of Yuma, Arizona), by personnel of the Engineer Detachment at Yuma Test Branch and was sent to the WES in three separate shipments. Fig. 2, a plot of the gradation curves for the three shipments, shows that shipments 2 and 3 were practically identical whereas shipment 1 was slightly coarser. Based upon these mechanical analyses and others made during field tests in the Yuma area, the sand was classed as SP-SM according to the Unified Soil Classification System. The value of angle of internal friction, as determined by direct shear tests on the air-dried material, ranged from 35.1 to 38.2 deg, and increased in proportion to density throughout the density range. No effort was made to keep the shipments separated, and they were all mixed together during the course of testing. Fig. 3 shows the gradations obtained from samples of the mixed soil which were taken in February

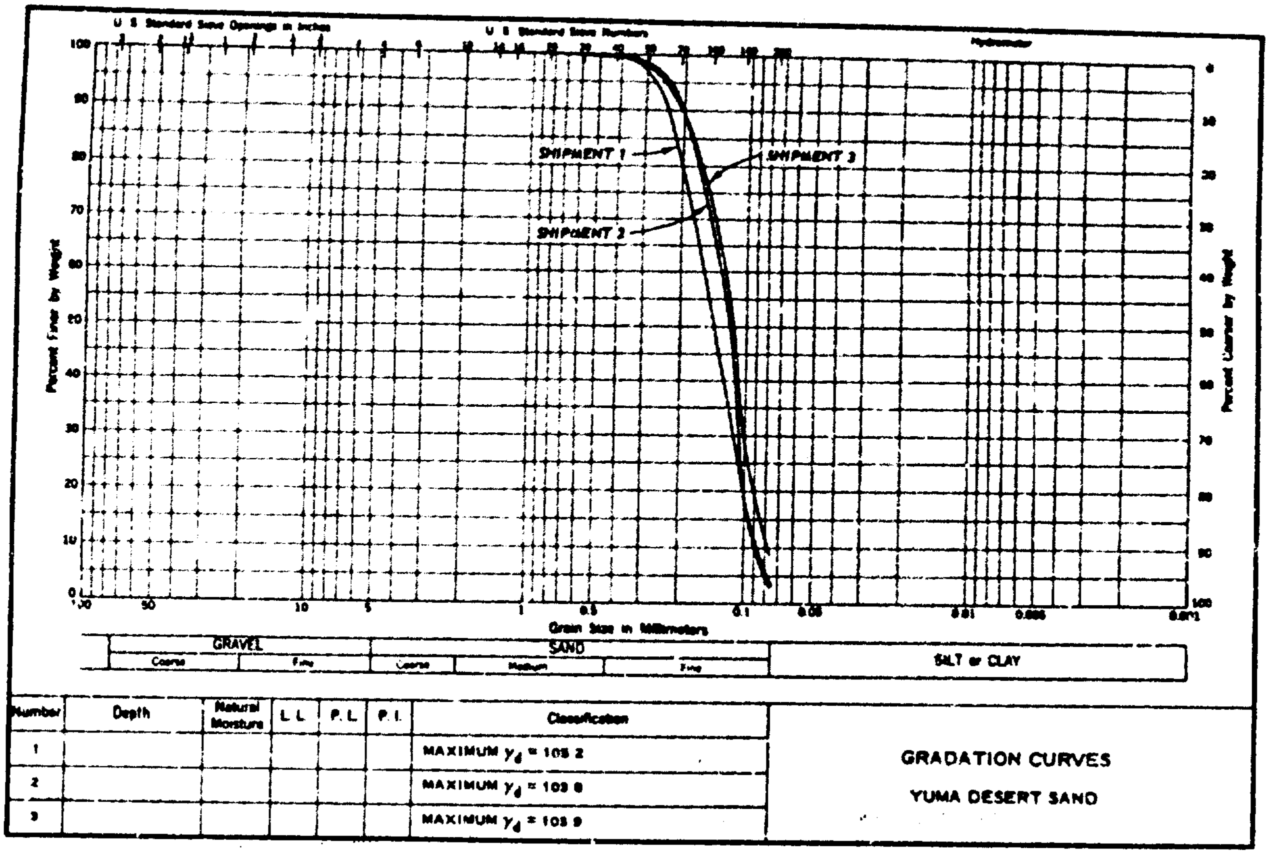


Fig. 2. Sieve analysis of three shipments of Yuma sand

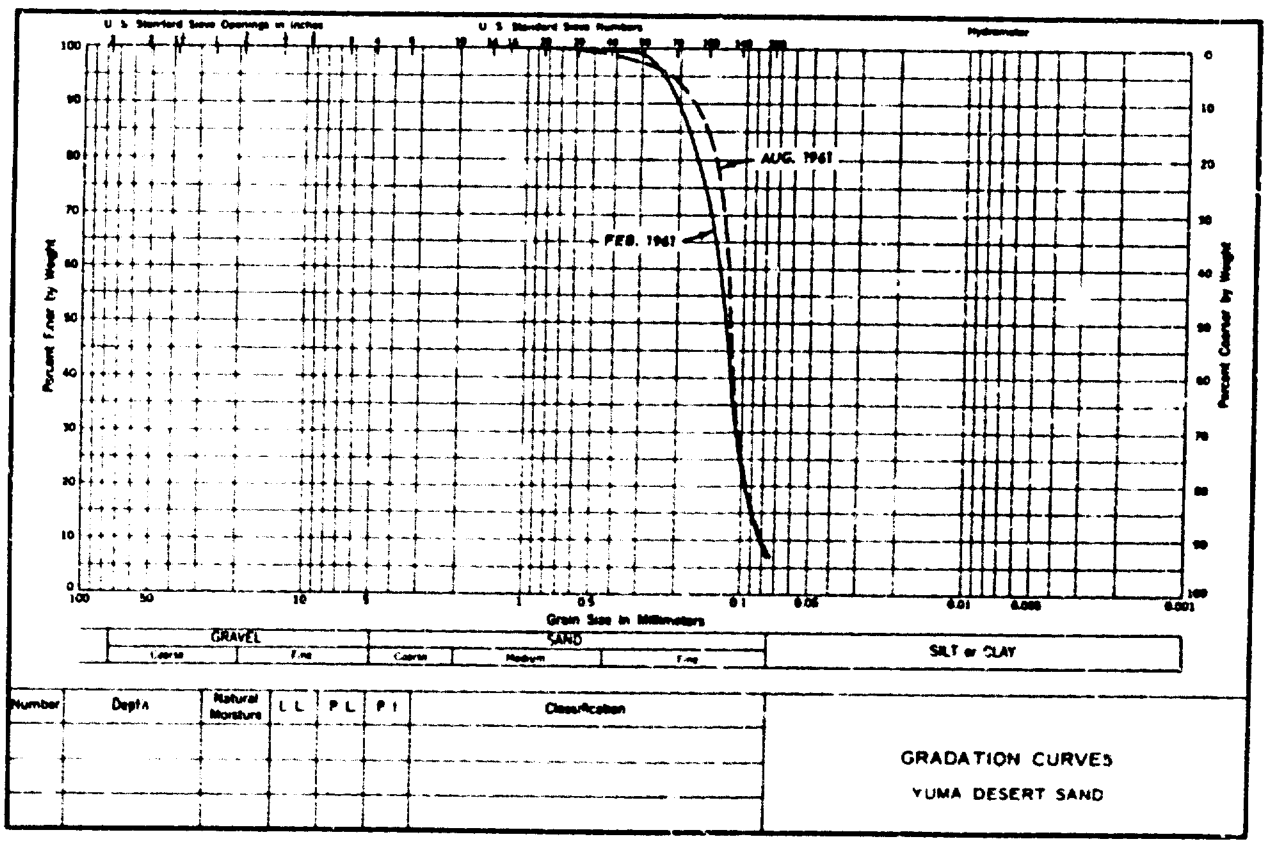


Fig. 3. Gradations of Yuma sand sampled from stockpile in February and August 1961

and August 1961. Specific gravity was determined twice; on one occasion it was 2.67, and on another it was 2.66. Average maximum dry density was determined in the laboratory to be about 104 lb per cu ft, and minimum density was about 87 lb per cu ft.

PART II: EXPLORATORY TESTING

6. The techniques used in this testing program (described in Report 1 of this series[1]) accelerated the rate of testing but raised certain questions regarding potential sources of error. For example, it was desired to conduct as many side-by-side tests in the soil cars as possible, but not at the risk of running them too close to each other or to the sidewalls of the soil car. Another question was whether the results at a particular transient slip in a programed-slip test were comparable to the results obtained in a constant-slip test. A few special tests were performed early in the program to answer these questions, and others were run later to answer other questions that arose during the program.

Location of Traffic Lane

7. Small diaphragm-type pressure cells buried in the soil were used to determine whether two valid tests could be run side by side in a test car. The evaluation involved three tests, all performed with the 9.00-14, 2-PR tire carrying a 1210-lb load. In the first two tests, designated S6 and S8, pressure cells were mounted at sta 0+91 in the sidewall of the test cars as shown in fig. 4. The traffic lane was located 16 in. from the

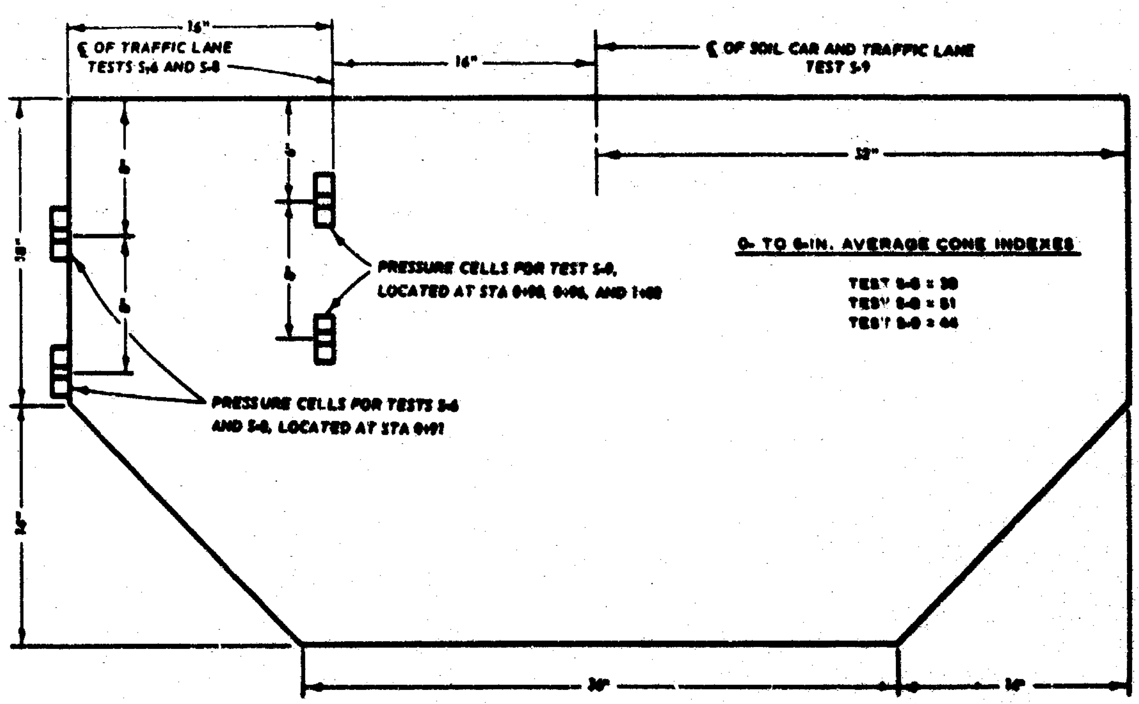


Fig. 4. Locations of pressure cells and traffic lanes

sidewall. In test S9, three pairs of cells were located at sta 0+90, 0+96, and 1+02, respectively. Each pair was placed 16 in. from the left sidewall and 16 in. from the center line of the soil car, one cell being at the 6-in. depth and one at the 14-in. depth. They were placed in the same position (diaphragm vertical) as that in which they had been mounted in the sidewall. The traffic lane was on the center line of the soil cars, offset 16 in. from the pressure cells but 32 in. from the sidewalls so that the sidewall effect on the cell registration was minimized.

8. The readings registered by the three cells at the 6-in. depth (test S9) when the wheel was at the same distance from each cell, were averaged and plotted against the position of the wheel relative to the cell. This plot is shown as a dashed line in fig. 5. A minus (-) wheel

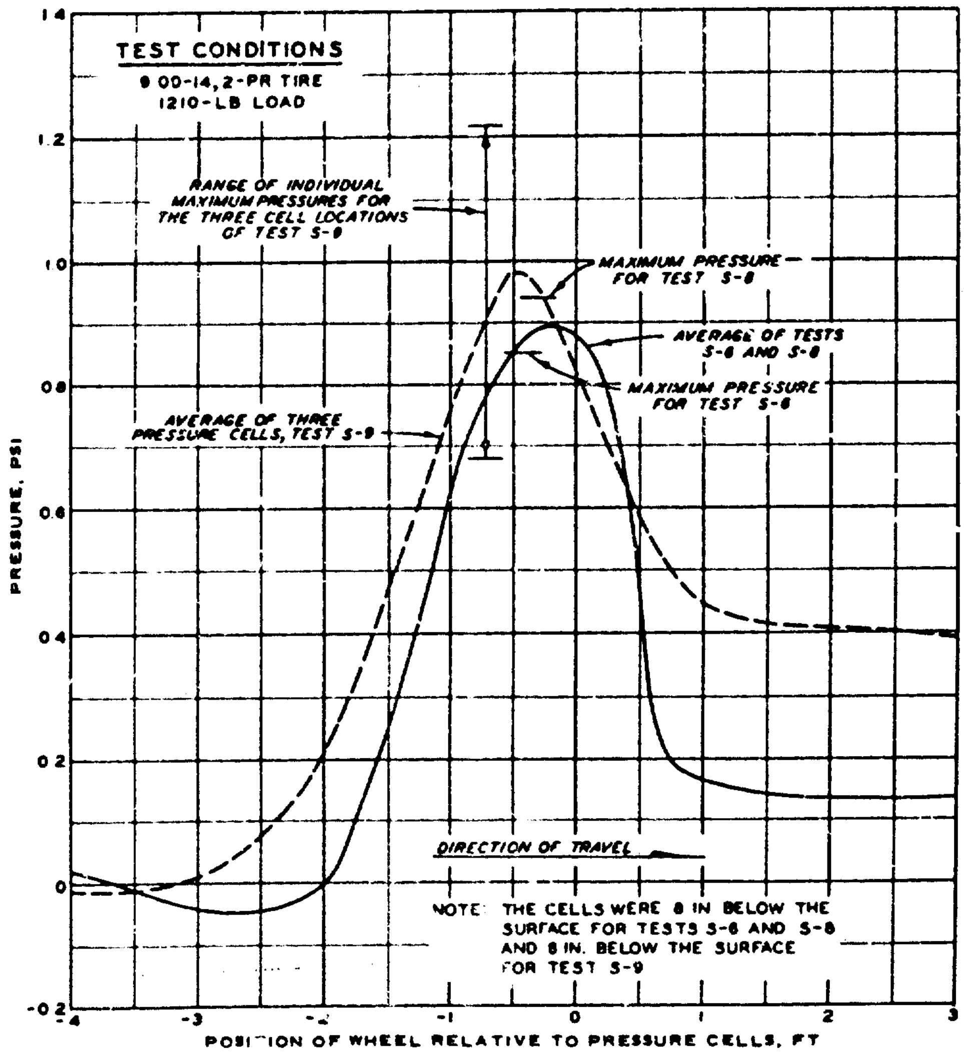


Fig. 5. Pressure cell readings

position indicates approach; a plus (+) position indicates departure of the wheel from the cell. The data measured by the 8-in.-depth cell in the side of the soil car in tests S6 and S8 were treated similarly, and the results are shown as a solid line in fig. 5.

9. The 8-in.-depth readings measured in the side of the soil car were consistently lower than the 6-in.-depth readings measured in the sand, and the maximum stresses recorded were on the order of only 1 psi. A comparison of average 16-in.-depth readings in the soil car with the 14-in.-depth readings in the sand mass showed a similar relation, with the maximum pressure in this case being on the order of about 0.6 psi. It was also noticed that the differences between individual cell readings at the shallow depths for the three stations in test S9 were greater than the difference between the maximum values of the average curve for test S9 and the average curve for tests S6 and S8, and were also greater than the difference between the individual maximum readings of tests S6 and S8, even though the latter tests were performed with the extremes of soil strength values (38 and 51 cone index, respectively). This indicated that sidewall effects were of less significance than variations due to slight nonuniformities of soil strength within the length of a test car or to methods of placing cells in the soil mass, and would not outweigh the advantage of performing two tests in the same soil car.

The Programed-Slip Technique

10. During a programed increasing-slip test (normal test), the rate of change in the performance variables, i.e. torque, pull, and slip, probably is greatest at the towed point. Therefore, any difference in test results that might be attributed to varying slip conditions would be detected if the towed force at the towed point were compared with the towed force obtained from an equivalent towed-wheel test. To make such a comparison, a number of tests consisting simply of measuring the average force required to tow the wheel in the test soil for a full test car length were performed in addition to the programed-slip tests. The towed coefficient (P_T/W), obtained from the programed-slip tests, was plotted against cone index of the soil for each tire and each deflection. This produced a

family of curves separated by load. Towed-force values were taken from these average curves at locations that corresponded in load and soil strength with the test conditions of each specific, simple towed-wheel test. These towed-force values and the results of each towed-wheel test were plotted against each other to produce the relation shown in figs. 7 and 8. The data indicate that the two testing methods produce comparable towed coefficients for a range of test conditions.

11. To provide additional information on the effect of testing techniques on test results, a series of constant-slip tests was conducted at several different positive slips for comparison with the results of a programed-slip test for similar test conditions. Fig. 6 shows a comparison of pull-slip data over a range that includes the maximum-pull condition. It can be seen that the programed-slip data fall within the range of scatter shown for the constant-slip data. The spread of the constant-slip data is due in part to the difficulty of building a

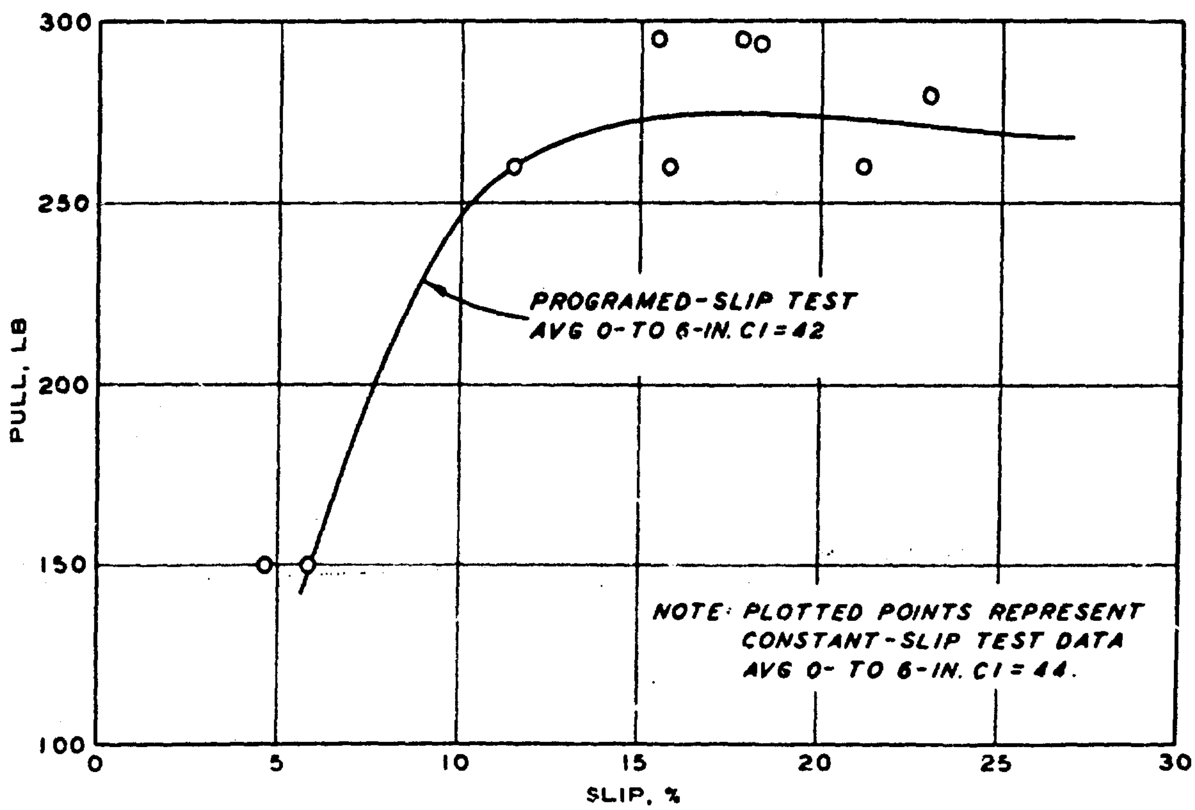


Fig. 6. Comparison of constant- and programed-slip tests; 9.00-14, 4-PR tire, 1000-lb load, and 25 percent deflection

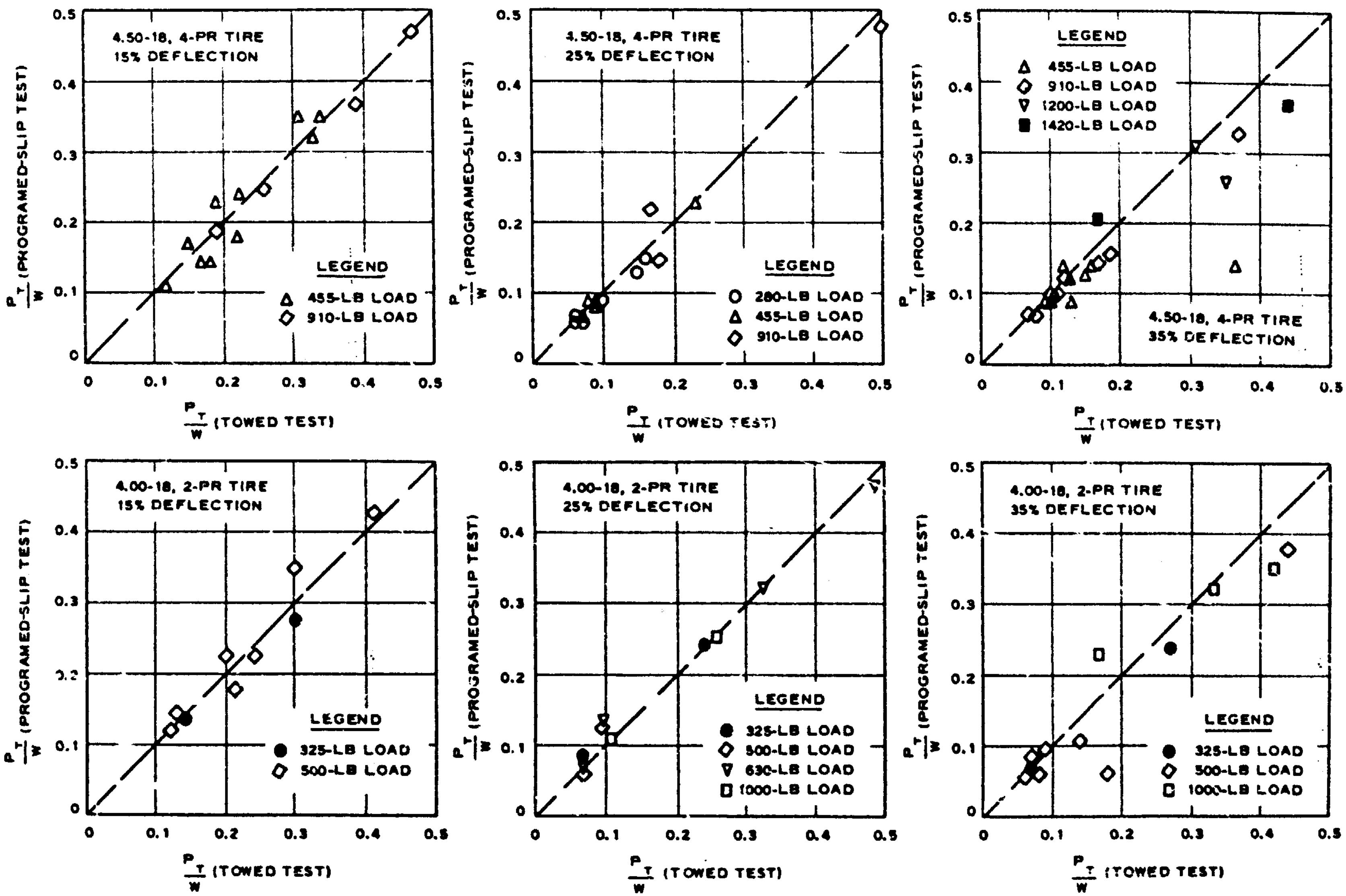


Fig. 7. Comparison of P_T/W from programed-slip tests and towed tests; 4.50-18, 4-PR and 4.00-18, 2-PR tires

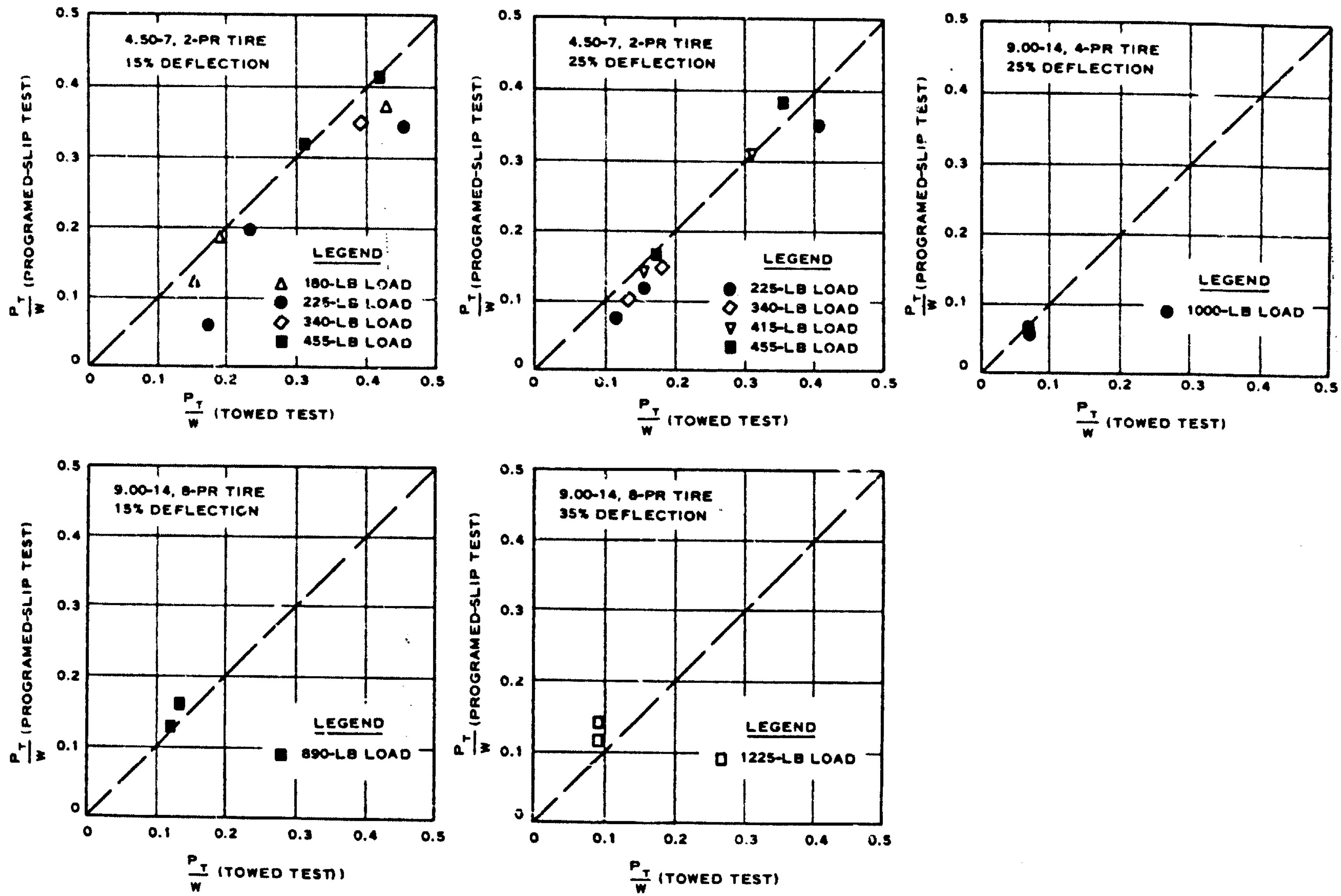


Fig. 8. Comparison of P_T/W from programed-slip tests and towed tests; 4.50-7, 2-PR, 9.00-14, 4-PR, and 9.00-14, 8-PR tires

series of test cars that have essentially identical soil properties in which to run the several tests required to develop a pull-slip relation by means of constant-slip tests. In all constant-slip tests represented, the 9.00-14, 4-PR tire was utilized, the load was 1000 lb, the tire deflection was 25 percent, and the soil strength averaged 44 cone index (0- to 6-in. average).

Other Exploratory Testing

12. Additional exploratory tests were found necessary as the program progressed, and others may be required in the future because there are many unknowns that may affect wheel performance. For instance, the question was raised as to how many passes of the wheel should be included in a standard test. In some of the early tests, 20 passes were made; but these tests revealed that very little change in performance took place after about the fifth pass. On this basis, the standard test was established to consist of five passes. The effect of speed also may be important, and future tests are planned that will establish the degree to which speed of forward motion affects performance. Scatter in the test results prompted an attempt to evaluate the effects of the nonlinearity of the curves of cone index versus depth encountered in some of the tests, and it is likely that more such tests will be run in the future. Obviously, this particular question is complex and probably will require an exhaustive study for even a qualitative solution. In the meantime, an effort has been made to produce a soil profile in the test cars in which the cone index increases uniformly with depth for at least the first 12 in.

PART III: ANALYSIS OF DATA

Analysis Techniques Used

13. Three major classes of independent variables are involved in the passage of a wheel through soil: (a) wheel geometry, (b) load, and (c) soil strength. (Time is not considered in this study because all tests were run at, or near, the same speed of forward advance, i.e. 6 fps.) Close examination of the data will reveal that any of the specific independent variables involved in this testing program fall in one of these three categories, and it will be obvious that wheel geometry, for a pneumatic tire, should include measures of both size and shape. The dependent variables that are measures of the performance of the tire include towed force, pull, torque input, sinkage, and slip. The independent variables constitute the "cause" and the dependent variables the "effect."

14. The simplest and most direct method of studying the relations between dependent and independent variables is through the medium of basic plots in which a single performance variable is plotted against a single test condition with all other independent variables held constant. The introduction of one additional pertinent independent variable will produce a family of curves separated by that additional variable. For example, a single curve of maximum pull versus cone index (soil strength) can be drawn if tire size and deflection (wheel geometry) and load are held constant. Additional curves for each load condition can be drawn if the load is allowed to vary. Unfortunately, when many variables are involved, the basic-plot approach becomes unwieldy because of the number of such plots that are involved. However, it is the simplest method by which the effects of individual variables can be shown directly and is indispensable for that reason. In the analysis, the basic plots will be examined first to establish clearly the trend of data in response to the several variables.

15. The obvious alternative to plotting individual variables against each other is to combine all of the pertinent independent variables into a single significant dimensionless term (or numeric) and plot each of the dependent variables, expressed as dimensionless numerics, against the independent numeric. The ideal dimensionless independent numeric must contain

all of the significant variables in the proper proportions and cause the performance curves for all the tires, under all test conditions, to collapse into a single curve within the band of experimental scatter of the data. Dimensional analysis has proved to be a useful tool in developing the form of the dimensionless independent numeric. It must be recognized, however, that dimensional analysis has its limitations and usually serves only as an intermediate step in the process of producing a dimensionless numeric in its final form. Numerical coefficients, for instance, cannot be determined by dimensional analysis but must be obtained through experimentation and experience. Also, it is often necessary to perform mathematical manipulations on the several numerics resulting from a dimensional analysis in order to produce an optimum independent dimensionless numeric. Dimensional analysis, then, is a powerful aid in the study of physical relations, but it is limited in itself to the production of qualitative rather than quantitative results. Nevertheless, many mobility experimenters have used this approach, starting with the same variables, and obtained comparable end results.[2] Several numerics emerge from the dimensional analysis, and it is necessary to choose the dominant one. The numeric that appears to be dominant in the mobility field is of the general form:

$$\frac{W}{\tau \ell^2}$$

where

W = load, lb

τ = soil strength, psi

ℓ = a characteristic linear dimension (such as wheel diameter), in.

Basic Data Plots

Towed force and maximum
pull versus soil strength

16. Complete summaries of pertinent data for the towed, self-propelled, and maximum-pull points for all powered-wheel tests and results of all towed tests are included in tables 2-6. Plots of towed force

divided by load (P_T/W) and maximum pull divided by load (P_M/W) versus 0- to 6-in. average cone index are included as plates 1-26. The forces were divided by load because the load varied somewhat from test to test, and this ratio was a convenient method of correcting for this load variation and at the same time converting the results to a dimensionless basis. These curves show the effect of varying soil strength when deflections or loads are held constant with a single tire and illustrate the extent of data scatter encountered. Plates 1-13 indicate that P_T/W increases as load increases, with cone index and deflection constant. The towed coefficient (P_T/W) decreases with increasing cone index when deflection and load are constant. When load and cone index are held constant, P_T/W increases with decreasing deflection, as shown by the plot in the lower right-hand corner of each plate. This progression is reversed for the pull coefficient (P_M/W) (plates 14-26), which increases with decreased load or with increased deflection or cone index.

Comparison of single and dual performance

17. Results from a few tests with the 4.50-18, 4-PR tire mounted in dual configuration are shown in plates 12, 13, 25, and 26. The tires were mounted first with no spacing between their sidewalls at 15 and 35 percent deflections (plates 12 and 25), and then with a 1-in. spacing at the same deflections (plates 13 and 26). The plates show that the difference in spacing had little effect upon performance. In comparing the results of the tests with the dual 4.50-18, 4-PR tires with those of tests with the 9.00-14, 8-PR tire at the 890-lb load (plates 8 and 21) (the latter tire has the same diameter and roughly the same width as the combined width of the duals), the following is noted: (a) the towed coefficient is about the same for the single tire as for the duals, and (b) the maximum-pull coefficient is higher for the duals than for the single tire. Comparison of the towed-force and maximum-pull data from tests of the dual tires at a 910-lb load with similar data from tests of single tires with a 455-lb load (equal loads per tire) again showed that the dual configurations tends to improve maximum-pull performance (plate 27). For example, the pull coefficient for the single 4.50-18, 4-PR tire, 455-lb load, at a cone index of 40, is about 0.33. The same test conditions with the tires

mounted in dual configuration but with a load of 910 lb produced a pull coefficient of about 0.46 (average for the 0- and 1-in. spacings). However, the towed-force coefficient is affected only slightly by the dual arrangement. Additional tests with the dual configuration are needed for a valid quantitative analysis.

Effect of tire size on performance

18. A comparison of the effectiveness of different tire sizes can be made on the basis of a specific load and deflection as shown in plates 28-31. This type of approach is limited, however, because it is useful only for the specific tires tested, and thus it is not particularly convenient from the designer's standpoint. A more convenient comparison of the influence of tire size is presented in plates 32-37. These graphs are cross plots from the faired curves drawn through the data points of plates 1-26 and show the effect of varying tire width when the diameter is held constant. The cross-plotting technique involves two approximations of the actual data points through the medium of faired curves. The shapes and general arrangement of the curves appear reasonable, however. These curves show that the wider tires have lower towed force and higher maximum pull. The effect of width on the towed coefficient is greatest on low-strength soil and least on high-strength soil. The pull coefficient is influenced about the same at all strength levels. Similarly, plates 38 and 39 show that as diameter is increased, the towed force decreases and maximum pull increases. Diameter influence varies slightly with strength for the towed data, but the trends for the pull data are not very consistent.

Relation of sinkage
to performance factors

19. It was shown in plates 1-26 that two of the performance parameters of pneumatic tires, namely, the towed and pull coefficients, can be related directly to soil strength with a fair degree of accuracy for a single pass of the wheel. Definite relations also can be shown between sinkage and soil strength and between towed and pull coefficients, respectively, and sinkage. These relations are likely to be of considerable importance in analysis for multiple passes of the wheel. Plates 40-42 show the relation between sinkage and soil strength for three different

deflections of the 4.50-18, 4-PR tire at the towed point. The families of curves are separated by load in a logical manner; however, it is evident, particularly in plates 41 and 42, that sinkage measurements scatter considerably at cone indexes higher than about 40. The maximum-pull and towed coefficients have been plotted against sinkage (all of which are dependent variables) for the same tire in plots a and b, respectively, of plate 43. Although the data scatter somewhat, it would be possible to draw a single curve to represent all conditions of load and deflection. However, the relations appear to separate on the basis of the test deflection as suggested in plate 43. It should be noted at this point that the sinkage values used in this report do not represent physical measurements obtained with a rod and level or similar equipment. The flow of sand into the rut left by the tire prevented this, so it was necessary to compute sinkage values based on the data that were continuously recorded during the test. These computations are covered in Appendix A.

20. An interesting analysis can be made if it is assumed that the resisting force experienced by the powered wheel at the maximum-pull point is the same as that measured for the towed wheel when sinkage is the same. Then, at any sinkage, the summation of the maximum pull and the towed force is a measure of the total horizontal force developed by the powered wheel. In plate 44, the summation of the maximum-pull and towed-force coefficients ($P_M/W + P_T/W$) is plotted with respect to sinkage of the wheel. These data represent tests with a 4.50-18, 4-PR tire. It can be seen that the sum of the towed and pull coefficients is essentially constant for a wide range of sinkages; however, a distinct curve can be drawn to represent each tire deflection. These data indicate the possible existence of an effective strength-of-soil coefficient similar in form to a friction coefficient.

Analysis of Wheel Force System

21. Torque is a dependent variable that has received only superficial attention in this analysis. Primary emphasis has been placed upon relating the towed force, maximum pull, and sinkage to the independent variables since these relations have the most immediate practical value. In later detailed analysis of powered wheels, however, it probably will be

useful to equate input to output by considering that torque and load constitute the input and that bearing and transmission losses plus pull and the soil reaction are measures of the output. For a steady-state condition, the forces acting on a powered, moving, pneumatic-tired wheel are as shown in fig. 9.

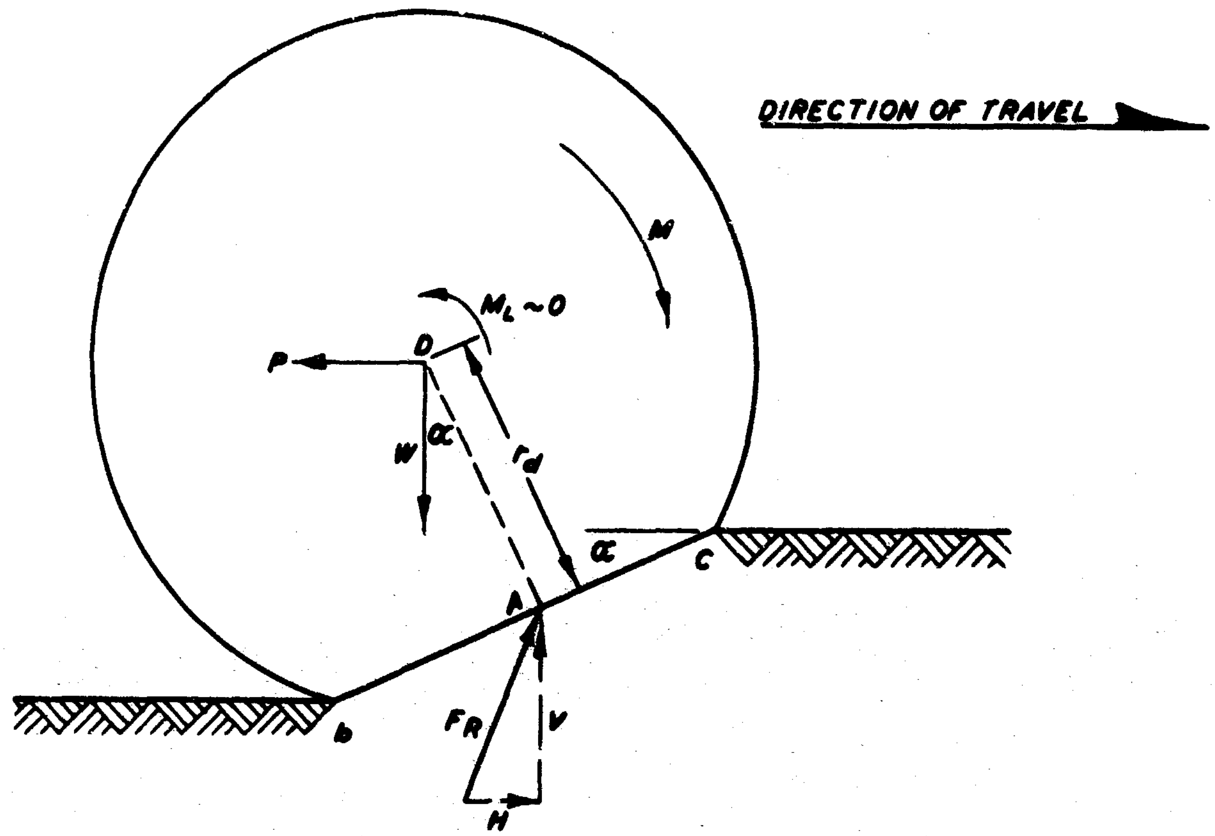


Fig. 9. Forces acting on a powered, moving, pneumatic-tired wheel

where

A = point of maximum deflection of tire

F_R = soil reaction (includes thrust, rolling resistance, etc.)

M = torque input to axle and M_M = M at the maximum-pull point

M_L = mechanical torque losses

P = pull and P_M = P at the maximum-pull point; also P_T = pull at the towed point

r_d = deflected radius ($d/2 - \delta_{MS}$) (normal to plane bc)

W = load on wheel

α = angle between plane of contact (bc) and soil surface; $\alpha_T = \alpha$ at P_T and $\alpha_M = \alpha$ at P_M

22. The point of application of F_R is unknown; however, if it is assumed that it acts at point A, which is the point of maximum deflection of the tire, the problem is simplified greatly. Further, tire deflection studies[3] have shown that the contact area between the tire and soil approximates a plane sloping upward in the direction of travel (plane bc in fig. 9, page 27) and that the point of maximum deflection (A) occurs about midway along the contact surface.

23. Based on the above approximations, it is possible to establish certain equalities among the forces making up the system. The soil reaction F_R can be broken down into a vertical component V and a horizontal component H . Then, summing the forces in the vertical direction:

$$\Sigma F_V : \quad V - W = 0$$

or

$$V = W$$

and summing the forces in the horizontal direction:

$$\Sigma F_H : \quad H - P = 0$$

or

$$H = P$$

Summing the moments about D , the following equation can be written.

Σ N at D:

$$M - M_L - \left[H\ (r_d \cos \alpha)\right] - \left[V\ (r_d \sin \alpha)\right] = 0 \qquad (1)$$

Substituting the equalities V = W and H = P and considering the fact that calibrations of the equipment have indicated that M_L is small enough to be negligible, equation 1 can be simplified to:

$$\frac{M}{r_d} = P \cos \alpha + W \sin \alpha \qquad (2)$$

24. This equation establishes first-order relations among the forces acting on the tire and data from the test program can be substituted in the equation to test the accuracy of the assumptions involved in this relation. Equation 2 cannot be used for predictions, however, because several of the

variables are not known before the test is performed.

25. The force F_R can be replaced by a single normal force N and a tangential force Σ_t acting at a point A as shown in fig. 10. A

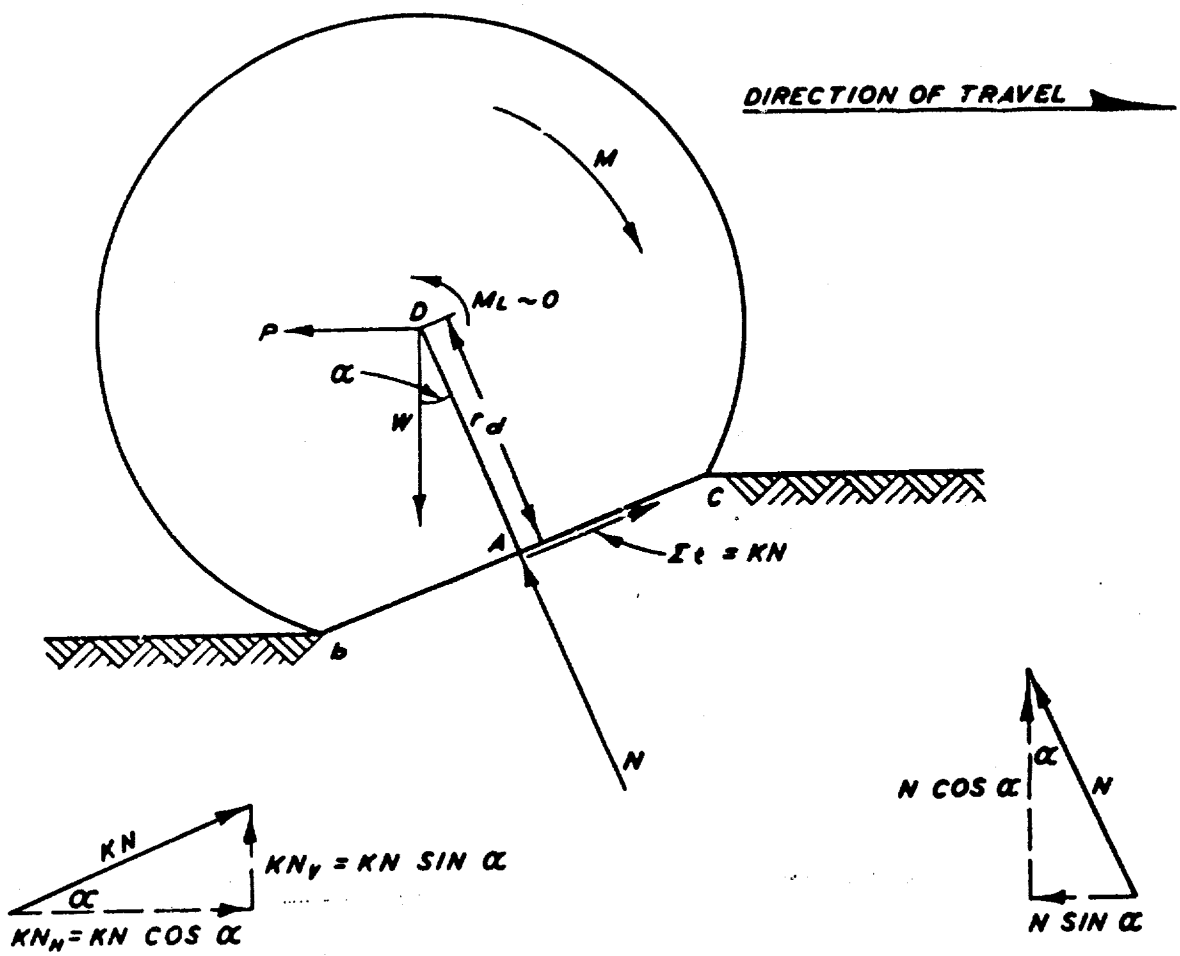


Fig. 10. Component forces of soil reaction (F_R)

constant shear coefficient, K , can be assumed so that $\Sigma_t = KN$. Based on studies of the distribution of normal pressures acting on a deformable wheel,[4] it is assumed that N will pass through the center line of the wheel axle. The assumptions mentioned in paragraph 22 also are included in this analysis, and therefore the force N will form the angle α with the vertical as shown in fig. 10.

$$\Sigma F_H : \; P + N \sin \alpha - KN \cos \alpha = 0$$

or

$$KN \cos \alpha = P + N \sin \alpha \qquad (3)$$

$$\Sigma F_V : \; W - KN \sin \alpha - N \cos \alpha = 0$$

or

$$W = KN \sin \alpha + N \cos \alpha \tag{4}$$

$$\Sigma M \text{ at } D : \; M = KN \, r_d \tag{5}$$

or in terms of the components of KN:

$$M = KN_H \, (r_d \cos \alpha) + KN_V \, (r_d \sin \alpha) \tag{6}$$

but

$$KN_H = KN \cos \alpha = P + N \sin \alpha \tag{7}$$

and

$$KN_V = KN \sin \alpha = W - N \cos \alpha \tag{8}$$

substituting equations 7 and 8 in equation 6 and reducing yields

$$M = (P + N \sin \alpha) \, (r_d \cos \alpha) + (W - N \cos \alpha) \, (r_d \sin \alpha)$$

$$M = P \, (r_d \cos \alpha) + N \sin \alpha \, (r_d \cos \alpha) + W \, (r_d \sin \alpha) - N \cos \alpha \, (r_d \sin \alpha)$$

$$M = P \, (r_d \cos \alpha) + W \, (r_d \sin \alpha)$$

or

$$\frac{M}{r_d} = P \cos \alpha + W \sin \alpha \tag{9}$$

this is identical with equation 2, and at the maximum-pull condition this equation becomes:

$$\frac{M_M}{r_d} = P_M \cos \alpha_M + W \sin \alpha_M \tag{10}$$

26. If the resultant of the normal forces acting on the wheel passes through the center of the axle, then the sum of the tangential forces KN is zero for a towed wheel, and the force system for the towed wheel can be represented as shown in fig. 11.

$$\Sigma F_V : \; W - N_T \cos \alpha_T = 0$$

or

$$V = W = N_T \cos \alpha_T \tag{11}$$

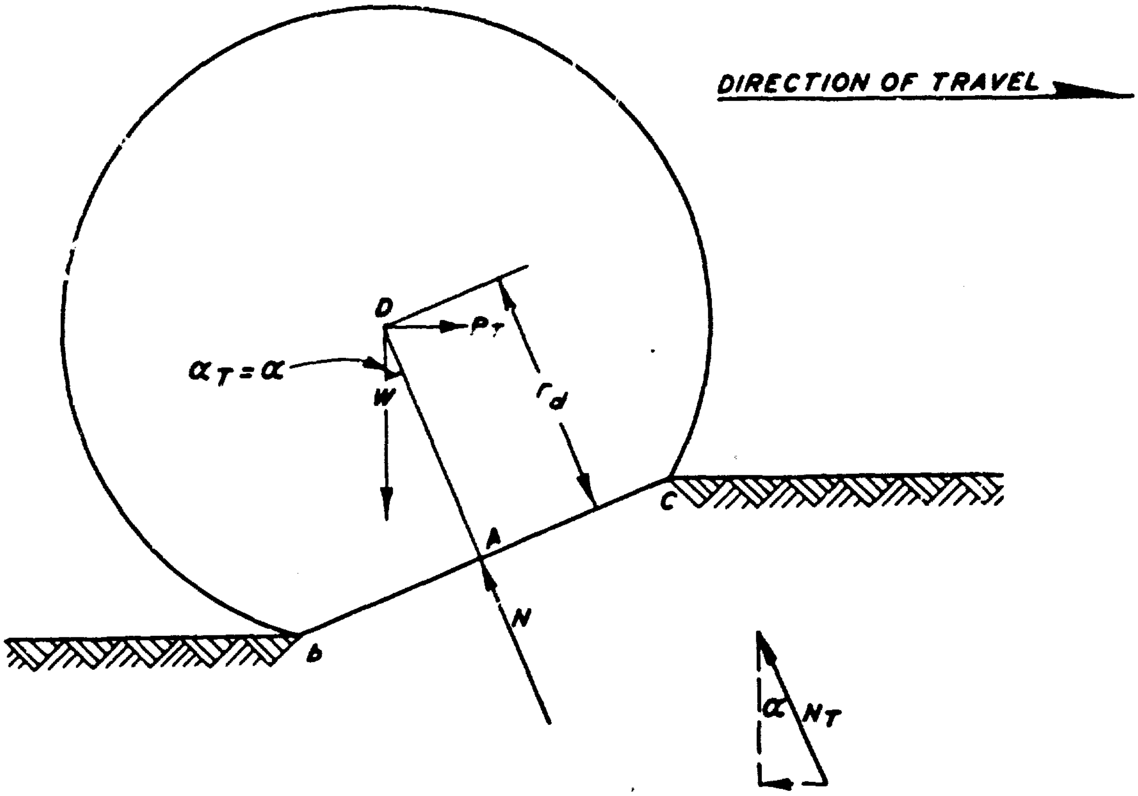


Fig. 11. Forces acting on a towed wheel

$$\Sigma F_H : \quad P_T - N_T \sin \alpha_T = 0$$

or

$$P_T = N_T \sin \alpha_T \tag{12}$$

$$\Sigma \text{ M at D:} \quad N_T \sin \alpha_T (r_d \cos \alpha_T) - N_T \cos \alpha_T (r_d \sin \alpha_T) = 0$$

$$P_T (r_d \cos \alpha_T) - W (r_d \sin \alpha_T) = 0$$

$$P_T = \frac{W \sin \alpha_T}{\cos \alpha_T} = W \tan \alpha_T \tag{13}$$

27. At this point, various approximations can be made and substituted in the equation $M_M/r_d = P_M \cos \alpha_M + W \sin \alpha_M$, and depending on the set of approximations used, the results can be slightly different. Three fairly logical groups of approximations will be discussed.

Case I. In this case, the only approximation is that $\alpha_T \approx \alpha_M$, so if the equality $W = P_T/\tan \alpha_T$ (see equation 13) is substituted in equation 10, then

$$\frac{M_M}{r_d} = P_M \cos \alpha_M + \frac{P_T \cos \alpha_T}{\sin \alpha_T} (\sin \alpha_M) \tag{14}$$

and if

$$\alpha_T = \alpha_M$$

then

$$\frac{M_M}{r_d} = (P_M + P_T) \cos \alpha_M \tag{15}$$

Case II. If it is assumed that for small sinkages and correspondingly small values of α, $\cos \alpha_M \approx 1$ and $\tan \alpha_T \approx \sin \alpha_M$, then

$$P_M \approx P_M \cos \alpha_M \tag{16}$$

and

$$P_T = W \tan \alpha_T \approx W \sin \alpha_M \tag{17}$$

Substituting equations 16 and 17 in equation 10 yields

$$\frac{M_M}{r_d} \approx P_M + P_T \tag{18}$$

Actually, sinkage and thus α are slightly greater at the maximum-pull condition than at towed condition so that $\alpha_M > \alpha_T$, but for a given α, $\tan \alpha > \sin \alpha$. Therefore, the inequalities incorporated in equation 17 tend to balance each other.

Case III. The basic approximation in this group of assumptions is that $N_T \sin \alpha_T \approx N_M \sin \alpha_M$. Substituting this expression in equation 12 yields

$$P_T \approx N_M \sin \alpha_M \tag{19}$$

At the maximum-pull condition, equation 3 would be written

$$KN \cos \alpha_M = P_M + N_M \sin \alpha_M \tag{20}$$

Then substituting P_T for $N_M \sin \alpha_M$, equation 3 becomes

$$KN \cos \alpha_M = P_M + P_T$$

or

$$KN = \frac{P_M + P_T}{\cos \alpha_M} \quad (21)$$

But

$$KN = \frac{M_M}{r_d} \text{ (see equation 5)}$$

Therefore,

$$\frac{M_M}{r_d} = \frac{P_M + P_T}{\cos \alpha_M} \quad (22)$$

For most tests, it can be shown that $\alpha_M > \alpha_T$, but for a given wheel load, $N_T > N_M$. Therefore, the inequalities in equation 19 tend to balance each other.

28. Each set of approximations involves the substitution of α_T for α_M . In most instances, $\alpha_T < \alpha_M$, but in cases II and III, there are factors that tend to compensate for this inequality. In case I the inequality is considered to be negligible. The angles α_T and α_M were determined for a few special tests. The data from these tests are presented in the following tabulation, together with the results of calculations obtained by means of equation 10 and by the equations derived from the various simplifying approximations, equations 15, 18, and 22.

	Measured				Calculated M_M, ft-lb			
Tire Size	α_M deg	α_T deg	z_M in.	M_M ft-lb	Eq 10	Case I Eq 15	Case II Eq 18	Case III Eq 22
4.50-18, 4-PR	18	12.5	2.89	171	175	140	148	156
6.00-16, 2-PR	7	4.6	0.90	326	326	302	304	306

These data lend credence to the assumptions used in developing equation 10 and seem to indicate that, of the additional approximations used, those in case III fit the data best.

29. In plate 45, the input torque divided by the deflected radius is plotted against the summation of $P_M + P_T$. Scatter of the data in this plate is relatively small, probably because the values plotted on both axes are affected in equal proportions by soil strength. The equation of the straight line passing through both the origin and the mean coordinates of all the data is

$$\frac{M_M}{r_d} = \frac{P_M + P_T}{0.967} \tag{23}$$

Of the equations previously derived, equation 22, $M_M/r_d = P_M + P_T/\cos \alpha_M$, most nearly approximates this empirical relation. The angle whose cosine is 0.967 is $\approx 14°45'$. A value of this magnitude for α_M is only slightly larger than the average α_M for the special tests mentioned in paragraph 28. The data shown in plate 45 represent tests with 10 different tires covering a deflection range of 15 to 35 percent and a 0- to 6-in. cone index range of 14 to 71. Data for these tests are given in table 5.

30. In plate 46, the input torque divided by the deflected radius is plotted against the wheel load. The equation of a straight line drawn through the origin and the mean coordinates of all the data points is

$$\frac{M_M}{r_d} = 0.380 \text{ W} \tag{24}$$

The scatter in the plot is quite large in comparison with that in the previous plot, and this probably can be attributed to the fact that M_M/r_d is dependent to some degree on soil strength, whereas the load is an independent variable. A review of the data indicated that there is a tendency for the coefficient in equation 24 to increase in proportion to soil strength. The data shown in plate 46 represent the same tests as those shown in plate 45, and these data also appear in table 5.

31. From this analysis, a performance prediction equation can be developed, e.g. an expression for computing the maximum pull that can be developed by a pneumatic tire operating in dry Yuma sand can be obtained by combining the equations developed from the analysis of the wheel force system with the empirical relation described by equations 23 and 24. Combining equations 23 and 24, it can be shown that $P_M + P_T/0.967 = 0.380 \text{ W}$, or $P_M + P_T = 0.367 \text{ W}$. Next, substitute $W \tan \alpha_T$ for P_T (see equation 13) in equation 25 and solve for P_M as follows:

$$P_M = 0.367 \text{ W} - \text{W} \tan \alpha_T$$

and reducing

$$P_M = (0.367 - \tan \alpha_T) W \qquad (25)$$

where W is a known quantity and $\tan \alpha_T$ can be estimated from relations previously developed (see plates 1-13). The coefficient 0.367 is empirical, and it represents the result of tests conducted on an average soil strength of 41 cone index. It will increase or decrease in proportion to soil strength, and since $\tan \alpha_T = P_T/W$ (see equation 13), this value will decrease as soil strength increases.

Numeric Plots

32. The general dimensionless numeric $W/\tau \ell^2$ referred to in paragraph 15 is based on dimensional analysis, and can be modified extensively as long as the dimensionless quality is not destroyed. Several variations of the numeric have been investigated, each utilizing cone index for the soil strength term. The linear dimension squared (ℓ^2) has been modified to bd (tire width times diameter), and δd (deflection times diameter). In the former case, there is no term to describe the deflected shape of the tire, and in the latter, there is no tire-width term. Since both deflection and width are known to influence tire performance, it is unlikely that numerics that fail to include these parameters will provide a basis for correlation of the performance of all tire sizes under a wide range of test conditions.

33. Recently, two numerics that incorporate tire diameter, width, and deflection have been proposed. One of these is $\frac{W}{CI \, \pi \, \delta \sqrt{bd}}$ and the other is $\frac{W}{CI \, \delta \, b^{0.5} \, d}$, where:

W = load, lb

CI = 0- to 6-in. average cone index, psi

π = a constant, 3.1416....

δ = hard-surface tire deflection, in.

b = tire width, in.

d = tire diameter, in.

The first numeric is dimensionless and was suggested in a letter to WES by Lt. Col. A. D. Sela of the Israeli Army.[5] It approximates the contact pressure of a pneumatic tire resting on a hard surface divided by the cone index of the soil. The second numeric, developed by Wilson, Nuttall, Raimond, Engineers, Inc. (WNRE) from an analysis of the Yuma sand test data, at first glance appears nondimensionless by a factor of $\ell^{0.5}$, but WNRE has attempted to prove that this numeric, $\frac{W}{CI\ \delta\ b^{0.5}\ d}$, is dimensionless.[6]

34. The WNRE numeric has been used in plates 47 and 48 to group all of the test data into a single set of plots. The towed-force-over-load numeric (P_T/W) and the sinkage-over-diameter numeric (z/d) are used as measures of performance at the towed point in plate 47. In plate 48, the numerics used to rate performance are the maximum-pull-over-load (P_M/W) and the sinkage-over-diameter (z/d) ratios. The sinkage values used in the data in plate 47 were those measured at the towed point, whereas the sinkages used in plate 48 were those measured at the maximum-pull point. The scatter of the data points in every plot is considerable. However, in view of the wide range of soil strengths, tire sizes, loads, and tire deflections represented, it can perhaps be considered encouraging that in each plot there is a strong central tendency that can be indicated by a single curve as shown.

35. These data plots, which contain all the available points, show that all the test results tend to fit into the same general range, but they are not suitable for studying the trend for each tire or for comparing these trends. A more informative comparison can be made by delineating the relation between the numerics separately for each test tire and then assembling these lines on a single plot. This procedure was used to produce the plots in plates 49-54. (The measures of tire performance are the same as those used in plates 47 and 48.) Plates 49 and 50 have been plotted on the basis of the Sela numeric; plates 51 and 52 employ the hard-surface contact pressure divided by cone index (for a direct comparison with the Sela numeric), and plates 53 and 54 use the WNRE numeric.

36. The data curves do not collapse well in any of these plots, although with some notable exceptions similar curve shapes result. The sinkage numerics in particular spread rather widely at the higher values of the independent numerics in all the plots. In each plot of the towed-coefficient numeric, the curve representing the data for the 1.75-26 bicycle

tire curves in a different direction from the predominant trend. The towed-coefficient relation for the 16x15-6R Terra-Tire also curves in this manner for the Sela and contact-pressure numeric plots but not for the WNRE numeric plot. The best overall relations were evidenced in the comparisons of the maximum-pull numerics with each of the three independent numerics. However, in these plots, the 1.75-26 bicycle tire data again did not conform well to the trend of the majority. Also, the data from the small-diameter 4.50-7 tire were not well contained within the common data range in these plots. It is of some interest to note that the Sela numeric and the contact-pressure numeric locate the 4.50-7 tire maximum-pull data in approximately the same relative position on the respective plots, but the relative locations of the 16x15-6R Terra-Tire data are quite different. In most other respects, the Sela numeric and the contact-pressure numeric produce essentially similar results. It must be concluded that no one of the three independent numerics examined can be shown to be definitely more useful than the others on the basis of these data plots.

U. S. Army Transportation Research Command Analysis Method

37. The U. S. Army Transportation Research Command (TRECOM)* has done much field testing in snow and sand in an effort to develop criteria for use in vehicle mobility design. A large portion of this work has been concerned with the use of scale models to predict performance of full-size vehicles. This work has resulted in the development of a technique for evaluating vehicle performance that utilizes a measure of relative effective soil strength, termed c_r, which is obtained from penetration tests with circular flat plates. A complete discussion of the c_r concept is contained in reference 7, which was prepared under contract with TRECOM.

38. Data from the maximum-pull points for the 4.50-18 tire tests yield the families of curves in plate 55 when treated by the TRECOM method. It can be seen that the terms on both axes of both plots are dimensionless and that the numeric on the horizontal axis is of the same form as that in paragraph 15. Data from the towed points of the same tests were used to draw the curves in plate 56.

39. It was noted that the towed coefficient (P_T/W) and the sinkage

* Now U. S. Army Aviation Material Laboratory.

wheel diameter (z/d) plots in plate 56 were in apparent disagreement with the results of tests performed by TRECOM[8] on a 6.00-16 and a 9.00-14 Model Marsh Buggy (MB) tire in sand in that the WES curves are concave upward whereas the TRECOM curves are convex upward. (Copies of the TRECOM plots are included herein as plates 57 and 58.) Results of tests performed with the 9.00-14, 2-PR tire indicated that this difference is contingent upon the load and soil strength combinations involved. The curves for z/d in the upper plot of plate 56, all of which are concave upward, were drawn from data points for widely varying loads and soil strengths. Plates 59-61 show that the curves may be either convex or concave upward depending upon soil strength and load conditions. The curves for constant soil strength are concave upward for the higher strengths (approximately $c_r = 0.70$ to 0.80), but the trend suggests that they may become convex upward for low soil strength ($c_r < 0.40$). If the data are plotted for specific loads (solid curves), the performance curves tend to be concave upward, with the possible exception of the very light loads at 15 percent tire deflection. Since there is a separation both by soil strength and load, it appears that the numeric $W/c_r bd$ will not serve as a common basis for correlation of the results of tests for a wide range of load and soil strength conditions. Note that the c_r values used in plates 55, 56, and 59-61 are based upon a 1.4-in.-diameter circular plate, so that the ratio of plate diameter to tire diameter is about 1:19.4 for the two tires involved.

Land Locomotion Laboratory Analysis Method

40. The Land Locomotion Laboratory (LLL), U. S. Army Tank-Automotive Command, has developed a number of formulas for the prediction of vehicle performance, based upon the six soil values proposed by Bekker. The details of the development and application of this method are given in reference 9. To evaluate these formulas for general use, several representative WES tests were analyzed by this method. Considerable difficulty was encountered in applying the sinkage formulas to these data because the depth-penetration curves for three different-size circular plates were not parabolas (did not plot as parallel straight lines on logarithmic-paper) as was assumed in the development of the equations. The parameters needed

for use in the equations were obtained from parabolas drawn (by statistical methods) to best approximate the actual load-penetration curves.

41. Plate 62 shows measured sinkage at the towed point plotted against sinkage predicted from the appropriate LLL formula for the 4.50-18, 4-PR tire. Although several data points fall above the one-to-one line, this line more nearly represents one boundary of this group of data. Similarly, a line with a slope of one on four can be used to represent the other boundary. In any event, the proposed formulas do not closely predict the actual sinkage of the towed wheel. The sinkage measured at the maximum-pull point is plotted against predicted sinkage in plate 63. The predicted values again scatter widely, but there is a tendency for the predicted values to be more evenly dispersed about a one-to-one relation. Plate 64 shows the relation between the towed force measured in the test and the values predicted by the LLL equations when the values of sinkage predicted by the LLL equations are used. The majority of the predicted values are larger than the measured ones, and the data points are badly scattered. Plate 65 shows the relation between the towed force measured in the test and the values predicted by the LLL equation when the measured values of sinkage from the actual test data are used. With a few exceptions, the predicted values are smaller than the measured values, and the one-to-one line seems to be a boundary. However, there is less scatter.

PART IV: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

42. The following conclusions concerning the first-pass performance of the pneumatic tires included in this program can be drawn from the analysis and tests that have been performed to date:

a. In spite of the relatively high degree of control exercised in preparing the soil and performing the tests, there is a considerable scatter of data in many of the plots. Nonlinearities in the curves of cone index versus depth are responsible for a large portion of the scatter.

b. Definite, orderly relations exist among the dependent performance variables such as maximum pull, towed force, sinkage, and torque.

c. Tire performance improves with (1) increasing cone index, (2) increasing tire deflection, (3) increasing tire diameter, (4) increasing tire width, and (5) decreasing load.

d. Two tires mounted side by side in a dual configuration require about the same towed-force-over-load ratio as a single tire of the same size, other conditions being equal. However, the dual arrangement produced somewhat greater maximum-pull-over-load ratio than the single tire under the same circumstances.

e. None of the numerics using cone index as a soil strength parameter produced the desired degree of correlation with the various dependent performance numerics. However, the progress that has been made by using dimensionless numerics indicates that the ultimate objective of establishing single relations between the various dependent numerics and the independent numeric can be achieved.

f. The TRECOM analysis system failed to produce adequate correlation of the data. It is difficult to determine whether this is caused by inadequacy of the form of the numeric or by the G_r value that is used to quantify the soil strength.

g. The analytical approach developed by LLL failed to produce acceptable predictions of sinkage due, partly at least, to the fact that the plate-penetration curves were not truly parabolic.

Recommendations

43. As a result of this study, it is recommended that:

a. Efforts be continued toward development of a suitable dimensionless numeric for correlation of the performance data for single-wheel tests.

b. Tests be conducted with 4x4 and 6x6 full-size vehicles to demonstrate the relation of their performance to the single-wheel tests.

c. Tests be conducted in at least one additional type of sand.

d. A program of fundamental studies be pursued to explain the influence of the individual variables on the performance of pneumatic tires in soft soils.

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Table 1

Tire Data

Deflection %	Load lb	Inflation Pressure psi: No Load	Inflation Pressure psi: Loaded	Carcass Section Height, in.: No Load	Carcass Section Height, in.: Loaded	Section Width in.: No Load	Section Width in.: Loaded	Tire Diam in.	Hard-Surface Measurements: Meas Rolling Circumference ft	Hard-Surface Measurements: Contact Area sq in.	Hard-Surface Measurements: Contact Length in.	Hard-Surface Measurements: Contact Width in.	Hard-Surface Measurements: Contact Pressure psi
							1.75-26, Bicycle						
15	100	40.3	42.1	1.40	1.19	1.72	1.84	28.17	6.52	2.2	3.9	0.7	45.4
15	225	91.0	93.2	1.40	1.19	1.77	1.89	28.17	6.52	2.4	4.1	0.8	91.8
35	100	12.4	13.3	1.40	0.91	1.69	2.02	28.17	6.44	6.1	6.1	1.2	16.2
35	225	33.0	34.8	1.40	0.91	1.72	2.01	28.17	6.44	5.9	5.9	1.2	38.0
							4.00-18, 2-PR						
15	325	30.1	30.6	3.34	2.83	4.57	4.74	26.18	6.70	9.7	5.6	2.0	33.5
15	500	49.8	50.6	3.38	2.88	4.62	4.71	26.26	6.78	9.6	5.7	2.0	52.0
15	630	54.2	55.0	3.42	2.90	4.63	4.72	26.34	6.79	11.1	6.0	2.1	56.7
15	750	69.7	70.0	3.50	2.92	4.64	4.73	26.50	6.80	11.8	6.0	2.4	63.5
25	325	15.3	15.9	3.32	2.49	4.48	4.77	26.14	6.57	16.1	7.2	2.6	20.1
25	500	24.0	24.4	3.34	2.50	4.49	4.77	26.18	6.58	17.5	7.5	2.8	28.4
25	630	29.9	30.6	3.34	2.51	4.57	4.78	26.18	6.59	17.5	7.5	2.8	35.9
25	1000	49.9	50.8	3.38	2.54	4.62	4.80	26.26	6.68	18.4	7.7	2.8	54.2
35	100	1.4	1.7	3.30	2.17	4.30	4.90	26.10	6.43	26.3	8.6	3.7	3.7
35	325	10.4	11.5	3.32	2.23	4.43	4.81	26.14	6.47	21.5	8.0	3.2	15.0
35	500	15.1	15.9	3.32	2.17	4.48	4.98	26.14	6.47	25.5	8.7	3.5	19.6
35	630	18.9	19.5	3.32	2.19	4.49	5.12	26.14	6.47	28.3	9.2	3.7	22.2
35	1000	29.5	30.6	3.34	2.16	4.57	5.08	26.18	6.47	27.7	9.2	3.5	36.0
							4.50-18, 4-PR						
15	455	31.4	31.7	3.80	3.23	4.78	5.03	27.10	6.86	11.9	5.9	2.4	37.9
15	700	51.9	52.3	3.80	3.23	4.80	5.00	27.10	6.88	11.7	6.1	2.3	59.8
15	910	69.2	70.0	3.80	3.23	4.90	5.10	27.10	6.90	12.9	6.1	2.4	70.4
25	280	7.6	8.0	3.80	2.85	4.70	5.10	27.10	6.69	22.4	7.7	3.4	12.4
25	455	13.6	14.3	3.80	2.85	4.78	5.21	27.10	6.68	22.9	7.9	3.4	19.8
25	700	23.9	24.4	3.80	2.85	4.76	5.28	27.10	6.69	22.2	8.0	3.3	31.5
25	910	31.0	31.7	3.80	2.85	4.78	5.30	27.10	6.69	23.4	8.0	3.4	38.7
35	455	7.3	8.0	3.80	2.47	4.70	5.54	27.10	6.53	35.1	9.6	4.2	12.9
35	910	18.9	19.9	3.80	2.47	4.78	5.59	27.10	6.57	34.3	9.7	4.0	26.0
35	1200		27.5	3.80	2.47	4.78		27.10	6.56	37.9	10.2	4.3	31.6
35	1420	30.2	31.7	3.80	2.47	4.78	5.66	27.10	6.56	38.5	10.2	4.3	36.8
							6.00-16, 2-PR						
15	225	9.7	9.7	5.02	4.27	6.48	6.71	27.58	7.00	22.0	7.5	3.6	10.2
15	315	14.0	14.0	5.03	4.28	6.57	6.72	27.60	7.01	21.0	7.4	3.5	15.0
15	455	21.3	21.3	5.04	4.28	6.60	6.77	27.62	7.02	20.5	7.4	3.4	22.2
15	890	45.5	45.9	5.10	4.33	6.68	6.80	27.74	7.08	19.2	7.3	3.2	46.1
25	225	4.4	4.4	5.03	3.76	6.40	6.86	27.56	6.80	37.8	10.1	4.6	6.0
25	455	9.6	10.0	5.02	3.76	6.50	7.00	27.58	6.82	40.5	10.3	4.8	11.2
25	990	13.6	14.0	5.03	3.77	6.51	6.93	27.60	6.83	37.8	9.8	4.5	15.6
25	890	21.8	22.3	5.04	3.78	6.60	7.05	27.62	6.85	36.8	9.7	4.5	24.2
35	225	2.4	2.4	5.01	3.26	6.33	7.22	27.56	6.66	55.9	12.0	5.9	4.0
35	455	6.2	6.2	5.02	3.27	6.42	7.37	27.58	6.65	53.8	12.3	6.0	8.5
35	890	13.5	14.0	5.03	3.27	6.57	7.46	27.60	6.67	57.4	12.0	5.8	15.5
35	1290	21.4	22.3	5.04	3.28	6.60	7.53	27.62	6.72	54.3	11.6	5.7	23.8
							6.00-16, Radial Ply						
15	690	45.7	46.6	4.72	4.01	6.30	6.78	26.98	6.95	16.8	6.5	3.1	52.9
35	890	14.2	15.0	4.61	3.00	6.20	7.34	26.76	6.85	43.8	11.4	4.6	20.3

(Continued)

Table 1 (Continued)

Deflection %	Load lb	Inflation Pressure psi: No Load	Inflation Pressure psi: Loaded	Carcass Section Height, in.: No Load	Carcass Section Height, in.: Loaded	Section Width in.: No Load	Section Width in.: Loaded	Tire Diam in.	Hard-Surface Measurements: Meas Rolling Circumference ft	Contact Area sq in.	Contact Length in.	Contact Width in.	Contact Pressure psi
								6.00-16, Radial Ply, with Directional Bar Tread					
15	890	45.0	45.6	5.22	4.44	6.29	6.80	27.98	7.09	27.4	6.9	4.9	39.7
35	890	11.2	12.4	5.18	3.37	6.23	7.42	27.90	6.97	52.8	11.0	5.3	16.8
								6.00-16, Solid Rubber					
2	455			5.28	5.17	7.00	7.01	28.06	7.26	3.0	2.7	1.4	49.2
3	890			5.28	5.11	7.00	7.03	28.06	7.25	5.2	3.5	1.8	68.5
								9.00-14, 2-PR					
10	195	13.9	14.1	5.81	5.23	8.50	8.65	27.09	7.00	15.8	5.6	3.5	12.3
15	225	9.0	9.4	5.75	4.89	8.48	8.62	26.97	6.95	26.0	7.0	4.5	8.6
15	340	13.9	14.1	5.81	4.94	8.50	8.69	27.09	6.95	26.1	7.0	4.5	12.9
15	455		17.6	5.84	4.94	8.68	8.91	27.15	7.02	27.6	7.3	4.6	16.4
15	670	30.0	30.1	6.04	5.13	8.70	8.82	27.55	7.13	23.4	7.0	4.2	28.6
15	890	39.8	40.2	6.16	5.24	8.82	8.99	27.79	7.17	24.2	7.1	4.2	36.7
20	500	13.9	14.1	5.81	4.64	8.49	8.75	27.09	8.75	36.0	8.3	5.2	13.8
20	890	24.8	25.0	5.94	4.75	8.58	8.89	27.35	6.95	39.6	8.8	5.4	22.4
25	290	5.7	5.9	5.67	4.25	8.52	8.82	26.81	6.74	43.1	8.9	5.8	6.7
25	455	9.0	9.4	5.75	4.31	8.48	8.85	26.97	6.76	47.4	9.2	6.2	9.6
25	670	13.7	14.1	5.81	4.36	8.50	8.78	27.09	6.82	47.2	9.6	5.9	14.1
25	890		17.6	5.84	4.38	8.64	9.00	27.15	6.85	48.4	9.7	6.0	18.3
25	1330	29.8	30.1	6.04	4.53	8.86	9.10	27.55	6.98	45.8	9.7	5.6	29.0
30	890		14.1	5.81	4.07	8.50	9.08	27.09	6.69	63.7	11.1	6.9	13.9
35	100	0.4	0.7	4.93	3.21	8.83	9.23	25.33	6.40	86.6	12.0	8.5	1.1
35	225	2.0	2.4	5.15	3.35	8.70	9.40	25.77	6.36	83.2	12.0	8.2	2.7
35	455	5.3	5.6	5.65	3.67	8.50	9.20	26.77	6.53	71.5	11.8	7.3	6.3
35	720	8.9	9.4	5.75	3.74	8.52	9.23	26.91	6.57	74.5	12.0	7.4	9.6
35	890	11.9	12.5	5.79	3.76	8.49	9.15	27.05	6.61	71.2	11.8	7.1	12.4
35	1020	13.5	14.1	5.81	3.78	8.51	9.20	27.09	6.62	71.2	11.8	7.2	14.3
35	1225	16.8	17.6	5.84	3.80	8.52	9.21	27.15	6.67	68.5	11.6	7.1	17.8
								9.00-14, 2-PR, Replacing Old 9.00-14, 2-PR*					
15	890	41.3	41.6	6.30	5.36	8.80	8.86	28.07	7.28	23.0	7.1	4.0	38.2
15	1300	58.4	59.0	6.42	5.46	8.93	9.13	28.31	7.36	21.0	7.1	3.75	61.8
25	455	9.3	9.3	5.80	4.35	8.50	8.99	27.07	6.79	44.2	9.4	5.7	10.3
25	890	19.8	20.0	6.00	4.50	8.57	8.98	27.47	6.91	42.0	9.4	5.4	21.2
								9.00-14, 4-PR					
25	1000	15.6	16.0	6.12	4.59	8.30	8.78	27.71	6.80	55.1	10.6	6.1	18.1
								9.00-14, 8-PR					
15	225	5.7	5.8	5.32	4.52	8.30	8.50	26.11	6.65	23.3	5.9	4.7	9.6
15	455	15.1	15.3	5.46	4.64	8.20	8.50	26.39	6.67	23.4	6.5	4.5	19.4
15	670	23.1	23.3	5.53	4.70	8.25	8.48	26.53	6.72	23.9	6.7	4.4	28.0
15	890	33.4	33.7	5.61	4.77	8.25	8.49	26.69	6.78	23.5	6.8	4.3	37.7
15	1025	39.6	40.2	5.63	4.77	8.25	8.49	26.73	6.82	22.9	6.9	4.2	44.6
15	1225	46.8	47.2	5.63	4.79	8.25	8.48	26.73		23.8	7.0	4.2	51.3
25	295	3.0	3.2	5.28	3.96	8.30	8.85	26.03	6.44	43.2	8.1	6.1	6.8
25	455	5.6	5.8	5.32	3.99	8.30	8.87	26.11	6.43	46.5	8.8	6.2	9.7
25	670	9.9	10.2	5.40	4.05	8.28	8.79	26.27	6.47	46.0	9.0	5.9	14.5
25	890	14.9	15.3	5.46	4.10	8.28	8.77	26.39	6.51	45.0	9.0	5.8	19.7
25	1210	21.0	21.4	5.52	4.14	8.26	8.71	26.51	6.56	45.1	9.2	5.7	26.8

(Continued)

* Use these data for all tests with 9.00-14, 2-PR tire after test 8576.

(Sheet 2 of 3 sheets)

Table 1 (Concluded)

Deflection %	Load lb	Inflation Pressure psi: No Load	Inflation Pressure psi: Loaded	Carcass Section Height, in.: No Load	Carcass Section Height, in.: Loaded	Section Width in.: No Load	Section Width in.: Loaded	Tire Diam in.	Hard-Surface Measurements: Meas Rolling Circumference ft	Hard-Surface Measurements: Contact Area sq in.	Hard-Surface Measurements: Contact Length in.	Hard-Surface Measurements: Contact Width in.	Hard-Surface Measurements: Contact Pressure psi
						9.00-14, 8-PR (Continued)							
35	455	2.9	3.2	5.28	3.44	8.30	9.17	26.03	6.28	58.5	9.6	7.0	7.7
35	720	5.5	5.8	5.32	3.46	8.30	9.23	26.11	6.28	65.1	10.5	7.1	11.0
35	890	7.8	8.1	5.36	3.48	8.28	9.22	26.19	6.29	68.0	10.9	7.2	13.0
35	1020	8.9	9.3	5.38	3.50	8.28	9.26	26.23	6.27	70.6	11.2	7.3	14.4
35	1225	12.5	12.9	5.42	3.52	8.28	9.20	26.31	6.33	67.3	11.0	7.0	18.1
35	1420	14.8	15.3	5.46	3.55	8.28	9.22	26.39	6.34	68.3	11.1	7.1	20.7
						5.00-12, 2-PR							
15	150	17.3	17.4	3.27	2.78	4.16	4.35	19.87	5.06	5.8	4.5	1.5	26.0
15	225	26.5	26.7	3.29	2.80	4.17	4.30	19.91	5.07	5.1	4.4	1.7	44.4
15	340	39.8	40.0	3.30	2.80	4.18	4.34	19.93	5.07	6.5	4.9	1.8	52.4
15	455	58.8	59.0	3.30	2.83	4.22	4.36	19.99	5.10	6.1	4.7	1.6	75.8
25	150	7.0	7.1	3.26	2.45	4.10	4.45	19.85	4.93	16.1	6.7	2.9	8.3
25	180	8.7	8.8	3.27	2.45	4.12	4.44	19.87	4.93	13.8	6.0	2.9	13.2
25	225	11.7	11.8	3.27	2.45	4.17	4.43	19.87	4.93	14.1	6.1	2.7	16.0
25	340	18.7	18.8	3.28	2.46	4.17	4.46	19.89	4.94	13.9	6.3	2.8	24.5
25	455	26.5	26.7	3.29	2.47	4.17	4.47	19.91	4.95	13.1	6.1	2.8	34.6
35	150	3.8	4.0	3.25	2.11	4.09	4.68	19.83	4.85	19.6	7.0	3.5	7.7
35	180	4.9	5.0	3.25	2.11	4.09	4.70	19.83	4.85	19.8	7.0	3.4	9.1
35	225	7.0	7.1	3.26	2.12	4.10	4.86	19.85	4.84	20.2	7.5	3.2	11.1
35	340	11.7	11.8	3.27	2.13	4.13	4.71	19.87	4.85	21.8	7.4	3.3	15.6
35	455	17.2	17.4	3.27	2.13	4.16	4.66	19.87	4.87	19.2	7.2	3.2	23.7
						4.50-7, 2-PR							
15	100	8.8	9.0	3.26	2.77	4.40	4.52	14.84	3.72	6.9	3.4	1.9	14.5
15	180	18.9	19.0	3.27	2.78	4.37	4.54	14.86	3.73	7.5	4.2	2.3	24.0
15	225	24.2	24.3	3.27	2.78	4.37	4.58	14.86	3.73	7.3	4.2	2.2	30.6
15	340	41.3	41.5	3.30	2.80	4.42	4.58	14.92	3.75	7.3	4.2	2.2	46.3
15	455	59.8	60.0	3.33	2.83	4.46	4.61	14.98	3.78	7.4	4.3	2.2	61.3
25	100	3.7	3.9	3.26	2.44	4.38	4.76	14.84	3.62	12.3	5.3	2.8	8.1
25	225	11.2	11.3	3.26	2.44	4.37	4.79	14.84	3.63	13.1	5.4	2.9	17.1
25	340	18.9	19.0	3.27	2.45	4.37	4.78	14.86	3.64	13.5	5.3	3.0	25.1
25	415	24.1	24.3	3.27	2.45	4.37	4.79	14.86	3.64	13.3	5.5	3.0	31.0
25	455	26.5	26.7	3.27	2.45	4.38	4.78	14.86	3.64	14.2	5.5	3.1	32.0
35	225	7.4	8.0	3.26	2.12	4.34	4.97	14.84	3.56	17.5	6.1	3.4	12.9
35	455	18.2	19.1	3.29	2.14	4.35	4.92	14.90	3.57	18.2	6.3	3.4	24.9
						4.50-18, 4-PR, Dual Configuration, No Spacing							
15	910	32.7	33.0	3.80	3.23	10.03	10.33	27.10	6.86	26.9	6.2	8.1	33.8
35	910	9.7	10.0	3.80	2.47	10.03	10.76	27.10	6.56	68.5	9.6	9.7	13.3
						4.50-18, 4-PR, Dual Configuration, 1-in. Spacing							
15	910	32.7	33.0	3.80	3.23	11.03	11.33	27.10	6.86	26.9	6.2	9.1	33.8
35	910	9.7	10.0	3.80	2.47	11.03	11.76	27.10	6.56	68.5	9.6	10.7	13.3
						16x15-6R, 2-PR, Terra-Tire							
15	225	6.8	7.0	5.00	4.25	15.20	15.20	17.00	4.29	25.0	3.3	8.4	9.0
15	360	13.8	14.0	5.19	4.41	15.20	15.20	17.38	4.41	20.4	3.1	7.8	17.7
15	455	17.5	17.7	5.28	4.49	15.20	15.20	17.56	4.46	20.7	3.0	8.2	22.0
15	720	30.9	31.1	5.50	4.68	15.20	15.20	18.00	4.60	22.6	3.6	7.3	31.8
25	225	2.9	3.1	4.84	3.63	15.20	15.20	16.68	4.23	50.9	5.1	10.9	4.4
25	360	5.3	5.5	4.92	3.69	15.20	15.20	16.84	4.27	50.3	5.1	11.0	7.2
25	455	7.0	7.2	5.00	3.75	15.20	15.20	17.00	4.30	52.6	5.4	11.0	8.6
25	720	12.9	13.1	5.19	3.89	15.20	15.22	17.38	4.37	50.4	5.4	10.8	14.3

(Sheet 3 of 3 sheets)

Table 2

Summary of Test Results

Yuma Sand, Pass 1, Towed Point

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				1.75-26, Bicycle				
S504A	92	15	102	-25	0	1.89	-9.9	24
S510A	94	15	114	-13	0	0.64	-1.0	68
S499A	95	15	140	-27	0	1.15	-7.5	43
S503A	88	15	212	-78	0	3.52	-15.8	21
S508A	87	15	216	-95	0	3.99	-18.6	25
S511A	91	15	256	-61	0	1.47	-8.1	67
S497A	102	15	258	-79	0	[illegible]	-12.4	37
S505A	91	35	91	-18	0	1.63	-6.4	22
S502A	90	35	93	-21	0	1.65	-8.1	19
S500A	98	35	133	-7	0	0.63	-0.5	42
S509A	88	35	201	-75	0	3.46	-17.4	22
S498A	95	35	253	-82	0	2.12	-11.5	37
S507A	91	35	261	-73	0	2.10	-10.3	34
				4.00-18, 2-PR				
S727A	88	15	170	-34	0	1.56	-14.0	20
S719A	89	15	202	-6	0	0.32	-3.0	51
S59A	87	15	318	[illegible]	0	1.76	-15.8	24
S209A	90	15	334	-99	0	1.91	-14.2	22
S209A	95	15	337	-99	0	1.91	-13.5	22
S209A	106	15	351	-106	0	2.09	-12.9	22
S48A	84	15	352	-60	0	1.00	-4.2	40
S209A	102	15	352	-107	0	1.95	-13.5	22
S79A	95	15	354	-50	0	0.57	-4.2	56
S210A	125	15	358	-50	0	0.78	-1.6	43
S210A	115	15	368	-51	0	0.79	-1.6	43
S319A	89	15	371	-49	0	0.92	-4.7	53
S34A	115	15	445	-192	0	3.74	-26.6	46
S71A	84	15	448	-170	0	2.91	-22.7	23
S34A	125	15	478	-197	0	3.31	-26.6	46
S62A	86	15	454	-148	0	2.04	-13.6	42
S231A	91	15	502	-213	0	3.63	-26.6	25
S231A	107	15	503	-204	0	3.39	-26.6	25
S34A	85	15	512	-120	0	1.44	-9.9	46
S34A	100	15	515	-130	0	1.57	-9.9	46
S228A	115	15	516	-63	0	0.66	-0.6	69
S228A	125	15	517	-62	0	0.67	-0.6	69
S213A	105	15	521	-158	0	2.12	-13.1	31
S61A	91	15	523	-145	0	1.47	-9.9	48
S227A	104	15	523	-105	0	1.13	-2.6	46
S231A	101	15	527	-205	0	3.23	-24.9	25
S227A	95	15	532	-107	0	1.28	-2.6	46
S213A	95	15	532	-158	0	2.14	-13.1	31
S214A	125	15	532	-110	0	1.27	-5.9	55
S214A	115	15	540	-110	0	1.36	-5.4	55

(Continued)

(Sheet 1 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.00-18, 2-PR (Continued)					
S232A	125	15	559	-75	0	1.06	-0.6	61
S232A	115	15	562	-76	0	0.87	-0.6	61
S69A	84	15	622	-230	0	2.84	-21.2	35
S325A	92	15	654	-106	0	1.04	-0.5	62
S68A	92	15	658	-193	0	1.83	-11.7	50
S77A	94	15	680	-160	0	1.47	-9.3	56
S323A	87	15	784	-171	0	1.50	-3.6	57
S58A	91	25	303	-83	0	1.89	-10.3	24
S211A	95	25	330	-76	0	1.50	-6.8	26
S211A	100	25	333	-76	0	1.36	-9.1	26
S211A	105	25	339	-87	0	1.71	-9.6	26
S212A	125	25	340	-24	0	0.25	-2.0	46
S64A	97	25	345	-50	0	0.63	-4.2	40
S212A	115	25	348	-24	0	0.37	-1.1	46
S84A	96	25	350	-21	0	0.20	0.0	58
S80A	98	25	352	-23	0	0.19	-0.5	56
S72A	86	25	457	-163	0	2.82	-19.0	23
S326A	87	25	476	-147	0	2.36	-14.9	25
S221A	105	25	510	-49	0	0.67	-1.4	50
S222A	125	25	512	-38	0	0.52	-1.0	71
S221A	95	25	515	-53	0	0.62	-2.4	50
S70A	93	25	519	-147	0	1.91	-15.6	35
S222A	115	25	520	-39	0	0.45	-2.9	71
S75A	99	25	531	-78	0	0.70	-2.7	58
S53A	87	25	547	-110	0	1.33	-6.1	44
S73A	96	25	553	-90	0	1.06	-4.2	60
S313A	94	25	607	-286	0	4.43	-37.0	22
S313A	102	25	645	-322	0	4.70	-35.1	22
S224A	125	25	669	-45	0	0.48	-0.6	73
S314A	122	25	672	-220	0	2.52	-19.8	33
S322A	88	25	676	-102	0	0.98	-3.1	54
S82A	97	25	678	-67	0	0.60	-0.5	62
S54A	85	25	679	-140	0	1.19	-4.2	44
S307A	94	25	679	-130	0	1.22	-2.5	40
S224A	115	25	689	-48	0	0.45	-0.6	73
S78A	101	25	690	-85	0	0.85	-1.4	56
S314A	116	25	691	-228	0	2.52	-16.3	33
S223A	105	25	698	-71	0	0.73	-1.5	54
S223A	95	25	708	-73	0	0.87	-1.1	54
S65A	85	25	1000	-410	0	3.58	-23.9	50
S327A	96	25	1032	-352	0	2.78	-11.1	44
S81A	92	25	1056	-305	0	2.16	-15.6	62
S83A	88	25	1070	-309	0	2.32	-15.6	58
S220A	115	25	1072	-115	0	0.80	-0.8	72
S220A	126	25	1074	-111	0	0.67	-1.1	72
S219A	105	25	1084	-265	0	1.92	-5.9	55
S219A	95	25	1090	-294	0	2.09	-7.6	55
S312A	100	35	109	-1	0	0.14	-0.7	29
S724A	92	35	186	-22	0	0.73	-1.4	20
S721A	91	35	187	-1	0	0.04	-3.1	41

(Continued)

(Sheet 2 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.00-18, 2-PR (Continued)					
S728A	93	35	190	-23	0	0.70	-0.8	21
S720A	91	35	210	-10	0	0.06	-4.2	50
S229A	96	35	309	-91	0	2.05	-14.6	19
S229A	90	35	310	-89	0	1.94	-15.9	19
S229A	100	35	315	-79	0	1.54	-14.6	19
S55A	88	35	325	-67	0	1.23	-6.0	25
S229A	105	35	333	-78	0	1.82	-14.6	19
S230A	115	35	335	-22	0	0.29	-1.4	56
S230A	125	35	340	-24	0	0.23	-0.9	56
S60A	98	35	347	-29	0	0.47	-3.1	48
S33A	115	35	430	-200	0	4.08	-23.0	17
S33A	125	35	490	-205	0	3.58	-30.0	17
S226A	115	35	502	-29	0	0.21	-0.6	71
S217A	105	35	503	-40	0	0.34	-1.7	48
S218A	125	35	504	-29	0	0.27	-0.6	65
S225A	105	35	504	-35	0	0.44	-1.2	50
S226A	125	35	504	-28	0	0.25	-1.2	71
S218A	115	35	505	-29	0	0.15	-1.7	65
S217A	95	35	509	-52	0	0.32	-1.2	48
S225A	95	35	509	-36	0	0.42	-0.6	50
S43A	115	35	510	-43	0	0.41	-1.7	71
S35A	84	35	519	-62	0	0.61	-1.2	40
S51A	90	35	520	-50	0	0.57	-4.2	60
S43A	125	35	522	-45	0	0.12	-1.7	71
S43A	100	35	526	-33	0	0.07	-1.2	71
S45A	91	35	528	-65	0	0.60	-4.7	46
S44A	100	35	530	-93	0	0.89	-2.2	71
S43A	85	35	532	-40	0	0.04	-0.6	71
S44A	115	35	535	-98	0	0.91	-3.2	71
S44A	125	35	535	-90	0	0.70	-3.2	71
S310A	95	35	536	-144	0	2.15	-9.3	25
S320A	95	35	536	-14	0	0.39	0.0	56
S63A	97	35	538	-91	0	0.97	-4.7	42
S33A	100	35	540	-67	0	0.58	-5.7	46
S44A	85	35	545	-103	0	0.77	-0.3	71
S49A	92	35	557	-30	0	0.29	-1.0	61
S33A	85	35	562	-90	0	0.65	-2.3	46
S39A	88	35	572	-39	0	0.30	-0.6	75
S41A	88	35	573	-44	0	0.59	-2.7	58
S311A	85	35	615	-233	0	3.15	-24.0	24
S328A	93	35	648	-234	0	2.94	-23.0	26
S317A	100	35	668	-89	0	0.76	-2.5	43
S315A	94	35	903	-456	0	5.53	-48.1	25
S315A	99	35	908	-528	0	6.34	-52.7	25
S315A	101	35	955	-561	0	6.17	-50.4	25
S67A	91	35	985	-332	0	2.97	-19.0	43
S315A	106	35	996	-525	0	5.36	-35.1	25
S215A	92	35	1035	-407	0	3.83	-30.7	36
S215A	99	35	1040	-471	0	4.65	-30.7	36
S316A	121	35	1045	-348	0	2.91	-11.1	38
S316A	116	35	1049	-353	0	2.83	-15.6	38

(Continued)

(Sheet 3 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.00-18, 2-PR (Continued)				
S76A	98	35	1055	-193	0	1.30	-4.7	58
S318A	97	35	1057	-201	0	1.81	-3.1	44
S215A	105	35	1058	-436	0	4.23	-28.3	36
S74A	98	35	1060	-213	0	1.55	-3.8	60
S47A	85	35	1074	-280	0	2.13	-10.7	40
S216A	117	35	1100	-184	0	1.53	-4.2	46
S216A	125	35	1102	-181	0	1.53	-3.6	46
				4.50-18, 4-PR				
S161A	95	15	448	-136	0	2.04	-14.9	28
S172A	128	15	460	-84	0	0.84	-3.4	54
S206A	125	15	462	-89	0	1.15	-8.2	39
S356A	93	15	467	-126	0	1.91	-12.4	33
S162A	125	15	467	-105	0	1.27	-7.1	38
S172A	122	15	468	-85	0	0.92	-3.4	54
S189A	105	15	468	-69	0	0.83	-2.9	47
S190A	115	15	468	-58	0	0.66	-2.4	62
S205A	95	15	468	-148	0	2.17	-19.5	28
S182A	125	15	469	-77	0	0.73	-3.9	56
S161A	102	15	470	-147	0	2.13	-14.9	28
S171A	93	15	470	-156	0	2.46	-21.6	31
S181A	95	15	470	-109	0	1.44	-10.0	46
S189A	97	15	470	-69	0	0.78	-4.4	47
S190A	125	15	471	-58	0	0.66	-1.8	62
S205A	90	15	472	-167	0	2.45	-17.5	28
S205A	103	15	474	-162	0	2.34	-19.5	28
S181A	105	15	477	-99	0	1.15	-7.8	46
S171A	102	15	479	-159	0	2.31	-18.8	31
S182A	115	15	480	-87	0	0.93	-6.9	56
S133A	91	15	481	-45	0	0.70	-0.5	59
S206A	115	15	484	-94	0	1.17	-8.2	39
S162A	115	15	485	-109	0	1.33	-8.3	38
S141A	93	15	492	-65	0	0.78	-2.0	55
S112A	91	15	478	-93	0	1.54	-8.1	44
S366A	97	15	736	-139	0	1.22	-4.7	57
S360A	92	15	759	-209	0	1.98	-12.4	42
S163A	93	15	892	-417	0	4.21	-31.8	33
S163A	103	15	906	-425	0	4.27	-31.8	33
S188A	117	15	937	-239	0	1.60	-8.2	57
S188A	125	15	940	-240	0	1.53	-10.0	57
S164A	125	15	944	-373	0	3.05	-20.9	43
S164A	115	15	957	-368	0	3.03	-20.9	43
S187A	105	15	964	-187	0	0.92	-2.8	69
S140A	98	15	965	-250	0	1.69	-11.1	59
S142A	97	15	965	-229	0	1.62	-5.7	60
S187A	95	15	972	-189	0	1.14	-3.8	69
S353A	91	25	275	-43	0	1.19	-4.7	19
S192A	125	25	279	-17	0	0.05	-1.0	70
S134A	92	25	280	18	0	0.69	-1.3	59
S191A	105	25	280	-18	0	0.03	-0.5	55
S201A	96	25	281	-45	0	1.01	-6.5	22

(Continued)

(Sheet 4 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.50-18, 4-PR (Continued)					
S165A	95	25	282	-42	0	0.98	-6.5	26
S192A	115	25	286	-18	0	0.00	-0.5	70
S147A	90	25	268	-40	0	1.17	-4.9	22
S165A	105	25	288	-41	0	0.94	-6.0	26
S166A	118	25	288	-26	0	0.45	-3.5	38
S198A	125	25	288	-18	0	0.11	-1.4	67
S166A	126	25	289	-26	0	0.40	-2.9	38
S202A	125	25	289	-29	0	0.40	-3.9	37
S191A	95	25	290	-18	0	0.00	-0.5	55
S201A	105	25	291	-45	0	0.92	-5.5	22
S202A	116	25	294	-29	0	0.45	-2.9	37
S198A	116	25	295	-19	0	0.13	-0.9	67
S138A	97	25	298	-20	0	1.03	-0.6	57
S197A	100	25	301	-20	0	0.25	-0.9	52
S113A	95	25	302	-21	0	0.71	-2.0	40
S197A	90	25	302	-20	0	0.19	-1.4	52
S136A	93	25	380	-26	0	1.09	-0.3	56
S145A	88	25	443	-111	0	2.37	-23.4	23
S173A	95	25	460	-40	0	0.66	-1.0	44
S159A	114	25	462	-105	0	1.47	-8.2	28
S159A	121	25	469	-104	0	1.82	-10.3	28
S185A	95	25	469	-31	0	0.38	-2.1	63
S186A	115	25	469	-42	0	0.45	-3.0	49
S159A	105	25	470	-111	0	1.70	-7.2	28
S186A	125	25	471	-41	0	0.61	-3.0	49
S132A	92	25	474	-32	0	1.44	-4.2	57
S174A	115	25	476	-31	0	0.43	-2.1	57
S174A	125	25	477	-32	0	0.17	-2.5	57
S159A	98	25	480	-111	0	1.54	-9.3	28
S173A	105	25	480	-35	0	0.47	-1.0	44
S185A	105	25	480	-31	0	0.47	-1.0	63
S114A	93	25	485	-43	0	0.73	-2.0	43
S365A	94	25	740	-62	0	0.45	-2.7	61
S195A	90	25	848	-419	0	4.86	-35.9	25
S195A	96	25	886	-423	0	4.85	-35.0	25
S195A	105	25	898	-469	0	5.42	-35.9	25
S119A	96	25	940	-90	0	0.86	-0.7	64
S111A	95	25	956	-163	0	1.59	-2.6	46
S176A	125	25	970	-88	0	0.54	-0.9	64
S196A	125	25	980	-171	0	1.51	-0.5	42
S176A	115	25	992	-89	0	0.56	-0.9	64
S175A	105	25	1002	-172	0	1.20	-2.9	51
S175A	95	25	1010	-196	0	1.56	-3.9	51
S196A	115	25	1022	-173	0	1.50	-11.5	42
S85A	87	35	430	-146	0	2.58	-24.9	26
S143A	86	35	448	-96	0	1.62	-13.2	19
S193A	90	35	451	-68	0	1.23	-4.5	29
S85A	99	35	452	-158	0	2.56	-20.7	26
S157A	95	35	459	-59	0	0.98	-4.5	30

(Continued)

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Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-18, 4-PR (Continued)				
S160A	121	35	459	-71	0	0.91	-5.5	27
S126A	97	35	460	-34	0	1.59	-5.0	55
S194A	125	35	460	-34	0	0.29	-2.0	49
S91A	94	35	462	-42	0	0.48	-3.0	31
S117A	97	35	462	-30	0	0.85	-2.0	57
S157A	121	35	463	-61	0	1.06	-4.5	30
S116A	97	35	464	-23	0	0.27	-1.5	52
S123A	95	35	468	-35	0	0.75	-2.7	56
S193A	99	35	468	-72	0	1.26	-6.5	29
S98A	103	35	470	-42	0	0.55	-2.0	38
S160A	96	35	470	-82	0	1.22	-7.0	27
S160A	106	35	470	-71	0	0.97	-6.0	27
S169A	103	35	470	-52	0	0.86	-5.5	27
S98A	122	35	471	-46	0	0.49	-3.0	38
S131A	93	35	471	-30	0	0.55	-1.0	57
S194A	115	35	471	-35	0	0.38	-2.0	49
S107A	96	35	473	-38	0	0.23	-3.6	33
S170A	126	35	473	-35	0	0.42	-0.6	52
S90A	102	35	474	-49	0	0.73	-3.1	38
S122A	95	35	475	-42	0	0.81	-1.0	64
S86A	123	35	478	-61	0	0.60	-4.9	39
S177A	105	35	478	-41	0	0.35	-3.0	38
S169A	95	35	479	-58	0	0.95	-5.5	27
S170A	117	35	479	-35	0	0.50	-2.4	52
S94A	95	35	481	-53	0	0.60	-1.0	33
S101A	97	35	481	-33	0	0.55	-1.0	44
S177A	95	35	481	-41	0	0.52	-3.0	38
S103A	94	35	483	-54	0	0.64	-4.5	34
S178A	125	35	483	-31	0	0.15	-0.1	62
S125A	98	35	484	-38	0	0.84	-1.0	65
S178A	115	35	484	-30	0	0.17	-0.1	62
S93A	94	35	485	-50	0	0.91	-2.6	34
S130A	94	35	487	-35	0	0.86	-1.0	56
S106A	95	35	488	-45	0	0.76	-2.0	39
S98A	101	35	490	-49	0	0.49	-2.4	38
S86A	113	35	502	-70	0	0.71	-4.9	39
S146A	87	35	880	-296	0	3.18	-35.2	24
S158A	93	35	904	-329	0	3.66	-35.5	26
S158A	102	35	904	-347	0	3.99	-35.5	26
S184A	126	35	914	-71	0	0.42	-1.7	60
S95A	89	35	915	-227	0	2.04	-10.7	32
S129A	96	35	915	-70	0	0.63	-1.5	58
S184A	119	35	916	-79	0	0.57	-1.7	60
S97A	106	35	924	-176	0	1.45	-4.8	38
S99A	100	35	924	-108	0	0.68	-1.7	42
S180A	125	35	924	-64	0	0.17	-0.9	70
S99A	92	35	930	-126	0	0.82	-1.7	42
S118A	96	35	930	-68	0	0.63	-1.5	60
S128A	95	35	930	-80	0	0.92	-2.4	62
S152A	96	35	930	-118	0	0.65	-2.6	40

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-18, 4-PR (Continued)				
S96A	93	35	935	-190	0	1.69	-4.9	40
S121A	96	35	935	-98	0	1.09	-4.2	54
S100A	98	35	936	-105	0	1.22	-2.3	49
S100A	112	35	936	-102	0	1.18	-2.3	49
S100A	126	35	940	-114	0	1.34	-2.3	49
S104A	90	35	940	-123	0	2.28	-11.1	36
S120A	96	35	940	-71	0	0.90	0.0	62
S156A	110	35	940	-158	0	1.61	-2.7	39
S158A	112	35	940	-334	0	3.64	-22.5	26
S183A	105	35	940	-94	0	0.74	-1.7	53
S110A	93	35	941	-131	0	1.29	-4.2	38
S99A	108	35	942	-111	0	0.59	-3.3	42
S127A	96	35	942	-76	0	0.84	-0.3	59
S97A	110	35	944	-160	0	1.27	-4.8	38
S115A	94	35	945	-78	0	0.95	-2.6	55
S151A	97	35	945	-145	0	0.48	-3.6	42
S158A	121	35	945	-369	0	4.14	-26.9	26
S97A	116	35	946	-192	0	1.52	-4.8	38
S124A	94	35	950	-98	0	1.09	-6.5	58
S153A	95	35	950	-220	0	1.85	-5.3	31
S154A	97	35	950	-158	0	1.26	-2.3	41
S92A	99	35	952	-218	0	1.75	-5.8	33
S105A	95	35	955	-132	0	1.15	-3.1	37
S156A	124	35	955	-157	0	1.41	-1.7	39
S102A	95	35	957	-132	0	1.51	-2.7	44
S180A	115	35	958	-59	0	0.36	-0.3	70
S183A	98	35	958	-94	0	0.84	-1.7	53
S109A	95	35	965	-112	0	1.47	-2.0	36
S179A	105	35	968	-93	0	0.77	-2.3	48
S155A	94	35	970	-225	0	1.90	-7.1	39
S108A	95	35	980	-105	0	1.11	-1.0	38
S179A	95	35	980	-110	0	1.04	-2.3	48
S207A	99	35	1105	-588	0	5.74	-49.2	30
S207A	93	35	1118	-610	0	5.78	-47.3	30
S203A	90	35	1128	-642	0	7.13	-49.4	26
S203A	102	35	1140	-652	0	7.81	-56.9	26
S207A	105	35	1157	-622	0	5.76	-47.3	30
S87A	90	35	1160	-722	0	7.79	-67.6	26
S203A	95	35	1190	-640	0	6.77	-54.5	26
S208A	130	35	1230	-370	0	2.84	-12.1	37
S364A	101	35	1233	-124	0	0.86	-2.4	53
S361A	98	35	1235	-356	0	2.66	-14.3	42
S208A	125	35	1244	-337	0	2.46	-9.3	37
S167A	98	35	1260	-675	0	7.83	-62.6	28
S208A	115	35	1265	-434	0	3.25	-17.0	37
S87A	103	35	1300	-763	0	7.74	-59.0	26
S204A	125	35	1318	-442	0	3.19	-17.0	41
S204A	114	35	1324	-443	0	3.32	-15.1	41
S88A	113	35	1420	-720	0	6.40	-46.0	39
S88A	127	35	1420	-760	0	7.35	-54.5	39

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-18, 4-PR (Continued)				
S362A	93	35	1442	-500	0	3.33	-21.2	53
S200A	126	35	1460	-126	0	0.76	-1.5	63
S200A	116	35	1466	-141	0	0.79	-2.5	63
S199A	102	35	1472	-271	0	1.77	-2.9	49
S135A	100	35	1477	-166	0	1.54	-1.6	58
S168A	117	35	1480	-650	0	5.69	-37.7	44
S168A	126	35	1496	-650	0	4.72	-32.6	44
S137A	98	35	1500	-158	0	1.78	-0.5	53
S199A	97	35	1510	-253	0	1.64	-3.5	49
S199A	90	35	1520	-253	0	1.67	-2.9	49
S378A	88	99*	200	-41	0	1.18	-11.7	25
S372A	88	99	265	-39	0	1.08	-9.3	39
S376A	85	99	337	-72	0	1.52	-20.5	28
S378A	92	99	355	-113	0	2.17	-19.5	25
S376A	89	99	384	-109	0	2.23	-22.7	28
S372A	92	99	437	-93	0	1.50	-12.8	39
S378A	96	99	508	-187	0	2.91	-29.0	25
S376A	93	99	554	-224	0	3.72	-31.6	28
S372A	95	99	586	-153	0	2.00	-19.3	39
S378A	100	99	630	-283	0	4.29	-33.3	25
S372A	99	99	717	-220	0	2.55	-20.5	39
S378A	105	99	749	-366	0	4.54	-29.3	25
S376A	98	99	759	-331	0	4.28	-36.4	28
S372A	103	99	828	-264	0	2.74	-25.8	39
S378A	109	99	840	-444	0	5.16	-35.1	25
S378A	114	99	916	-506	0	6.05	-42.8	25
S372A	108	99	919	-345	0	3.67	-31.0	39
S376A	102	99	921	-432	0	5.27	-37.9	28
S378A	124	99	987	-575	0	7.04	-48.1	25
S378A	119	99	988	-545	0	6.42	-46.0	25
S378A	129	99	1010	-582	0	7.25	-50.4	25
S372A	112	99	1020	-400	0	3.94	-34.2	39
S372A	116	99	1061	-423	0	4.00	-32.4	39
S372A	121	99	1091	-494	0	4.82	-40.8	39
S376A	107	99	1091	-520	0	5.62	-42.8	28
S372A	126	99	1135	-524	0	4.88	-37.9	39
S376A	112	99	1160	-579	0	6.08	-44.9	28
S376A	116	99	1239	-599	0	6.85	-50.7	28
S376A	121	99	1320	-634	0	7.06	-56.5	28
				6.00-16, 2-PR				
S709A	88	15	201	-35	0	1.17	-9.0	21
S693A	86	15	217	-28	0	1.03	-6.0	16
S679A	90	15	223	-5	0	0.31	-4.0	31
S705A	90	15	229	0	0	0.01	-0.1	52
S696A	85	15	282	-64	0	1.58	-10.0	14

(Continued)

* Where the figure 99 appears, deflection varied during course of test due to changing load.

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				6.00-16, 2-PR (Continued)				
S682A	91	15	324	-24	0	0.37	-2.0	43
S677A	83	15	397	-97	0	1.91	-10.0	18
S698A	86	15	410	-102	0	2.50	-11.4	18
S678A	115	15	423	-146	0	3.11	-33.0	17
S715A	86	15	430	-76	0	1.16	-9.9	22
S711A	91	15	437	-21	0	0.35	-0.5	50
S675A	90	15	450	-34	0	0.79	-3.0	38
S673A	90	15	453	-10	0	0.31	-2.0	48
S519A	93	15	880	-284	0	2.58	-21.0	26
S523A	91	15	889	-86	0	0.58	-1.5	52
S713A	90	15	897	-113	0	1.00	-5.3	49
S521A	89	15	917	-210	0	1.72	-6.4	39
S710A	92	25	215	-32	0	0.85	-5.3	21
S694A	90	25	217	-29	0	0.89	-10.0	17
S681A	91	25	228	-8	0	0.06	-3.0	41
S706A	92	25	231	-9	0	0.10	-2.4	54
S699A	91	25	452	-23	0	0.32	-2.4	38
S704A	89	25	463	-11	0	0.63	-0.2	54
S697A	87	25	546	-110	0	2.56	-14.1	19
S701A	89	25	579	-29	0	0.39	-3.7	43
S708A	90	25	585	-13	0	0.97	-1.0	58
S703A	89	25	877	-34	0	0.10	-2.4	56
S700A	91	25	891	-81	0	0.76	-4.8	38
S695A	90	35	216	-39	0	1.15	-13.0	15
S680A	91	35	224	-8	0	0.00	-4.0	40
S691A	89	35	425	-62	0	1.38	-12.0	16
S676A	91	35	441	-27	0	0.26	-4.0	36
S674A	90	35	490	-10	0	0.06	0.0	43
S717A	90	35	847	-181	0	2.02	-16.7	24
S518A	96	35	885	-167	0	1.74	-8.7	24
S522A	93	35	890	-42	0	0.09	-1.7	49
S520A	92	35	908	-60	0	0.71	-1.5	26
S707A	93	35	1294	-62	0	0.12	0.0	56
S702A	97	35	1302	-100	0	0.42	-3.0	44
				6.00-16, Radial Ply				
S491A	90	15	862	-330	0	3.33	-22.9	22
S492A	88	15	866	-288	0	2.86	-22.2	23
S489A	96	15	894	-95	0	0.80	-1.0	59
S495A	91	15	898	-112	0	0.98	-0.5	53
S494A	91	15	900	-174	0	1.48	-7.0	42
S487A	92	35	863	-18[illegible]	0	2.64	-11.1	24
S488A	95	35	885	-167	0	1.97	-7.0	27
S493A	97	35	885	-72	0	0.40	-1.0	39
S490A	93	35	893	-42	0	0.39	-2.0	59
S496A	94	35	893	-35	0	0.15	-1.5	56

(Continued)

(Sheet 9 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			6.00-16, Radial Ply, with Directional Bar Tread					
S533A	93	15	898	-109	0	1.12	-1.0	66
S531A	94	15	908	-189	0	1.98	-4.9	42
S529A	95	35	876	-212	0	2.26	-7.5	26
S532A	93	35	888	-97	0	1.18	0.0	44
S534A	92	35	893	-54	0	0.64	-0.6	63
			6.00-16, Solid Rubber					
S524A	85	2	430	-148	0	2.19	-19.0	24
S525A	96	2	455	-81	0	0.96	-5.3	34
S528A	88	3	910	-175	0	1.13	-5.8	56
			9.00-14, 2-PR					
S269A	89	10	201	-18	0	0.82	-1.0	26
S271A	92	10	215	-13	0	0.50	-0.7	39
S239A	89	15	243	-33	0	0.65	-3.0	25
S259A	86	15	245	-11	0	0.02	0.0	69
S237A	90	15	336	-48	0	0.87	-1.1	25
S251A	86	15	354	-28	0	0.39	0.0	48
S263A	88	15	357	-16	0	0.42	0.0	63
S559A	89	15	454	-8	0	0.36	-1.0	71
S265A	91	15	463	-29	0	0.35	0.0	67
S233A	89	15	470	-53	0	0.55	-2.7	44
S241A	87	15	481	-103	0	1.29	-5.1	23
S235A	89	15	698	-82	0	0.67	-1.0	45
S268A	92	15	699	-41	0	0.33	0.0	73
S255A	90	15	856	-377	0	4.30	-47.9	16
S539A	90	15	876	-88	0	0.77	-4.2	48
S255A	100	15	884	-445	0	4.74	-55.8	16
S574A	90	15	892	-92	0	0.75	-3.8	50
S570A	94	15	897	-85	0	1.11	-3.1	45
S573A	90	15	898	-177	0	1.23	-9.9	35
S571A	91	15	900	-167	0	1.26	-6.8	39
S572A	93	15	903	-103	0	0.44	-3.1	51
S576A	96	15	905	-38	0	0.60	0.0	66
S254A	91	15	906	-121	0	0.91	0.0	45
S537A	87	15	906	-62	0	0.18	-3.6	54
S305A	93	15	907	-50	0	0.37	1.0	67
S255A	105	15	908	-444	0	4.45	-44.8	16
S303A	92	15	908	-153	0	1.32	-4.5	40
S306A	92	15	910	-66	0	0.52	-0.3	72
S575A	94	15	913	-41	0	0.51	0.0	57
S266A	92	15	924	-75	0	0.64	-1.5	60
S304A	90	15	924	-155	0	1.27	-1.7	41
S256A	125	15	932	-239	0	1.81	-10.7	30
S256A	115	15	964	-247	0	1.95	-10.7	30
S270A	90	20	497	-66	0	0.95	-3.1	27
S272A	92	20	516	-31	0	0.47	-2.0	44
S274A	92	20	926	-106	0	1.02	-2.4	44

(Continued)

(Sheet 10 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				9.00-14, 2-PR (Continued)				
S345A	88	25	297	-11	0	0.26	0.0	34
S243A	90	25	302	-30	0	0.42	-3.4	24
S261A	90	25	303	-8	0	0.14	0.0	63
S253A	89	25	314	-10	0	0.21	-0.5	48
S348A	88	25	454	-21	0	0.11	-2.7	68
S331A	89	25	456	-9	0	0.09	-0.5	50
S344A	90	25	459	-25	0	0.57	-4.2	33
S335A	91	25	466	-44	0	0.64	-5.8	26
S267A	88	25	467	-30	0	0.21	-2.7	68
S252A	87	25	478	-16	0	0.37	-2.0	44
S238A	87	25	657	-142	0	1.48	-6.4	21
S341A	91	25	676	-42	0	0.55	-1.1	36
S250A	91	25	679	-40	0	0.39	-2.0	46
S262A	91	25	688	-21	0	0.14	0.5	69
S332A	87	25	689	-26	0	0.19	-1.5	53
S242A	88	25	890	-203	0	1.86	-7.5	28
S248A	88	25	896	-151	0	1.34	-8.1	25
S343A	90	25	907	-118	0	1.05	-2.9	33
S264A	93	25	916	-43	0	0.14	0.0	68
S234A	92	25	930	-77	0	0.35	-0.7	49
S257A	88	25	1292	-582	0	4.30		22
S257A	104	25	1330	-637	0	5.19		22
S257A	99	25	1345	-628	0	4.61		22
S244A	88	25	1368	-483	0	2.95	-15.6	26
S349A	94	25	1371	-254	0	1.56	-5.3	36
S260A	99	25	1380	-80	0	0.62	0.0	65
S236A	90	25	1400	-170	0	0.79	-1.0	51
S258A	116	25	1406	-354	0	5.19	-11.1	32
S258A	123	25	1430	-350	0	2.14	-9.9	32
S273A	94	30	904	-70	0	0.13	-2.0	37
S542A	93	35	99	-3	0	0.66	0.5	26
S544A	93	35	110	-2	0	0.21	0.6	47
S547A	91	35	114	-6	0	0.43	2.4	70
S545A	92	35	236	-12	0	0.08	-1.7	45
S543A	93	35	240	-18	0	0.33	-3.1	25
S546A	89	35	250	-11	0	0.00	-0.7	67
S567A	88	35	435	-13	0	0.15	-2.7	30
S566A	88	35	436	-23	0	0.17	-4.2	30
S561A	89	35	450	0	0	0.07	-1.0	45
S564A	91	35	451	0	0	0.00	-1.0	56
S565A	92	35	456	-4	0	0.12	[illegible]	61
S295A	84	35	465	-37	0	0.31	[illegible]	62
S275A	89	35	472	-19	0	0.13	-4.7	34
S277A	88	35	472	-34	0	0.07	-2.7	44
S279A	86	35	472	-13	0	0.33	-2.0	26
S280A	86	35	475	-37	0	0.29	-4.2	32
S297A	90	35	725	-18	0	0.11	-1.0	65
S336A	91	35	726	-75	0	0.69	-6.4	25
S346A	89	35	730	-50	0	0.27	-7.0	32
S281A	91	35	732	-72	0	1.19	-6.4	21

(Continued)

(Sheet 11 of 18 sheets)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
9.00-14, 2-PR (Continued)								
S291A	89	35	734	-40	0	0.56	-2.5	45
S278A	91	35	752	-50	0	0.25	-4.2	47
S538A	92	35	862	-53	0	0.31	-4.7	47
S563A	91	35	870	-78	0	1.09	-5.8	29
S535A	99	35	879	-162	0	1.69	-9.9	25
S329A	90	35	880	-35	0	0.05	-2.0	48
S562A	88	35	881	-45	0	0.02	10.3	54
S541A	97	35	884	-143	0	1.65	-11.7	25
S333A	89	35	886	-82	0	0.71	-6.4	32
S536A	97	35	890	-28	0	0.11	-0.5	60
S282A	91	35	904	-120	0	1.11	-4.3	27
S299A	91	35	914	-35	0	0.03	-0.5	66
S293A	88	35	915	-63	0	0.23	-3.4	39
S347A	91	35	962	-40	0	0.11	-1.0	60
S339A	88	35	1021	-202	0	1.95	-10.5	20
S283A	98	35	1050	-182	0	1.81	-6.4	20
S294A	91	35	1050	-46	0	0.31	-2.0	50
S342A	88	35	1050	-96	0	0.73	-4.7	39
S334A	88	35	1051	-142	0	0.75	-6.7	29
S298A	91	35	1058	-44	0	0.09	-2.0	60
S330A	91	35	1058	-51	0	0.23	-5.1	49
S337A	88	35	1204	-344	0	2.65	-11.1	23
S300A	91	35	1237	-65	0	0.23	-0.5	66
S340A	94	35	1237	-128	0	0.79	-5.2	37
S284A	92	35	1240	-240	0	1.68	-3.6	27
S292A	94	35	1250	-83	0	0.64	-1.0	49
S296A	94	35	1255	-59	0	0.17	-1.5	63
9.00-14, 2-PR, Replacing Old 9.00-14, 2-PR								
S742A	88	15	867	-144	0	1.14	-7.0	32
S737A	93	15	878	-58	0	0.63	-3.1	57
S578A	92	15	882	-150	0	2.17	-4.2	36
S741A	90	15	884	-130	0	1.20	-5.3	36
S743A	91	15	884	-74	0	0.65	-1.0	51
S579A	86	15	885	-213	0	2.34	-7.1	29
S581A	91	15	892	-100	0	0.95	-5.0	45
S582A	87	15	892	-226	0	1.90	-12.0	27
S744A	91	15	894	-66	0	0.49	-1.5	48
S738A	92	15	895	-79	0	0.48	-3.4	47
S583A	93	15	900	-75	0	0.76	-1.0	48
S580A	92	15	904	-159	0	1.42	-6.0	40
S740A	87	15	913	-160	0	1.23	-6.7	32
S745A	91	15	920	-65	0	0.41	-2.0	57
S739A	91	15	938	-66	0	0.62	-2.0	61
S642A	98	15	1280	-178	0	0.94	-4.0	50
S644A	100	15	1301	-116	0	0.55	-1.0	58
S643A	99	15	1304	-109	0	0.60	-0.4	62

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				9.00-14, 2-PR, Replacing Old 9.00-14, 2-PR (Continued)				
S689A	92	25	441	-39	0	0.43	-6.0	26
S683A	90	25	449	-11	0	0.08	-1.0	32
S684A	92	25	452	-20	0	0.10	-1.0	33
S690A	92	25	453	-34	0	0.43	-5.0	28
S685A	91	25	453	-20	0	0.24	-2.0	38
S687A	87	25	853	-151	0	2.58	-13.0	21
S688A	88	25	863	-157	0	1.60	-10.0	22
S686A	90	25	874	-80	0	0.68	-3.0	43
				9.00-14, 4-PR				
S26A	117	25	1020	-72	0	0.30	-6.4	57
S26A	124	25	1030	-100	0	0.38	-8.1	57
S32A	87	25	1035	-56	0	0.33	-5.3	60
S26A	127	25	1043	-81	0	0.18	-5.3	44
S26A	103	25	1044	-60	0	0.19	-5.2	57
S28A	85	25	1057	-104	0	0.66	-6.4	30
S26A	89	25	1062	-50	0	0.04	-3.9	57
S26A	113	25	1066	-80	0	0.22	-5.3	44
S31A	87	25	1070	-70	0	0.31	-4.2	60
S26A	99	25	1080	-60	0	0.00	-4.7	44
S27A	85	25	1080	-119	0	0.91	-5.9	37
S26A	85	25	1104	-60	0	0.00	-5.3	44
S30A	99	25	1116	-84	0	0.39	-6.4	42
S29A	99	25	1128	-87	0	0.59	-6.4	42
				9.00-14, 8-PR				
S399A	87	15	227	-10	0	0.26	-4.7	37
S405A	88	15	227	-16	0	0.67	-4.2	28
S437A	88	15	480	-23	0	0.28	-2.0	60
S401A	91	15	485	-40	0	0.15	-3.1	43
S408A	89	15	668	-140	0	1.53	-11.1	25
S414A	90	15	678	-111	0	0.98	-6.4	43
S421A	91	15	825	-451	0	4.69	-55.0	17
S421A	100	15	842	-486	0	4.74	-57.0	17
S421A	118	15	858	-532	0	5.57	-57.0	17
S421A	112	15	881	-492	0	4.74	-58.7	17
S443A	115	15	890	-116	0	1.01	-3.1	41
S443A	95	15	893	-122	0	0.92	-3.1	41
S443A	105	15	893	-110	0	0.88	-3.1	41
S444A	95	15	893	-112	0	0.86	-2.6	45
S443A	125	15	895	-115	0	1.23	-5.3	41
S444A	115	15	896	-118	0	0.97	-2.6	45
S444A	105	15	897	-103	0	0.79	-2.6	45
S415A	93	15	900	-181	0	1.20	-4.2	52
S435A	94	15	902	-80	0	0.38	-3.6	57
S434A	101	15	1060	-132	0	0.95	-2.0	54
S433A	104	15	1270	-210	0	1.28	-3.4	49

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 8-PR (Continued)					
S416A	88	25	288	-15	0	0.21	-1.7	37
S407A	88	25	302	-24	0	0.25	-1.7	26
S419A	86	25	310	-18	0	0.21	-3.6	37
S400A	89	25	452	-20	0	0.17	-3.0	35
S403A	87	25	455	-50	0	0.84	-5.8	28
S441A	88	25	470	-25	0	0.05	-3.1	56
S410A	89	25	665	-136	0	1.59	-9.3	25
S417A	90	25	892	-102	0	0.89	-4.2	36
S438A	94	25	915	-45	0	0.17	-3.1	59
S418A	95	25	1210	-176	0	1.30	-4.7	40
S436A	96	25	1225	-76	0	0.13	-1.7	61
S409A	91	35	465	-50	0	0.59	-7.5	23
S442A	89	35	468	-32	0	0.04	-2.0	55
S428A	90	35	470	-31	0	0.04	-2.7	38
S424A	91	35	738	-116	0	1.18	-9.1	23
S411A	89	35	772	-120	0	1.88	-7.0	23
S426A	87	35	965	-185	0	1.59	-10.3	21
S429A	85	35	884	-145	0	1.18	-5.8	34
S440A	90	35	892	-42	0	0.00	-1.3	55
S422A	89	35	902	-78	0	0.33	-2.7	40
S425A	92	35	1038	-233	0	1.72	-12.4	25
S454A	94	35	1232	-123	0	0.78	-3.3	34
S454A	109	35	1232	-111	0	0.62	-2.5	34
S453A	123	35	1233	-109	0	0.39	-4.2	38
S453A	100	35	1237	-105	0	0.46	-3.3	38
S453A	90	35	1239	-109	0	0.50	-0.5	38
S454A	117	35	1241	-108	0	0.61	-2.6	34
S439A	92	35	1242	-88	0	0.17	-4.2	54
S453A	116	35	1242	-105	0	0.46	-2.0	38
S430A	98	35	1243	-134	0	0.75	-2.3	39
S454A	122	35	1267	-107	0	0.59	-2.6	34
			5.00-12, 2-PR					
S614A	84	15	133	-57	0	2.20	-23.0	14
S618A	99	15	136	-52	0	2.49	-35.0	15
S628A	97	15	146	-11	0	0.49	0.0	46
S620A	94	15	151	-14	0	0.63	-5.0	33
S619A	122	15	203	-102	0	3.36	-47.0	18
S638A	100	15	222	-27	0	0.61	-4.0	47
S630A	96	15	223	-13	0	0.59	-2.0	54
S634A	93	15	225	-41	0	0.99	-8.0	37
S615A	96	15	244	-44	0	1.01	-8.0	38
S622A	86	15	310	-93	0	1.48	-13.0	35

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				5.00-12, 2-PR (Continued)				
S632A	95	15	348	-49	0	0.91	-4.7	59
S640A	101	15	434	-49	0	1.04	-10.0	50
S624A	92	15	445	-154	0	1.98	-20.0	37
S636A	100	15	448	-168	0	1.99	-23.0	42
S626A	91	15	461	-114	0	1.27	-7.0	46
S617A	93	35	132	-37	0	1.65	-21.0	15
S621A	90	35	155	-9	0	0.28	-3.0	40
S629A	96	35	161	-4	0	0.35	-1.0	54
S639A	125	35	219	-11	0	0.08	-3.0	53
S734A	92	35	220	-9	0	0.10	-4.8	40
S631A	93	35	224	-12	0	0.24	-4.0	57
S635A	122	35	225	-25	0	0.48	-6.0	37
S616A	96	35	232	-12	0	0.18	-3.0	40
S732A	90	35	325	-47	0	0.77	-9.1	22
S733A	94	35	326	-29	0	0.11	-3.6	42
S666A	115	35	327	-42	0	0.90	-5.0	34
S670A	115	35	332	-30	0	0.35	-3.0	47
S672A	94	35	334	-12	0	0.24	-2.0	56
S735A	90	35	338	-20	0	0.20	-4.0	61
S633A	92	35	343	-31	0	0.48	-3.0	58
S665A	89	35	345	-50	0	0.76	-6.0	35
S669A	93	35	347	-23	0	0.26	-4.0	46
S623A	98	35	348	-43	0	0.72	-5.0	33
S667A	115	35	437	-94	0	1.37	-8.0	32
S664A	88	35	438	-94	0	1.22	-9.0	31
S637A	123	35	446	-71	0	0.91	-6.0	39
S668A	90	35	447	-87	0	1.52	-8.0	37
S641A	123	35	449	-33	0	0.47	-3.0	55
S625A	92	35	453	-66	0	1.05	-6.0	37
S627A	96	35	461	-30	0	0.35	-2.0	49
S736A	96	35	461	-28	0	0.09	-3.0	61
S671A	92	35	466	-29	0	0.47	-2.0	53
				4.50-7, 2-PR				
S585A	91	15	100	-28	0	1.33	-25.0	17
S593A	102	15	109	-6	0	0.39	-6.0	43
S594A	97	15	110	0	0	0.40	-4.0	59
S586A	100	15	115	-12	0	0.21	-5.0	37
S591A	92	15	122	-38	0	1.10	-21.2	24
S483A	86	15	167	-55	0	1.25	-19.8	25
S379A	95	15	174	-28	0	0.34	-5.3	51
S387A	105	15	175	-36	0	0.70	-7.0	42
S395A	128	15	176	-79	0	1.70	-37.9	24
S395A	120	15	180	-74	0	1.61	-34.2	24
S473A	94	15	181	-42	0	0.89	-10.5	41
S387A	95	15	182	-36	0	0.65	-5.3	42
S395A	115	15	182	-75	0	1.62	-34.2	24
S379A	125	15	183	-28	0	0.43	-5.3	51
S395A	100	15	183	-79	0	1.72	-35.1	24

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-7, 2-PR (Continued)				
S379A	105	15	184	-28	0	0.47	-4.7	51
S387A	125	15	190	-34	0	0.65	-4.2	42
S379A	115	15	191	-28	0	0.46	-7.5	51
S387A	115	15	191	-35	0	0.65	-5.3	42
S476A	97	15	192	-12	0	0.15	-3.1	66
S397A	107	15	210	-94	0	1.75	-37.0	26
S484A	87	15	212	-72	0	1.29	-21.2	24
S397A	95	15	216	-94	0	1.58	-37.0	26
S389A	115	15	221	-55	0	0.90	-13.6	41
S397A	115	15	221	-99	0	1.68	-37.0	26
S381A	105	15	225	-37	0	0.50	-4.7	70
S381A	115	15	227	-37	0	0.47	-6.4	70
S381A	125	15	228	-40	0	0.51	-8.1	70
S389A	95	15	228	-53	0	0.78	-8.7	41
S397A	125	15	230	-110	0	1.76	-40.8	26
S389A	105	15	231	-50	0	0.78	-12.4	41
S381A	95	15	233	-42	0	0.47	-6.4	70
S464A	90	15	234	-63	0	1.09	-13.6	31
S389A	125	15	238	-55	0	0.79	-9.9	41
S466A	100	15	246	-20	0	0.43	-1.0	56
S391A	110	15	341	-128	0	1.57	-26.6	38
S391A	115	15	341	-136	0	1.70	-32.4	38
S383A	115	15	342	-83	0	0.82	-14.9	73
S383A	125	15	346	-87	0	0.82	-12.4	73
S383A	105	15	348	-86	0	0.89	-13.0	73
S383A	95	15	349	-90	0	0.86	-13.6	73
S468A	94	15	349	-72	0	0.69	-4.2	54
S472A	97	15	352	-97	0	1.03	-11.1	42
S391A	95	15	355	-143	0	1.65	-29.0	38
S391A	125	15	357	-138	0	1.61	-25.8	38
S391A	105	15	361	-136	0	1.59	-26.6	38
S394A	105	15	442	-184	0	1.77	-29.0	41
S394A	115	15	457	-185	0	1.87	-29.0	41
S394A	95	15	458	-191	0	1.77	-27.4	41
S394A	125	15	459	-194	0	1.82	-30.7	41
S386A	105	15	464	-144	0	1.17	-13.6	51
S386A	125	15	464	-145	0	1.10	-13.0	51
S477A	99	15	467	-92	0	0.57	-3.1	68
S386A	95	15	477	-140	0	1.03	-11.1	51
S386A	115	15	477	-147	0	1.18	-14.3	51
S584A	87	25	90	-24	0	0.97	-23.0	16
S584A	89	25	90	-26	0	1.27	-20.0	16
S592A	99	25	105	-9	0	0.20	-4.0	38
S589A	101	25	115	-9	0	0.29	-3.0	56
S590A	87	25	121	-36	0	0.79	-25.0	23
S482A	91	25	211	-70	0	1.31	-17.6	19
S486A	89	25	213	-73	0	1.34	-19.0	25
S396A	90	25	215	-80	0	1.30	-19.0	22
S380A	95	25	219	-27	0	0.26	-5.3	57
S396A	95	25	220	-90	0	1.50	-33.3	22
S396A	102	25	222	-93	0	1.65	-29.9	22
S380A	105	25	226	-25	0	0.37	-5.3	57

(Continued)

Table 2 (Continued)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-7, 2-PR (Continued)				
S463A	97	25	230	-36	0	0.48	-4.2	33
S380A	115	25	231	-26	0	0.36	-4.2	57
S380A	125	25	231	-25	0	0.32	-4.2	57
S388A	115	25	231	-35	0	0.60	-7.5	43
S396A	115	25	231	-97	0	1.66	-30.7	22
S388A	90	25	232	-38	0	0.66	-6.4	43
S396A	125	25	236	-95	0	1.62	-29.9	22
S388A	100	25	239	-39	0	0.69	-8.7	43
S388A	125	25	243	-37	0	0.68	-7.0	43
S465A	97	25	244	-13	0	0.29	0.0	56
S398A	92	25	319	-190	0	2.82	-62.6	21
S398A	114	25	324	-195	0	3.08	-62.6	21
S478A	85	25	325	-110	0	1.84	-24.5	22
S390A	115	25	328	-60	0	0.56	-5.8	46
S390A	125	25	330	-60	0	0.43	-7.5	46
S398A	128	25	332	-226	0	3.45	-78.6	21
S390A	100	25	333	-60	0	0.48	-5.8	46
S390A	90	25	334	-60	0	0.58	-5.3	46
S382A	105	25	336	-43	0	0.37	-3.6	70
S398A	100	25	338	-183	0	2.76	-56.3	21
S382A	125	25	340	-45	0	0.39	-4.7	70
S398A	111	25	340	-194	0	2.90	-62.6	21
S382A	95	25	343	-47	0	0.38	0.0	70
S382A	115	25	346	-47	0	0.43	-2.5	70
S467A	93	25	349	-37	0	0.28	-3.1	56
S471A	99	25	353	-58	0	0.50	-3.1	42
S384A	125	25	414	-64	0	0.53	-4.2	72
S384A	100	25	419	-65	0	0.56	-4.7	72
S384A	115	25	419	-67	0	0.63	-5.8	72
S392A	105	25	420	-128	0	1.18	-13.0	43
S384A	105	25	422	-66	0	0.63	-3.6	72
S392A	95	25	422	-130	0	1.12	-13.0	43
S392A	115	25	423	-132	0	1.18	-14.9	43
S392A	125	25	430	-133	0	1.18	-14.3	43
S587A	87	25	445	-180	0	1.95	-27.6	44
S393A	107	25	448	-161	0	1.49	-23.5	40
S393A	118	25	456	-166	0	1.53	-26.6	40
S475A	95	25	458	-108	0	0.87	-11.1	45
S393A	127	25	459	-170	0	1.51	-25.0	40
S588A	101	25	468	-80	0	0.48	-6.0	52
S393A	98	25	468	-155	0	1.43	-21.2	40
S385A	125	25	472	-84	0	0.61	-8.7	57
S385A	105	25	475	-82	0	0.60	-4.7	57
S385A	115	25	475	-82	0	0.58	-5.8	57
S385A	95	25	479	-80	0	0.58	-5.3	57
S731A	91	35	205	-54	0	1.09	-15.0	25
S729A	99	35	232	-25	0	0.04	-6.0	56
S512A	93	35	237	-20	0	0.17	-3.1	38
S730A	96	35	456	-66	0	0.88	-6.7	50

(Continued)

(Sheet 17 of 18 sheets)

Table 2 (Concluded)

Test No.	Station	Deflection %	Load lb	Towed Force, lb	Torque ft-lb	Sinkage in.	Slip %	-6 in. vg CI
				4.50-7, 2-PR (Continued)				
S513A	92	35	455	-75	0	0.59	-4.7	37
S514A	90	35	246	-19	0	0.48	-5.3	58
S515A	91	35	485	-45	0	0.52	-1.5	55
S516A	94	35	215	-40	0	0.93	-12.4	30
				4.50-18, 4-PR, Dual Configuration, No Spacing				
S610A	90	15	880	-199	0	1.55	-9.9	33
S608A	92	15	900	-85	0	0.45	-3.0	50
S605A	86	35	882	-292	0	2.49	-26.0	16
S611A	121	35	893	-103	0	1.01	-5.3	33
S609A	92	35	898	-46	0	0.20	-2.0	50
S606A	91	35	914	-88	0	0.72	-4.0	32
				4.50-18, 4-PR, Dual Configuration, 1-in. Spacing				
S602A	96	15	891	-461	0	3.91	-56.2	16
S601A	88	15	901	-88	0	0.61	-9.0	45
S597A	101	15	908	-124	0	1.11	-4.0	38
S603A	120	35	899	-346	0	2.83	-34.2	17
S599A	97	35	914	-96	0	0.65	-3.0	32
S600A	91	35	920	-44	0	0.39	-1.0	48
				16x15-6R, 2-PR, Terra-Tire				
S645A	89	15	206	-44	0	1.03	-15.0	18
S646A	98	15	220	-24	0	0.43	-3.2	32
S650A	93	15	221	-7	0	0.22	-2.7	50
S648A	86	15	437	-60	0	0.42	-5.0	36
S649A	92	15	454	-30	0	0.54	-1.0	42
S651A	85	15	682	-263	0	1.36	-30.0	17
S652A	101	15	709	-115	0	0.91	-4.0	40
S654A	91	15	721	-134	0	1.06	-6.0	39
S653A	91	15	728	-86	0	0.65	-1.0	54
S658A	97	25	212	-30	0	0.45	-9.0	21
S662A	93	25	215	-2	0	0.16	-1.0	57
S659A	96	25	224	-6	0	0.45	0.0	40
S657A	89	25	426	-125	0	0.66	-18.0	19
S660A	90	25	460	-31	0	0.37	-2.0	39
S661A	91	25	460	-17	0	0.26	0.0	55
S655A	92	25	707	-90	0	0.63	-4.0	38
S663A	90	25	727	-30	0	0.32	-3.0	57

(Sheet 18 of 18 sheets)

Table 3

Summary of Test Results

Yuma Sand, Pass 1, Self-Propelled Point

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				1.75-26, Bicycle				
S504A	101	15	92	0	22	1.88	5.2	24
S510A	98	15	104	0	10	0.51	2.6	68
S499A	102	15	125	0	24	1.08	3.4	43
S503A	111	15	214	0	94	4.60	26.7	21
S508A	108	15	231	0	92	4.29	19.7	25
S497A	114	15	233	0	75	2.30	9.1	37
S511A	99	15	246	0	53	1.33	5.1	67
S502A	101	35	96	0	28	2.27	9.5	19
S505A	99	35	104	0	21	1.79	5.7	22
S500A	99	35	132	0	4	0.64	0.5	42
S501A	107	35	211	0	81	4.60	20.3	17
S506A	109	35	216	0	50	4.57	24.0	23
S509A	109	35	225	0	82	3.92	21.1	22
S498A	107	35	240	0	67	2.06	10.3	37
S507A	104	35	250	0	40	2.26	14.5	34
				4.00-18, 2-PR				
S723A	94	15	165	0	28	1.51	-0.5	21
S727A	100	15	173	0	43	2.25	0.0	20
S719A	89	15	203	0	4	0.18	-2.0	51
S59A	105	15	319	0	101	2.19	12.4	24
S48A	95	15	339	0	70	1.13	9.0	40
S79A	99	15	345	0	47	0.76	1.0	56
S319A	93	15	354	0	43	0.90	0.5	53
S37A	122	15	410	0	210	5.93	45.9	15
S71A	108	15	433	0	148	2.93	13.7	23
S61A	106	15	505	0	142	1.56	9.5	48
S62A	104	15	508	0	148	1.96	11.8	42
S56A	109	15	509	0	201	3.33	26.1	25
S46A	95	15	531	0	110	1.34	1.0	46
S36A	103	15	548	0	148	3.64	13.0	40
S42A	93	15	551	0	108	1.22	12.0	58
S52A	93	15	551	0	110	1.06	8.6	60
S50A	96	15	553	0	110	0.85	8.0	61
S40A	89	15	582	0	101	1.11	7.4	75
S69A	112	15	608	0	251	3.03	22.5	35
S68A	107	15	622	0	192	1.89	14.4	50
S325A	97	15	641	0	105	1.03	4.8	62
S321A	95	15	661	0	149	1.61	7.8	47
S77A	105	15	665	0	129	1.41	8.9	56
S323A	97	15	779	0	182	1.47	9.1	57
S58A	105	25	321	0	88	2.01	8.3	24
S84A	97	25	344	0	19	0.26	0.0	58
S64A	101	25	352	0	41	0.61	0.0	40
S80A	99	25	353	0	20	0.27	1.5	56
S72A	106	25	447	0	140	2.73	12.6	23

(Continued)

Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.00-18, 2-PR (Continued)					
S326A	104	25	487	0	153	2.90	14.2	25
S309A	106	25	502	0	176	3.49	14.5	22
S70A	107	25	512	0	132	1.64	11.9	35
S75A	102	25	520	0	58	0.92	3.4	58
S53A	96	25	534	0	90	1.19	5.0	44
S73A	102	25	550	0	83	0.83	5.5	60
S54A	98	25	652	0	146	1.68	9.1	44
S307A	99	25	666	0	84	1.05	5.1	40
S322A	94	25	671	0	80	1.09	2.9	54
S82A	100	25	678	0	68	0.44	2.0	62
S78A	104	25	692	0	85	0.80	2.7	56
S308A	105	25	992	0	291	2.38	17.4	44
S327A	113	25	1012	0	311	2.63	16.7	44
S324A	102	25	1013	0	244	1.73	9.8	53
S81A	109	25	1020	0	280	1.95	11.9	62
S83A	106	25	1064	0	297	2.16	12.3	58
S312A	100	35	110	0	1	0.14	-0.5	29
S728A	97	35	186	0	21	1.07	-0.2	21
S724A	95	35	186	0	13	0.90	2.4	20
S721A	92	35	187	0	4	0.13	-2.7	41
S720A	91	35	211	0	7	0.08	-4.2	50
S55A	98	35	336	0	60	1.19	6.6	25
S60A	100	35	345	0	27	0.16	1.0	48
S38A	108	35	450	0	165	3.64	26.7	15
S63A	103	35	508	0	87	1.07	6.8	42
S310A	104	35	515	0	113	2.16	6.5	25
S35A	89	35	518	0	80	1.17	3.9	40
S45A	95	35	536	0	51	0.49	0.4	46
S51A	93	35	536	0	43	0.43	0.0	60
S320A	95	35	540	0	14	0.41	0.0	56
S39A	89	35	551	0	34	0.50	2.0	75
S49A	94	35	556	0	31	0.32	2.0	61
S41A	90	35	580	0	40	0.50	0.0	58
S725A	108	35	610	0	234	4.24	20.0	21
S311A	110	35	617	0	215	3.33	21.4	24
S328A	111	35	654	0	174	2.71	11.9	26
S328A	108	35	662	0	218	3.23	22.9	26
S317A	102	35	667	0	52	0.74	1.0	43
S67A	120	35	940	0	360	3.41	27.4	43
S318A	103	35	1037	0	170	1.63	7.0	44
S74A	106	35	1040	0	192	1.50	8.5	60
S76A	105	35	1050	0	142	1.16	5.6	58
S47A	103	35	1070	0	265	2.17	18.0	40
			4.50-18, 4-PR					
S356A	105	15	453	0	117	1.85	7.4	33
S149A	112	15	460	0	172	3.42	23.4	22
S133A	94	15	464	0	45	0.73	2.6	59
S112A	101	15	476	0	76	1.40	6.0	44
S141A	97	15	482	0	62	0.81	1.8	55
S366A	104	15	701	0	91	1.40	7.0	57

(Continued)

Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.5C-18, 4-PR (Continued)					
S360A	106	15	717	0	202	2.11	11.5	42
S363A	107	15	920	0	260	2.19	10.1	46
S140A	109	15	925	0	210	1.50	11.2	59
S142A	107	15	925	0	212	1.69	10.6	60
S139A	104	15	936	0	230	1.75	9.5	54
S353A	98	25	267	0	58	1.66	6.1	19
S147A	93	25	277	0	33	1.13	0.0	22
S134A	93	25	284	0	15	0.65	1.5	59
S138A	98	25	295	0	16	0.84	0.7	57
S113A	96	25	300	0	20	0.66	-1.0	40
S136A	94	25	366	0	23	1.06	1.5	56
S352A	102	25	441	0	141	2.82	12.8	23
S145A	106	25	456	0	139	2.82	11.9	23
S132A	94	25	470	0	32	1.44	-0.5	57
S114A	96	25	478	0	33	0.64	0.0	43
S365A	96	25	731	0	62	0.57	-0.5	61
S359A	103	25	751	0	130	1.37	2.0	41
S119A	99	25	945	0	91	0.94	3.8	64
S143A	100	35	450	0	104	2.36	6.4	19
S131A	94	35	466	0	27	0.74	-0.5	57
S90A	104	35	469	0	42	0.67	0.7	38
S116A	98	35	469	0	20	0.32	1.0	52
S94A	98	35	470	0	50	0.56	2.6	33
S123A	96	35	470	0	32	0.67	0.0	56
S126A	98	35	470	0	31	0.80	0.0	55
S351A	95	35	470	0	105	2.00	8.7	25
S117A	98	35	472	0	26	0.82	-1.0	57
S91A	96	35	473	0	40	0.56	0.6	31
S106A	97	35	473	0	38	0.82	0.0	39
S122A	97	35	475	0	38	0.82	0.0	64
S130A	95	35	475	0	31	0.82	1.0	56
S107A	98	35	476	0	33	1.23	1.0	33
S103A	97	35	477	0	48	0.73	-1.5	34
S125A	99	35	478	0	32	0.71	0.7	65
S101A	101	35	480	0	81	0.49	3.5	44
S93A	97	35	487	0	43	0.90	1.0	34
S152A	100	35	920	0	99	0.58	2.0	40
S92A	108	35	928	0	168	1.44	10.1	33
S120A	98	35	930	0	70	0.82	0.3	62
S129A	98	35	930	0	62	0.58	1.0	58
S151A	102	35	930	0	128	0.51	2.4	42
S104A	103	35	932	0	185	2.42	8.1	36
S128A	97	35	934	0	70	0.90	1.5	62
S121A	99	35	935	0	88	1.09	1.0	54
S154A	102	35	935	0	156	1.24	4.3	41
S153A	105	35	937	0	180	1.73	9.4	31
S95A	102	35	940	0	214	2.07	9.4	32
S96A	100	35	940	0	139	1.10	5.8	40

(Continued)

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Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.50-18, 4-PR (Continued)					
S115A	97	35	940	0	70	0.93	1.5	55
S118A	98	35	940	0	68	0.60	0.0	60
S357A	105	35	945	0	256	2.84	13.2	30
S127A	99	35	948	0	72	0.82	2.9	59
S110A	99	35	949	0	112	1.05	3.1	38
S124A	98	35	949	0	92	0.94	1.0	58
S102A	100	35	960	0	100	1.52	2.8	44
S108A	99	35	964	0	90	1.14	4.0	38
S155A	104	35	964	0	171	1.74	6.6	39
S109A	99	35	965	0	103	1.46	1.0	36
S105A	100	35	968	0	110	1.42	5.4	37
S364A	104	35	1226	0	120	0.97	2.6	53
S361A	110	35	1240	0	268	2.02	6.0	42
S135A	103	35	1473	0	130	1.35	1.6	58
S362A	110	35	1477	0	268	2.07	7.4	53
S137A	101	35	1496	0	155	1.70	2.7	53
			6.00-16, 2-PR					
S709A	96	15	198	0	43	1.82	2.0	21
S693A	94	15	208	0	51	2.24	0.0	16
S679A	90	15	224	0	2	0.40	-3.0	31
S705A	90	15	229	0	2	0.01	-0.1	52
S696A	100	15	268	0	92	2.58	4.9	14
S682A	92	15	324	0	22	0.31	-1.0	43
S677A	103	15	412	0	140	3.02	7.0	18
S698A	104	15	412	0	141	2.96	9.3	18
S715A	100	15	426	0	133	2.64	5.2	22
S711A	92	15	436	0	21	0.27	0.0	50
S675A	93	15	449	0	44	0.75	1.0	38
S673A	90	15	455	0	14	0.31	-2.0	48
S523A	94	15	883	0	83	0.52	2.0	52
S521A	99	15	899	0	199	1.69	9.5	39
S713A	96	15	899	0	131	1.03	4.3	49
S694A	94	25	217	0	27	0.99	-5.0	17
S710A	97	25	218	0	35	1.10	1.0	21
S681A	91	25	227	0	9	0.06	-2.0	41
S706A	93	25	231	0	6	0.06	-0.5	54
S692A	98	25	401	0	113	2.53	2.0	16
S699A	93	25	451	0	24	0.24	0.0	38
S704A	89	25	463	0	11	0.60	-0.2	54
S697A	108	25	560	0	223	3.82	17.5	19
S701A	91	25	579	0	26	0.39	-1.3	43
S708A	90	25	587	0	15	0.99	-1.0	58
S703A	90	25	879	0	41	0.20	-1.0	56
S700A	95	25	887	0	91	0.65	0.1	38
S695A	94	35	218	0	32	1.21	-7.0	15
S680A	91	35	224	0	6	0.04	-3.0	40
S676A	92	35	441	0	26	0.28	-2.0	36
S691A	96	35	441	0	66	1.46	-1.0	16
S674A	91	35	490	0	17	0.12	0.0	43

(Continued)

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Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			6.00-16, 2-PR (Continued)					
S717A	106	35	875	0	222	3.10	6.5	24
S520A	94	35	882	0	66	0.68	0.0	26
S522A	94	35	890	0	40	0.08	1.5	49
S518A	103	35	907	0	131	1.61	3.8	24
S707A	94	35	1292	0	82	0.14	0.2	56
S702A	100	35	1300	0	105	0.40	1.8	44
			6.00-16, Radial Ply					
S489A	100	15	881	0	100	0.83	1.5	59
S495A	94	15	897	0	123	0.87	2.9	53
S494A	100	15	901	0	199	1.68	6.5	42
S488A	103	35	862	0	199	2.62	7.0	27
S487A	105	35	876	0	255	3.36	9.5	24
S493A	99	35	884	0	75	0.36	2.4	39
S490A	94	35	890	0	45	0.29	-0.5	59
S496A	95	35	890	0	38	0.14	0.5	56
S534A	93	35	899	0	61	0.59	2.9	63
			6.00-16, Radial Ply, with Directional Bar Tread					
S530A	115	15	856	0	430	4.97	35.1	25
S531A	103	15	882	0	213	2.14	7.8	42
S533A	97	15	887	0	119	1.25	4.8	66
S529A	106	35	874	0	253	3.07	11.8	26
S532A	96	35	895	0	97	1.01	4.2	44
			6.00-16, Solid Rubber					
S524A	112	2	441	0	163	[illegible].69	16.7	24
S525A	103	2	457	0	97	1.20	5.2	34
S527A	92	2	458	0	74	0.81	0.0	58
S526A	105	3	872	0	295	2.45	13.4	33
S528A	98	3	896	0	206	1.32	5.2	56
			9.00-14, 2-PR					
S269A	91	10	201	0	21	0.74	0.7	36
S271A	92	10	215	0	11	0.47	0.0	39
S249A	86	15	233	0	30	0.25	-0.3	48
S239A	93	15	240	0	31	0.61	2.7	25
S259A	87	15	245	0	9	0.20	0.0	69
S237A	95	15	331	0	60	1.09	5.1	25
S251A	88	15	351	0	27	0.35	0.0	48
S263A	89	15	356	0	13	0.33	0.0	63
S559A	99	15	454	0	6	0.17	-1.0	71
S265A	92	15	461	0	30	0.29	0.0	67
S233A	92	15	478	0	55	0.46	2.0	44
S241A	96	15	481	0	117	1.60	7.5	23

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(Sheet [illegible] of 11 sheets)

Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 2-PR (Continued)					
S247A	98	15	668	0	142	1.97	7.6	27
S235A	93	15	670	0	88	0.74	4.3	45
S268A	94	15	697	0	51	0.39	2.6	73
S539A	94	15	861	0	83	0.77	-0.3	48
S540A	106	15	869	0	319	3.33	14.2	25
S301A	100	15	875	0	267	2.56	9.1	26
S302A	103	15	875	0	271	2.62	13.0	25
S246A	103	15	885	0	299	3.05	15.6	23
S569A	101	15	890	0	195	1.69	6.3	35
S574A	94	15	890	0	100	0.84	0.5	50
S254A	96	15	890	0	128	0.99	4.8	45
S570A	98	15	900	0	105	1.28	0.5	45
S571A	100	15	900	0	168	1.21	4.8	39
S572A	97	15	900	0	100	0.48	2.9	51
S303A	98	15	900	0	170	1.50	4.8	40
S576A	97	15	902	0	40	0.41	1.3	66
S573A	102	15	903	0	213	1.68	5.7	35
S568A	103	15	905	0	270	2.86	8.0	35
S304A	97	15	905	0	157	1.26	6.1	41
S306A	96	15	905	0	66	0.44	2.0	72
S575A	95	15	910	0	54	0.69	2.0	57
S537A	90	15	916	0	72	0.07	1.5	54
S266A	95	15	917	0	95	0.60	3.4	60
S305A	95	15	928	0	62	0.48	1.5	67
S270A	94	20	500	0	63	0.91	1.0	27
S274A	96	20	902	0	111	1.08	3.5	44
S272A	94	20	518	0	33	0.40	-0.5	44
S345A	88	25	293	0	12	0.17	0.0	34
S24[illegible]A	93	25	298	0	28	0.43	1.0	24
S261A	91	25	302	0	6	0.10	0.0	63
S253A	90	25	313	0	12	0.06	0.0	48
S331A	89	25	457	0	11	0.05	-0.5	50
S335A	93	25	460	0	40	0.50	-0.5	26
S348A	89	25	464	0	22	0.19	-0.[illegible]	68
S267A	90	25	466	0	26	0.23	-0.5	68
S245A	90	25	470	0	67	1.27	5.2	26
S[illegible]4A	[illegible]	25	470	0	25	0.50	-4.0	33
S2[illegible]2A	[illegible]	25	472	0	17	0.26	-0.1	44
S238A	101	25	660	0	168	1.90	10.4	21
S338A	95	25	663	0	103	1.45	0.5	25
S250A	92	25	675	0	40	0.49	1.0	46
S341A	92	25	675	0	47	0.64	1.5	36
S262A	92	25	690	0	20	0.10	0.7	69
S332A	89	25	693	0	21	0.22	0.3	53
S248A	98	25	885	0	172	1.71	7.9	25
S242A	104	25	898	0	252	2.32	12.8	28
S3[illegible]3A	[illegible]	[illegible]	900	0	136	1.21	2.9	33
S2[illegible]4A	[illegible]	25	915	0	51	0.34	1.5	49
S264A	94	25	924	0	41	0.16	1.0	68

(Continued)

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Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 2-PR (Continued)					
S236A	96	25	1378	0	170	0.85	2.9	51
S260A	101	25	1382	0	89	0.43	2.0	65
S349A	100	25	1388	0	251	1.52	4.5	36
S350A	97	25	1389	0	228	1.50	3.6	40
S273A	96	30	894	0	72	0.25	-0.6	37
S542A	93	35	97	0	2	0.75	1.0	26
S544A	94	35	110	0	2	0.23	1.0	47
S547A	91	35	110	0	5	0.49	2.6	70
S543A	94	35	232	0	15	0.29	-1.0	25
S545A	93	35	232	0	11	0.12	-1.0	45
S546A	90	35	248	0	10	0.26	-0.7	67
S567A	88	35	438	0	15	0.15	-2.7	30
S566A	89	35	442	0	19	0.07	-2.7	30
S561A	89	35	450	0	0	0.07	-1.0	45
S564A	91	35	452	0	0	0.01	-1.0	56
S565A	92	35	456	0	9	0.14	-1.0	61
S295A	86	35	460	0	35	0.28	1.0	62
S275A	90	35	467	0	25	0.09	-2.7	34
S280A	88	35	468	0	36	0.27	-3.1	32
S277A	90	35	470	0	31	0.14	0.0	44
S279A	87	35	476	0	16	0.31	-0.5	26
S297A	91	35	726	0	16	0.09	-0.5	65
S281A	96	35	730	0	83	1.11	0.0	21
S336A	95	35	730	0	74	0.97	-1.5	25
S346A	91	35	733	0	50	0.29	-1.5	32
S276A	87	35	745	0	38	0.30	0.0	44
S291A	90	35	750	0	43	0.42	2.5	45
S278A	93	35	753	0	48	0.17	-0.5	47
S535A	105	35	860	0	140	1.72	0.0	25
S563A	95	35	868	0	73	0.75	-1.7	29
S329A	92	35	880	0	42	0.05	-1.0	48
S562A	90	35	881	0	49	0.19	-1.1	54
S538A	94	35	882	0	49	0.19	-2.7	47
S541A	105	35	889	0	151	1.77	2.9	25
S536A	97	35	895	0	29	0.07	-1.0	60
S333A	93	35	896	0	88	0.82	-1.0	32
S299A	91	35	905	0	25	0.08	0.0	66
S282A	96	35	908	0	120	1.24	2.6	27
S293A	90	35	930	0	63	0.19	-1.0	39
S347A	92	35	930	0	45	0.10	0.5	60
S339A	99	35	1046	0	185	2.05	3.1	20
S334A	94	35	1047	0	130	1.01	0.0	29
S283A	98	35	1056	0	178	1.69	4.3	20
S342A	92	35	1059	0	103	0.77	-1.3	39
S294A	93	35	1060	0	88	0.20	1.0	50
S330A	93	35	1067	0	54	0.16	0.0	49
S298A	92	35	1070	0	43	0.06	0.0	60
S340A	98	35	1222	0	136	1.07	1.0	37
S300A	92	35	1235	0	65	0.28	2.0	66
S337A	105	35	1241	0	345	3.07	10.3	23
S284A	99	35	1244	0	218	1.96	4.8	27

(Continued)

Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				9.00-14, 2-PR (Continued)				
S296A	95	35	1252	0	65	0.18	0.0	63
S292A	96	35	1255	0	84	0.65	2.5	49
				9.00-14, 2-PR, Replacing Old 9.00-14, 2-PR				
S737A	96	15	878	0	78	0.73	2.0	57
S742A	98	15	878	0	183	1.51	4.0	32
S578A	99	15	882	0	161	2.41	4.8	36
S579A	100	15	882	0	219	2.08	4.0	29
S741A	98	15	884	0	178	1.47	5.4	36
S743A	94	15	886	0	94	0.73	3.0	51
S577A	105	15	888	0	287	2.61	9.1	25
S583A	96	15	893	0	91	1.64	2.9	48
S738A	94	15	895	0	80	0.65	1.3	47
S581A	95	15	896	0	109	0.96	0.0	45
S744A	94	15	897	0	72	0.53	1.0	48
S580A	98	15	900	0	151	1.96	4.8	40
S745A	93	15	915	0	72	0.48	1.0	57
S740A	99	15	921	0	227	1.88	6.1	32
S739A	94	15	935	0	77	0.58	2.0	61
S642A	103	15	1290	0	200	1.13	2.0	50
S643A	102	15	1296	0	124	0.74	3.2	62
S644A	103	15	1308	0	145	0.55	4.0	58
S689A	94	25	441	0	36	0.71	-2.0	26
S683A	91	25	450	0	17	0.18	0.0	32
S684A	92	25	452	0	21	0.10	0.7	33
S690A	94	25	452	0	40	0.54	0.0	28
S685A	92	25	452	0	19	0.18	0.7	38
S687A	106	25	866	0	342	3.44	16.0	21
S688A	102	25	870	0	289	3.10	8.0	22
S686A	92	25	885	0	81	0.64	1.0	43
				9.00-14, 4-PR				
S28A	90	25	1042	0	107	0.63	-4.1	30
S32A	89	25	1043	0	64	0.33	-2.6	60
S31A	89	25	1054	0	73	0.25	-2.0	40
S27A	90	25	1090	0	113	0.77	-1.8	37
S30A	96	25	1090	0	100	0.49	-2.0	42
S29A	96	25	1120	0	100	0.59	0.0	42
				9.00-14, 8-PR				
S399A	88	15	226	0	8	0.17	-1.5	37
S405A	90	15	234	0	15	0.64	-3.1	28
S404A	96	15	459	0	85	1.39	4.8	25
S401A	93	15	476	0	37	0.00	-0.5	43
S437A	90	15	477	0	26	0.31	0.0	60

(Continued)

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Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 8-PR (Continued)					
S408A	100	15	666	0	164	1.86	7.6	25
S414A	96	15	675	0	101	0.96	2.6	43
S415A	101	15	903	0	166	1.27	4.8	52
S435A	97	15	907	0	80	0.48	1.0	57
S434A	105	15	1050	0	122	0.93	1.0	54
S433A	110	15	1226	0	219	1.43	8.5	49
S416A	89	25	300	0	16	0.32	-2.7	37
S407A	90	25	302	0	20	0.32	-0.7	26
S419A	88	25	312	0	17	0.21	-2.0	37
S403A	91	25	450	0	51	0.73	-1.5	28
S400A	90	25	462	0	21	0.27	-0.5	35
S441A	89	25	470	0	23	0.05	-2.4	56
S410A	98	25	670	0	130	1.63	4.8	25
S402A	90	25	677	0	35	0.47	0.0	42
S417A	94	25	903	0	103	0.77	-2.0	36
S438A	96	25	903	0	46	0.22	1.0	59
S418A	100	25	1208	0	171	1.14	6.3	40
S436A	98	25	1220	0	77	0.24	2.4	61
S409A	96	35	460	0	49	0.78	-3.1	23
S442A	90	35	464	0	30	0.02	-2.1	55
S428A	92	35	470	0	30	0.32	-0.3	38
S424A	97	35	723	0	104	1.38	-0.3	23
S411A	98	35	800	0	115	1.34	-0.5	23
S426A	102	35	885	0	184	2.18	3.9	21
S429A	91	35	885	0	122	0.50	-2.0	34
S440A	91	35	885	0	45	0.11	1.0	55
S422A	93	35	892	0	80	0.51	0.0	40
S425A	103	35	1031	0	168	1.77	5.6	25
S427A	105	35	1214	0	264	2.57	6.3	23
S430A	101	35	1232	0	134	0.91	1.9	39
S439A	94	35	1238	0	82	0.06	0.0	54
S423A	94	35	1442	0	160	1.14	0.1	35
			5.00-12, 2-PR					
S614A	105	15	132	0	36	2.82	9.0	14
S628A	98	15	146	0	5	0.48	0.4	46
S620A	97	15	152	0	9	0.65	0.0	33
S630A	97	15	224	0	19	0.58	0.0	54
S615A	102	15	245	0	31	1.10	2.0	38
S622A	105	15	335	0	80	1.81	10.0	35
S632A	100	15	345	0	36	0.79	2.0	59
S624A	109	15	444	0	109	2.15	10.0	37
S626A	102	15	461	0	80	1.34	9.0	46
S617A	103	35	147	0	26	2.17	3.4	15
S621A	91	35	156	0	4	0.30	-1.0	40
S629A	96	35	159	0	5	0.22	0.0	54
S734A	92	35	220	0	5	0.00	-3.1	40
S613A	105	35	224	0	57	3.02	11.0	18

(Continued)

(Sheet 9 of 11 sheets)

Table 3 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			5.00-12, 2-PR (Continued)					
S631A	94	35	225	0	10	0.26	-1.2	57
S616A	97	35	232	0	5	0.28	-2.0	40
S733A	96	35	326	0	21	0.07	-2.0	42
S732A	97	35	327	0	45	1.18	2.5	22
S672A	94	35	333	0	12	0.20	0.0	56
S735A	91	35	338	0	13	0.22	-1.0	61
S633A	95	35	342	0	22	0.45	0.0	58
S623A	101	35	345	0	27	0.63	0.0	33
S665A	93	35	346	0	29	0.76	0.0	35
S669A	94	35	347	0	15	0.39	-1.9	46
S664A	96	35	447	0	59	1.36	2.0	31
S625A	97	35	450	0	44	0.99	1.0	37
S668A	97	35	456	0	64	1.43	4.0	37
S736A	97	35	460	0	18	0.04	-0.6	61
S627A	97	35	461	0	22	0.24	0.0	49
S671A	94	35	466	0	20	0.54	0.0	53
			4.50-7, 2-PR					
S585A	105	15	99	0	17	1.65	7.0	17
S593A	104	15	103	0	3	0.39	0.0	43
S594A	98	15	106	0	1	0.42	0.0	59
S586A	[illegible]	[illegible]	115	0	5	0.23	-1.0	37
S591A	[illegible]	15	123	0	16	1.21	3.4	24
S483A	109	15	172	0	36	2.00	14.5	25
S473A	103	15	175	0	18	0.89	2.0	41
S469A	106	15	183	0	28	1.48	9.5	26
S476A	99	15	192	0	10	0.15	0.0	66
S470A	113	15	220	0	45	1.85	-0.3	28
S464A	102	15	240	0	30	1.10	6.8	31
S466A	102	15	242	0	13	0.37	1.0	56
S472A	112	15	330	0	55	1.28	14.2	42
S468A	102	15	339	0	32	0.67	7.1	54
S477A	107	15	448	0	48	0.62	8.3	68
S584A	104	25	100	0	15	1.68	6.0	16
S592A	100	25	105	0	3	0.29	0.0	38
S589A	102	25	112	0	5	0.31	0.0	56
S590A	102	25	127	0	13	1.05	0.0	23
S486A	109	25	224	0	39	1.49	11.1	25
S463A	101	25	232	0	17	0.46	1.0	33
S465A	98	25	238	0	8	0.20	0.5	56
S471A	105	25	342	0	28	0.48	4.3	42
S467A	96	25	344	0	23	0.40	4.5	56
S587A	106	25	452	0	79	2.10	6.3	44
S475A	105	25	454	0	53	1.15	3.8	45
S588A	104	25	463	0	41	0.55	4.0	52
S731A	106	35	212	0	37	1.82	10.0	25
S516A	102	35	226	0	22	1.04	1.0	30
S729A	101	35	233	0	12	0.32	-0.3	56
S512A	95	35	235	0	11	0.24	0.0	38
S514A	92	35	242	0	10		0.0	58

(Continued)

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Table 3 (Concluded)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-7, 2-PR (Continued)				
S730A	104	35	456	0	33	0.98	0.0	50
S513A	98	35	457	0	38	0.75	5.4	37
S515A	94	35	473	0	24	0.30	0.0	55
				4.50-18, 4-PR, Dual Configuration, No Spacing				
S608A	95	15	901	0	95	0.59	1.0	50
S607A	96	15	904	0	181	1.27	2.0	34
S609A	93	35	900	0	49	0.22	1.0	50
S605A	111	35	902	0	282	2.83	7.0	16
S606A	94	35	916	0	85	0.93	1.0	32
				4.50-18, 4-PR, Dual Configuration, 1-in. Spacing				
S601A	91	15	902	0	96	0.83	-0.3	45
S597A	104	15	908	0	127	1.11	2.0	38
S596A	112	35	910	0	329	3.07	17.4	14
S599A	99	35	922	0	89	0.47	1.0	32
S600A	92	35	922	0	47	0.47	0.0	48
				16x15-6R, 2-PR, Terra-Tire				
S650A	94	15	221	0	4	0.22	-2.0	50
S646A	100	15	222	0	13	0.46	1.0	32
S645A	96	15	236	0	32	1.06	-0.2	18
S648A	90	15	439	0	33	0.60	-1.0	36
S647A	107	15	445	0	99	1.52	10.0	21
S649A	93	15	455	0	20	0.57	0.0	42
S652A	105	15	712	0	72	0.88	2.0	40
S653A	94	15	731	0	51	0.59	3.0	54
S654A	97	15	739	0	79	1.01	4.0	39
S658A	101	25	214	0	15	0.57	0.0	21
S662A	93	25	216	0	3	0.16	-1.5	57
S659A	96	25	224	0	1	0.43	0.0	40
S657A	99	25	448	0	65	1.26	2.0	19
S660A	92	25	458	0	13	0.37	0.0	39
S661A	92	25	462	0	13	0.26	1.0	55
S655A	95	25	713	0	42	0.56	1.0	38
S663A	91	25	731	0	21	0.37	0.0	57

(Sheet 11 of 11 sheets)

Table 4

Summary of Test Results

Yuma Sand, Pass 1, Maximum-Pull Point

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				1.75-26, Bicycle				
S504A	111	15	86	17	33	1.97	26.4	24
S510A	106	15	92	20	32	0.70	18.7	68
S499A	110	15	106	19	41	1.26	22.2	43
S497A	123	15	211	24	96	2.89	32.9	37
S503A	113	15	215	9	97	4.44	32.4	21
S508A	119	15	215	20	107	4.85	49.5	25
S511A	108	15	221	28	80	1.60	23.1	67
S502A	110	35	96	16	38	2.28	27.5	19
S505A	107	35	99	11	34	1.95	18.3	22
S500A	103	35	115	27	33	0.80	9.9	42
S501A	117	35	205	12	93	5.22	41.4	17
S509A	120	35	210	21	99	4.91	55.2	22
S507A	115	35	220	27	110	2.81	38.0	34
S498A	114	35	222	31	91	2.61	27.4	37
S506A	111	35	230	8	58	4.65	30.6	23
				4.00-18, 2-PR				
S727A	110	15	180	32	80	2.64	20.0	20
S722A	101	15	184	57	63	0.67	9.1	44
S723A	111	15	184	44	81	1.93	26.0	21
S719A	100	15	215	76	96	0.43	12.0	51
S59A	110	15	309	23	123	2.16	24.7	24
S79A	109	15	315	64	112	1.04	21.3	56
S319A	101	15	335	68	112	1.08	15.6	53
S48A	105	15	345	48	121	1.11	22.0	40
S37A	122	15	410	0	210	5.93	45.9	15
S71A	113	15	410	13	175	3.69	25.0	23
S61A	114	15	481	41	199	1.95	24.6	48
S62A	113	15	485	39	209	2.47	25.9	42
S56A	111	15	497	19	203	3.14	30.2	25
S46A	107	15	500	58	185	1.71	25.0	46
S36A	109	15	510	50	168	3.58	21.9	40
S42A	111	15	512	62	200	1.55	28.0	58
S52A	107	15	512	62	193	1.56	26.3	60
S50A	109	15	520	72	189	1.33	25.0	61
S40A	100	15	548	66	192	1.41	20.0	75
S69A	115	15	580	15	261	3.38	29.3	35
S68A	112	15	609	29	220	2.16	20.6	50
S325A	105	15	617	77	201	1.50	20.0	62
S321A	104	15	633	66	224	1.87	18.4	47
S77A	111	15	635	74	219	1.62	19.7	56
S323A	104	15	752	80	227	1.82	21.6	57
S58A	112	25	308	35	128	2.10	22.9	24
S64A	109	25	314	62	110	0.84	15.3	40
S80A	106	25	335	100	128	0.20	13.3	56
S84A	107	25	340	105	131	0.72	16.7	58
S72A	112	25	427	22	172	2.97	21.5	23

(Continued)

(Sheet 1 of 12 sheets)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.00-18, 2-PR (Continued)					
S70A	118	25	470	41	212	2.61	35.2	35
S53A	110	25	495	75	189	1.91	25.4	44
S326A	111	25	497	20	213	3.65	32.4	25
S75A	110	25	498	98	180	1.09	17.4	58
S309A	107	25	506	11	185	3.43	17.8	22
S73A	110	25	510	92	188	1.23	18.9	60
S54A	111	25	608	59	235	2.29	30.0	44
S307A	105	25	631	95	192	1.35	16.7	40
S322A	104	25	632	103	218	1.42	20.3	54
S82A	111	25	647	104	190	1.06	23.9	62
S78A	111	25	655	118	200	1.15	20.3	56
S65A	118	25	930	-25	382	3.91	26.4	50
S308A	107	25	981	29	332	2.68	22.3	44
S66A	119	25	984	-30	442	4.37	34.1	43
S324A	108	25	997	83	343	2.10	19.3	53
S327A	115	25	1000	24	340	2.74	20.0	44
S81A	114	25	1015	62	372	2.38	24.5	62
S83A	110	25	1015	41	358	2.48	20.0	58
S312A	104	35	101	42	41	0.13	6.5	29
S724A	111	35	183	65	81	1.29	25.0	20
S721A	105	35	200	103	105	0.35	17.6	41
S728A	109	35	207	51	75	1.78	21.0	21
S720A	100	35	220	131	122	0.06	11.5	50
S60A	111	35	312	99	129	0.48	18.5	48
S55A	111	35	315	60	122	1.52	25.9	25
S38A	117	35	420	7	183	4.72	41.5	15
S63A	111	35	480	70	170	1.31	19.0	42
S310A	109	35	491	49	173	2.50	18.0	25
S320A	102	35	506	147	182	0.61	10.7	56
S51A	106	35	513	146	196	0.70	18.1	60
S49A	106	35	524	168	212	0.58	22.0	61
S45A	108	35	525	111	181	0.61	16.3	46
S35A	108	35	526	90	200	1.74	27.6	40
S41A	103	35	544	134	183	0.75	15.0	58
S39A	108	35	545	175	235	0.70	26.4	75
S725A	113	35	622	45	272	4.04	30.0	21
S328A	110	35	624	34	235	3.34	29.4	26
S311A	112	35	625	11	227	3.50	26.6	24
S317A	107	35	626	144	202	0.85	11.5	43
S328A	115	35	632	34	211	2.88	21.9	26
S67A	121	35	925	0	376	3.71	29.3	43
S57A	111	35	940	-48	328	4.41	15.8	23
S76A	112	35	989	130	328	1.61	20.3	58
S318A	108	35	991	78	275	2.04	16.4	44
S74A	112	35	1012	120	335	1.91	20.3	60
S47A	107	35	1046	74	316	2.42	17.7	40

(Continued)

(Sheet 2 of 12 sheets)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				4.50-18, 4-PR				
S133A	106	15	443	92	173	1.14	20.4	59
S356A	110	15	446	35	170	2.05	17.7	33
S149A	113	15	455	11	178	3.42	25.3	22
S112A	110	15	459	69	159	1.48	23.2	44
S141A	106	15	460	85	149	0.97	17.3	55
S355A	116	15	687	-11	296	4.35	33.8	29
S366A	110	15	699	80	151	1.77	19.2	57
S360A	110	15	700	34	256	2.49	25.6	42
S150A	123	15	865	-26	462	5.21	46.5	31
S139A	113	15	910	60	335	2.27	23.9	54
S142A	113	15	915	70	314	2.08	22.2	60
S140A	116	15	918	68	325	1.97	26.0	59
S363A	112	15	919	36	331	2.42	19.4	46
S353A	105	25	269	52	102	1.62	16.7	19
S147A	104	25	278	53	99	1.72	17.9	22
S138A	107	25	282	135	146	0.97	15.2	57
S134A	101	25	290	107	118	0.78	11.0	59
S113A	106	25	293	105	122	0.90	13.0	40
S136A	103	25	344	142	157	1.13	15.2	56
S352A	106	25	444	26	171	2.89	21.0	23
S132A	105	25	447	150	193	1.05	15.6	57
S145A	113	25	458	36	175	2.90	25.3	23
S114A	108	25	470	123	178	1.09	16.9	43
S354A	113	25	662	-15	262	4.59	28.6	23
S359A	110	25	701	99	250	1.80	17.7	41
S365A	104	25	704	160	231	0.85	12.0	61
S358A	114	25	889	-24	359	4.21	26.2	31
S148A	115	25	900	-85	362	6.23	27.9	22
S111A	109	25	910	141	283	1.51	17.0	46
S119A	109	25	910	170	295	1.12	17.3	64
S126A	108	35	442	170	199	0.78	15.3	55
S116A	107	35	445	157	178	0.39	11.5	52
S117A	107	35	445	177	200	0.83	12.7	57
S143A	107	35	448	49	154	2.66	17.1	19
S90A	112	35	450	148	175	0.99	14.9	38
S91A	105	35	450	128	169	0.58	13.1	31
S107A	110	35	450	150	188	0.22	18.7	33
S351A	99	35	452	54	188	1.82	13.0	25
S125A	106	35	453	181	202	0.74	13.1	65
S131A	102	35	453	178	204	0.75	10.7	57
S93A	106	35	455	135	172	0.92	15.5	34
S130A	104	35	455	168	203	0.95	13.1	56
S106A	106	35	457	148	187	1.00	14.2	39
S101A	108	35	459	152	187	0.78	14.8	44
S103A	109	35	460	121	184	1.18	20.6	34
S122A	107	35	460	179	215	0.97	16.7	64
S123A	105	35	460	168	200	0.73	12.3	56
S94A	110	35	465	130	190	1.22	23.2	33
S152A	109	35	885	159	312	1.19	18.9	40
S146A	118	35	892	-23	356	5.51	29.6	24

(Continued)

(Sheet 3 of 12 sheets)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.50-18, 4-PR (Continued)					
S120A	112	35	895	252	340	1.10	20.2	62
S121A	114	35	895	249	363	1.42	20.2	54
S129A	108	35	895	268	349	0.67	15.8	58
S92A	114	35	900	101	280	1.67	20.7	33
S118A	112	35	900	215	340	0.95	25.5	60
S128A	108	35	904	282	363	1.21	18.0	62
S151A	113	35	904	166	364	1.43	23.5	42
S96A	110	35	910	131	319	1.62	23.0	40
S124A	107	35	910	251	330	1.05	13.7	58
S154A	110	35	912	125	313	2.03	19.8	41
S110A	109	35	915	150	310	1.52	20.0	38
S115A	107	35	915	275	358	1.01	14.8	55
S95A	111	35	916	84	338	2.66	24.5	32
S105A	110	35	916	155	320	1.97	21.2	37
S357A	108	35	917	66	311	2.69	18.6	30
S153A	115	35	918	102	361	2.69	27.6	31
S109A	114	35	920	187	362	2.12	28.0	36
S102A	111	35	924	188	335	1.89	23.0	44
S127A	108	35	928	243	335	1.07	16.9	59
S104A	112	35	930	97	326	2.84	23.5	36
S108A	111	35	930	174	310	1.53	20.0	38
S155A	108	35	940	81	277	1.92	13.7	39
S361A	116	35	1194	78	397	2.63	20.3	42
S364A	111	35	1203	218	401	1.46	17.4	53
S135A	112	35	1431	288	463	1.49	16.8	58
S362A	114	35	1431	47	411	2.75	17.7	53
S137A	108	35	1450	260	421	1.77	13.5	53
S89A	112	35	1464	-60	452	3.78	15.1	30
			6.00-16, 2-PR					
S709A	108	15	204	40	88	2.25	20.0	21
S679A	105	15	221	100	115	0.81	21.0	31
S705A	100	15	231	19	125	0.27	15.0	52
S693A	112	15	232	55	116	2.27	31.0	16
S696A	109	15	281	42	123	2.47	19.0	14
S682A	102	15	323	137	154	0.62	15.0	43
S677A	114	15	392	43	193	3.54	27.0	18
S698A	111	15	411	44	192	2.88	22.5	18
S711A	106	15	434	148	211	0.85	23.1	50
S715A	112	15	435	52	205	2.88	24.5	22
S675A	107	15	451	120	204	1.47	22.0	38
S673A	101	15	470	180	228	0.59	13.0	48
S523A	103	15	869	189	326	0.90	14.9	52
S519A	114	15	881	-5	308	3.00	14.5	26
S521A	108	15	883	117	365	2.08	20.9	39
S713A	107	15	886	197	375	1.48	19.7	49

(Continued)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				6.00-16, 2-PR (Continued)				
S694A	109	25	217	65	104	1.68	21.0	17
S710A	110	25	217	72	98	1.62	22.5	21
S706A	104	25	227	143	140	0.30	18.0	54
S681A	101	25	238	144	142	0.30	14.0	41
S692A	111	25	423	63	193	2.87	23.0	16
S699A	105	25	451	196	221	0.77	20.5	38
S704A	105	25	471	247	318	0.89	24.1	54
S697A	111	25	571	55	248	4.00	22.7	19
S701A	102	25	574	207	277	0.77	16.9	43
S708A	106	25	584	261	331	1.83	23.0	58
S700A	106	25	878	23[illegible]	377	1.26	18.8	38
S703A	103	25	886	331	449	0.82	19.0	56
S695A	110	35	206	83	101	1.21	21.0	15
S680A	100	35	229	140	138	0.18	11.0	40
S676A	101	35	435	200	212	0.38	12.0	36
S691A	111	35	444	83	199	2.76	23.0	16
S674A	102	35	492	290	321	0.32	18.0	43
S717A	115	35	864	97	342	2.92	24.2	24
S520A	107	35	866	249	374	1.30	20.0	26
S522A	105	35	881	333	423	0.70	21.9	49
S518A	110	35	882	147	333	2.05	17.4	24
S702A	110	35	1295	332	478	1.11	15.2	44
				6.00-16, Radial Ply				
S491A	115	15	849	-46	329	4.37	18.7	22
S494A	110	15	863	102	375	2.36	25.4	42
S495A	101	15	867	150	290	1.08	13.4	53
S489A	107	15	873	183	325	1.13	16.3	59
S492A	111	15	883	-32	297	3.44	12.7	23
S493A	109	35	861	259	404	1.24	21.3	39
S496A	102	35	865	318	406	0.38	11.5	56
S487A	111	35	867	82	356	2.83	21.3	24
S490A	105	35	871	353	459	0.83	17.0	59
S488A	108	35	881	137	315	2.31	15.6	27
				6.00-16, Radial Ply, with Directional Bar Tread				
S531A	111	15	854	81	363	2.61	24.8	42
S530A	115	15	856	0	430	4.97	35.1	25
S533A	104	15	876	167	328	1.51	17.0	66
S534A	103	35	860	340	441	1.22	17.7	63
S532A	103	35	867	254	394	1.36	17.4	44
S529A	113	35	878	131	379	3.18	24.2	26
				6.00-16, Solid Rubber				
S524A	114	2	432	19	175	2.78	20.0	2[illegible]
S525A	113	2	447	64	194	1.75	23.1	34
S527A	101	2	449	77	165	1.09	18.4	58
S526A	107	3	863	20	338	2.73	20.0	33
S528A	106	3	869	76	321	1.63	23.1	56

(Continued)

(Sheet 5 of 12 sheets)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 2-PR					
S269A	99	10	198	50	72	0.76	12.9	26
S271A	101	10	218	70	95	0.61	13.9	39
S249A	98	15	230	100	120	0.24	12.1	48
S239A	102	15	234	57	84	0.86	14.7	25
S259A	93	15	245	105	115	0.20	8.5	69
S237A	108	15	330	62	141	1.51	26.5	25
S251A	100	15	340	133	167	0.53	15.8	48
S263A	97	15	351	138	152	0.37	11.0	63
S559A	101	15	449	206	244	0.39	14.5	71
S265A	101	15	450	170	201	0.58	11.9	67
S233A	100	15	469	131	185	0.50	11.9	44
S241A	107	15	474	64	192	1.67	21.8	23
S247A	107	15	656	70	268	2.30	22.1	27
S235A	102	15	671	142	243	0.99	15.5	45
S268A	102	15	677	194	265	0.71	13.7	73
S539A	103	15	850	184	326	1.15	13.4	48
S301A	106	15	856	49	360	3.07	19.0	26
S540A	107	15	858	24	343	3.34	17.0	25
S302A	110	15	869	45	364	3.11	25.2	25
S537A	97	15	869	214	313	0.17	11.0	54
S246A	112	15	872	20	365	3.53	30.8	23
S254A	106	15	880	168	332	1.26	19.0	45
S560A	102	15	881	294	403	0.70	14.9	80
S304A	104	15	883	147	294	1.38	15.3	41
S305A	102	15	883	224	319	0.66	11.7	67
S306A	103	15	885	240	338	0.71	11.9	72
S569A	109	15	888	140	389	2.21	18.3	35
S266A	103	15	888	201	318	0.81	13.9	60
S574A	105	15	890	231	398	1.17	16.7	50
S303A	104	15	890	104	280	1.49	13.8	40
S570A	109	15	891	207	385	1.62	17.4	45
S571A	110	15	893	170	391	1.67	17.0	39
S576A	108	15	897	282	407	0.88	16.8	66
S572A	108	15	904	186	367	1.23	17.4	51
S568A	109	15	905	79	370	2.90	18.5	35
S573A	111	15	909	108	385	2.25	18.4	35
S575A	105	15	915	281	[illegible]	0.80	16.0	57
S272A	104	20	489	163	205	0.57	12.1	44
S270A	102	20	500	108	182	1.22	14.2	27
S274A	105	20	885	169	319	1.49	16.1	44
S243A	105	25	282	98	124	0.74	16.6	24
S345A	101	25	291	119	149	0.56	13.8	34
S253A	101	25	296	138	150	0.30	11.4	48
S261A	98	25	298	132	140	0.20	9.3	63
S344A	102	25	442	160	204	0.56	11.2	33
S252A	100	25	445	175	221	0.47	12.3	44
S331A	100	25	447	193	219	0.10	11.9	50
S245A	104	25	448	117	187	1.40	21.9	26
S335A	106	25	449	130	200	1.14	21.3	26
S348A	98	25	459	194	230	0.28	12.0	68

(Continued)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 2-PR (Continued)					
S267A	99	25	462	189	204	0.16	10.0	68
S250A	102	25	651	210	280	0.58	17.3	46
S341A	104	25	651	186	286	1.27	21.5	35
S338A	107	25	655	111	250	1.84	18.7	25
S262A	101	25	657	251	300	0.58	11.6	69
S332A	99	25	665	258	318	0.39	13.0	53
S238A	106	25	682	86	238	2.03	16.8	21
S248A	108	25	860	136	347	2.15	24.2	25
S343A	105	25	869	175	339	1.52	17.2	33
S234A	105	25	884	245	376	0.80	14.9	49
S242A	113	25	892	83	380	2.63	28.4	28
S264A	104	25	905	321	396	0.64	13.8	68
S240A	110	25	1330	-65	500	4.32	23.8	23
S244A	111	25	1342	-32	450	3.42	16.2	26
S260A	112	25	1346	346	547	1.14	19.1	65
S349A	108	25	1346	151	464	2.04	17.7	36
S350A	105	25	1349	195	519	2.06	16.3	40
S236A	106	25	1365	245	493	1.20	17.4	51
S273A	106	30	880	259	354	0.57	13.1	37
S542A	101	35	101	44	44	0.73	12.3	26
S544A	105	35	109	59	57	0.03	20.0	47
S547A	99	35	112	62	62	0.28	14.5	70
S545A	101	35	228	112	116	0.04	12.3	45
S546A	96	35	233	121	121	0.03	7.8	67
S543A	104	35	234	107	119	0.38	15.6	25
S567A	108	35	441	205	233	0.72	25.7	30
S566A	107	35	452	211	243	0.70	24.0	30
S280A	100	35	453	169	214	0.57	13.0	32
S561A	101	35	453	231	234	0.42	16.3	45
S295A	99	35	455	205	238	0.47	16.7	62
S565A	102	35	458	255	263	0.20	14.2	61
S564A	101	35	459	253	259	0.14	13.0	56
S277A	101	35	460	204	222	0.24	12.3	44
S279A	99	35	462	168	204	0.69	14.5	26
S275A	104	35	482	216	340	0.38	17.7	34
S336A	105	35	702	179	266	1.20	14.2	25
S281A	104	35	719	161	241	1.32	13.0	21
S278A	106	35	720	303	355	0.40	18.4	47
S346A	103	35	725	254	321	0.67	15.3	32
S297A	105	35	73[illegible]	335	374	0.40	18.0	65
S276A	101	35	733	275	328	0.80	17.0	44
S291A	102	35	739	287	350	0.80	15.2	45
S535A	116	35	856	135	372	2.79	25.9	25
S536A	105	35	858	373	433	0.42	14.2	60
S333A	103	35	862	193	322	1.32	14.2	32
S293A	103	35	867	305	402	0.49	15.6	39
S538A	104	35	867	308	391	0.76	14.9	47
S541A	114	35	868	131	334	2.48	21.3	25
S329A	105	35	876	317	400	0.61	14.9	48

(Continued)

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Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			9.00-14, 2-PR (Continued)					
S282A	107	35	880	180	330	1.74	17.5	27
S299A	103	35	880	392	441	0.28	15.6	66
S563A	108	35	882	243	374	1.67	22.2	29
S347A	102	35	886	325	403	0.18	15.3	[illegible]
S562A	[illegible]	35	888	350	414	0.70	14.2	54
S294A	103	35	1009	332	439	0.61	13.4	50
S330A	106	35	[illegible]	368	469	0.57	14.9	49
S339A	111	35	1020	134	400	2.84	25.7	20
S342A	103	35	1023	264	412	1.40	14.6	39
S283A	110	35	1038	150	396	2.36	24.0	20
S334A	102	35	1041	189	344	1.22	10.8	29
S298A	105	35	1050	419	511	0.34	16.7	60
S300A	105	35	1199	430	549	0.83	17.9	66
S284A	105	35	1202	97	357	2.65	16.0	27
S296A	106	35	1206	425	541	0.63	14.5	63
S337A	110	35	1209	100	447	3.22	23.1	23
S340A	107	35	1209	267	460	1.39	17.4	37
S292A	106	35	1210	353	504	1.08	14.9	49
			9.00-14, 2-PR, Replacing Old 9.00-14, 2-PR					
S741A	[illegible]	15	880	140	385	1.96	20.2	36
S583A	107	15	906	223	393	1.16	15.0	48
S742A	109	15	867	114	367	2.27	20.0	32
S579A	110	15	875	128	410	2.67	19.0	29
S577A	115	15	882	80	412	3.12	24.2	25
S578A	110	15	882	151	410	2.78	22.5	36
S737A	108	15	884	232	403	1.31	21.9	57
S743A	104	15	892	227	378	1.03	14.0	51
S744A	104	15	892	233	373	0.82	13.0	48
S738A	104	15	894	243	366	0.96	13.0	47
S582A	110	15	895	114	393	2.76	18.0	27
S580A	107	15	397	190	353	1.45	14.0	40
S581A	106	15	898	203	386	1.35	14.0	45
S740A	108	15	913	136	399	2.29	18.7	32
S745A	107	15	924	246	416	1.00	20.0	57
S739A	103	15	942	243	374	0.90	13.0	61
S644A	111	15	1300	271	486	1.08	13.0	58
S642A	111	15	1303	235	449	1.10	18.0	50
S643A	110	15	1281	262	435	1.06	12.4	62
S683A	105	25	445	199	234	0.78	22.0	32
S689A	106	25	447	146	197	1.07	15.0	26
S684A	105	25	450	192	227	0.80	22.0	33
S690A	104	25	451	145	187	0.94	13.0	28
S685A	106	25	457	197	243	0.76	23.0	38
S688A	112	25	866	105	393	3.00	25.0	22
S687A	110	25	878	71	384	3.16	23.0	21
S686A	103	25	882	297	421	1.02	18.0	43

(Continued)

(Sheet 8 of 12 sheets)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				9.00-14, 4-PR				
S27A	108	25	990	240	410	1.28	21.4	37
S32A	104	25	1020	355	481	0.04	14.2	60
S28A	99	25	1033	190	316	0.92	8.8	30
S31A	107	25	1044	342	489	0.18	19.5	60
S29A	81	25	1076	272	430	0.95	16.6	42
S30A	84	25	1084	270	390	0.62	13.0	42
				9.00-14, 8-PR				
S405A	101	15	225	70	90	0.93	17.6	28
S399A	97	15	230	77	90	0.49	11.8	37
S404A	106	15	445	69	187	1.91	24.0	25
S437A	101	15	446	144	189	0.56	11.9	60
S401A	104	15	448	117	167	0.35	13.5	43
S408A	105	15	670	70	240	2.07	16.2	25
S420A	114	15	833	-74	295	5.14	19.2	15
S413A	110	15	866	-4	295	3.10	16.7	27
S435A	105	15	878	185	301	0.94	13.4	57
S406A	104	15	879	111	312	2.41	20.4	26
S415A	107	15	885	126	297	1.37	16.2	52
S431A	126	15	988	-54	472	3.39	44.9	19
S434A	112	15	1024	188	383	1.21	16.0	54
S433A	117	15	1217	146	429	1.68	18.9	49
S432A	126	15	1225	-68	499	4.45	27.5	25
S407A	100	25	2[illegible]7	97	118	0.56	14.8	26
S416A	98	25	292	123	143	0.30	13.0	37
S419A	100	25	292	125	141	0.37	15.0	37
S403A	106	25	458	141	200	1.22	21.9	28
S441A	100	25	459	201	232	0.26	12.6	56
S400A	102	25	462	160	199	0.93	17.1	35
S402A	102	25	654	194	262	1.04	16.2	42
S410A	107	25	660	130	250	1.62	17.7	25
S417A	105	25	868	213	332	1.16	16.2	36
S438A	106	25	880	278	361	0.47	12.9	59
S436A	107	25	1181	337	469	0.58	15.3	61
S412A	116	25	1184	-70	430	4.15	18.0	20
S418A	108	25	1200	192	397	1.49	17.5	40
S442A	104	35	445	206	232	0.42	19.0	55
S409A	106	35	452	142	193	1.00	14.8	23
S428A	106	35	459	182	224	0.66	18.4	38
S424A	110	35	712	187	293	1.79	22.2	23
S411A	107	35	760	168	279	1.75	15.6	23
S426A	109	35	872	126	302	2.13	14.1	21
S429A	104	35	879	285	377	1.05	15.3	34
S422A	106	35	880	269	370	1.13	21.8	40
S440A	99	35	882	331	388	0.10	9.4	55
S425A	110	35	1008	138	360	2.36	18.3	25
S427A	112	35	1205	117	409	2.77	15.7	23
S430A	109	35	1225	288	461	1.26	14.7	39
S439A	105	35	1228	427	547	0.53	13.4	54
S423A	106	35	1426	280	514	1.80	16.3	35

(Continued)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
				5.00-12, 2-PR				
S620A	105	15	150	39	40	0.98	16.3	33
S628A	103	15	150	38	35	0.61	11.5	46
S614A	115	15	166	11	55	3.32	36.0	14
S612A	117	15	208	6	86	4.29	48.6	16
S630A	106	15	220	56	61	0.76	16.0	54
S615A	111	15	226	40	74	1.30	19.0	38
S622A	110	15	324	33	100	2.13	23.0	35
S632A	108	15	335	62	89	1.24	20.0	59
S624A	114	15	438	19	135	2.40	23.0	37
S626A	110	15	452	30	135	1.85	24.0	46
S617A	118	35	146	27	52	2.84	43.0	15
S621A	102	35	154	66	59	0.50	16.0	40
S629A	104	35	162	76	57	0.52	13.2	54
S734A	102	35	218	86	70	0.56	13.4	40
S613A	110	35	222	22	69	3.13	20.0	18
S631A	102	35	223	103	83	0.30	10.9	57
S616A	106	35	230	76	78	0.65	15.0	40
S733A	108	35	320	115	109	0.45	21.6	42
S623A	110	35	333	105	100	1.08	17.0	33
S672A	104	35	333	123	112	0.47	14.0	56
S665A	106	35	335	78	98	1.26	29.0	35
S633A	105	35	339	114	107	0.61	17.0	58
S732A	102	35	340	62	78	0.79	10.7	22
S735A	101	35	340	130	112	0.45	13.9	61
S669A	106	35	343	117	115	0.73	19.0	46
S664A	108	35	441	55	123	1.97	23.0	31
S625A	107	35	451	96	126	1.21	17.0	37
S627A	107	35	454	146	143	0.75	19.0	49
S736A	105	35	458	150	130	0.18	11.4	61
S668A	104	35	463	61	118	1.67	17.0	37
S671A	102	35	474	143	138	0.70	12.0	53
				4.50-7, 2-PR				
S585A	111	15	82	9	19	1.74	30.0	17
S594A	104	15	100	32	20	0.53	11.0	59
S593A	111	15	101	30	19	0.58	12.0	43
S591A	111	15	107	22	23	1.04	15.8	24
S586A	106	15	108	32	19	0.29	10.0	37
S469A	108	15	170	0	32	1.55	13.0	26
S483A	109	15	172	0	36	2.00	14.5	25
S473A	106	15	173	17	26	0.91	9.4	41
S476A	107	15	177	56	44	0.34	14.2	66
S470A	113	15	220	0	45	1.85	18.0	28
S464A	109	15	222	16	44	1.25	18.7	31
S466A	110	15	222	54	46	0.65	16.0	56
S484A	114	15	225	-11	52	2.42	22.1	24
S472A	114	15	328	12	63	1.38	15.3	42
S468A	107	15	336	39	56	0.75	13.0	54

(Continued)

Table 4 (Continued)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			4.50-7, 2-PR (Continued)					
S480A	100	15	398	-123				26
S474A	109	15	446	-16	93	1.99	18.0	41
S595A	107	15	456	-16	84	1.72	16.0	53
S477A	110	15	456	17	63	0.74	12.3	68
S592A	108	25	95	42	23	0.46	18.0	38
S584A	107	25	104	13	20	1.42	12.0	16
S590A	108	25	122	29	27	0.88	13.0	23
S589A	107	25	110	48	28	0.31	8.0	56
S463A	107	25	219	48	40	0.55	11.5	33
S482A	107	25	221	-6	36	1.45	5.7	19
S486A	109	25	224	0	39	1.49	11.1	25
S465A	104	25	228	91	61	0.44	12.3	56
S467A	103	25	327	84	67	0.65	15.2	56
S485A	112	25	330	-39	71	2.92	15.2	23
S471A	112	25	337	53	64	0.73	17.0	42
S478A	107	25	339	-50	48	2.32	4.5	22
S479A	110	25	430	-90	88	3.45	13.0	24
S475A	109	25	446	45	74	1.06	12.3	45
S588A	107	25	454	63	79	0.65	13.0	52
S731A	109	35	209	24	45	1.52	16.0	25
S516A	109	35	216	33	41	1.22	14.2	30
S512A	102	35	225	71	49	0.47	11.8	38
S514A	100	35	225	84	56	0.37	11.1	58
S729A	105	35	228	71	52	0.39	10.0	56
S513A	104	35	441	48	73	1.00	13.4	37
S730A	105	35	450	75	75	0.96	10.0	50
S517A	109	35	450	-43	82	2.82	14.5	29
S515A	103	35	457	107	89	0.72	15.3	55
			4.50-18, 4-PR, Dual Configuration, No Spacing					
S608A	103	15	901	226	328	0.76	14.0	50
S607A	108	15	905	158	376	1.68	19.0	34
S605A	117	35	886	103	353	2.85	19.0	16
S606A	102	35	922	311	396	0.96	11.0	32
S609A	103	35	922	588	473	0.74	14.0	50
			4.50-18, 4-PR, Dual Configuration, 1-in. Spacing					
S598A	118	15	888	-18	390	4.37	24.0	13
S597A	115	15	895	190	373	1.43	19.0	38
S604A	122	15	897	-58	446	5.40	31.0	15
S601A	100	15	904	222	355	0.92	13.2	45
S599A	110	35	918	347	432	0.67	16.0	32
S596A	123	35	922	60	448	4.29	42.3	14
S600A	100	35	929	428	482	0.69	11.0	48

(Continued)

(Sheet 11 of 12 sheets)

Table 4 (Concluded)

Test No.	Station	Deflection %	Load lb	Pull, lb	Torque ft-lb	Sinkage in.	Slip %	0-6 in. Avg CI
			16x15-6R, 2-PR, Terra-Tire					
S646A	108	15	207	70	56	0.64	15.0	32
S650A	103	15	223	103	72	0.40	12.0	50
S645A	109	15	227	63	66	1.34	26.0	18
S647A	111	15	442	33	114	1.67	18.0	21
S648A	99	15	449	111	118	0.71	11.0	36
S649A	101	15	454	142	121	0.62	13.0	42
S652A	110	15	703	108	157	1.14	11.0	40
S653A	103	15	723	168	182	0.82	15.0	54
S654A	105	15	732	96	167	1.24	17.0	39
S658A	108	25	214	73	61	0.64	16.0	21
S662A	103	25	225	124	84	0.37	15.0	57
S659A	106	25	230	130	82	0.64	15.0	40
S657A	110	25	438	98	112	1.67	18.0	19
S661A	103	25	450	221	164	0.48	17.0	55
S660A	100	25	462	176	130	0.52	12.0	39
S655A	106	25	703	202	186	0.93	19.0	38
S656A	113	25	711	-6	196	2.87	25.0	19
S663A	99	25	736	267	203	0.47	10.0	57

(Sheet 12 of 12 sheets)

Table 5

Performance Data for Group of Representative Tests

Test No.	Deflection %	0-6 in. CI	Load* lb	$r_d = d/2 - \delta_{MS}$ ft	$P_M + P_T$ lb	M_M/r_d lb
			1.75-26**, Bicycle			
S504A	15	24	86	1.145	42	29
S510A	15	68	92	1.145	33	28
S499A	15	43	106	1.145	46	36
S503A	15	21	215	1.145	87	76
S511A	15	67	221	1.145	89	70
S505A	35	22	99	1.130	29	30
S500A	35	42	115	1.130	34	29
S509A	35	22	210	1.130	96	88
S507A	35	34	220	1.130	100	97
S498A	35	37	222	1.130	113	81
			4.00-18, 2-PR			
S79A	15	56	315	1.055	114	106
S61A	15	48	481	1.068	186	186
S325A	15	62	617	1.068	183	188
S84A	25	58	340	1.021	126	128
S313A	25	22				
S327A	25	44	1000	1.055	376	322
S55	35	25	315	1.039	127	117
S310	35	25	491	1.035	193	167
S317	35	43	626	1.004	193	201
S74	35	58	1012	1.004	313	333
			4.50-7, 2-PR			
S483	15	25	172	0.603	55	60
S397	15	26				
S391	15	38				
S477	15	68	456	0.597	109	106
S380	25	57				
S478	25	22	339	0.591	60	81
S475	25	45	446	0.570	153	130
S512	35	38	225	0.569	91	86
S731	35	25	209		78	
S730	35	50	450		141	

(Continued)

* Wheel load read at maximum-pull point.

** For 1.75-26 tire, $\frac{\delta_{MS}}{\delta_{MH}}$ is assumed to equal 1.

(Sheet 1 of 3 sheets)

Table 5 (Continued)

Test No.	Deflection %	0-6 in. CI	Load lb	$r_d = d/2 - \delta_{MS}$ ft	$P_M + P_T$ lb	M_M/r_d lb
			4.50-18, 4-PR			
S182A	15	56				
S360A	15	42	700	1.109	243	231
S140A	15	59	918	1.106	318	296
S166A	25	38				
S145A	25	23	458	1.093	147	160
S365A	25	61	704	1.061	222	218
S195A	25	25				
S131A	35	57	453	1.018	208	201
S146A	35	24	892	1.079	273	329
S208A	35	37				
			5.00-12, 2-PR			
S614A	15	14	166	0.818	68	67
S630	15	54	220	0.806	69	76
S615	15	38	226	0.810	84	91
S632	15	59	335	0.808	111	110
S626	15	46	452	0.814	144	166
S621	35	40	154	0.752	75	74
S631	35	57	223	0.748	115	111
S732	35	22	340	0.764	109	102
S625	35	37	451	0.762	162	165
S736	35	61	458	0.735	178	177
			6.00-16, 2-PR			
S709A	15	21	204	1.120	75	79
S677A	15	18	392	1.129	140	171
S675A	15	38	451	1.106	154	184
S521A	15	39	883	1.115	327	327
S681A	25	41	238	1.045	152	136
S704A	25					
S703A	25	56	886	1.050	295	315
S680A	35	40	229	1.003	148	137
S518A	35	24	882	1.020	314	327
S702A	35	44	1295	1.018	432	470
			6.00-16, Radial Ply			
S491A	15	22	849	1.138	284	289
S494A	15	42	863	1.121	276	335
S495A	15	53	867	1.111	262	261
S489A	15	59	873	1.111	278	292

(Continued)

(Sheet 2 of 3 sheets)

Table 5 (Concluded)

Test No.	Deflection %	0-6 in. CI	Load lb	$r_d = d/2 - \delta_{MS}$ ft	$P_M + P_T$ lb	M_M/r_d lb
			6.00-16, Radial Ply (Continued)			
S492A	15	23	883	1.134	256	261
S493A	35	24	861	1.040	331	388
S496A	35	56	865	1.038	353	391
S487A	35	24	867	1.063	263	335
S490A	35	59	871	1.029	395	445
S488A	35	27	881	1.054	304	299
			9.00-14, 2-PR			
S271A	15	39	218	1.089	91	88
S559A	15	71	449	1.061	214	230
S579A	15	29	875	1.112	341	368
S685A	25	38	457	1.022	217	238
S262A	25	69	657	1.020	272	294
S244A	25	26	1342	1.071	451	420
S546A	35	67	233	0.929	132	132
S277A	35	44	460	0.966	254	230
S541A	35	25	865	1.000	274	334
S296A	35	63	1206	0.960	484	564
			9.00-14, 8-PR			
S437	15	60	446	1.048	167	180
S413	15	27	866	1.090	290	270
S433	15	49	1217	1.060	358	405
S416	25	37	292	0.990	138	144
S410	25	25	660	1.005	266	248
S438	25	59	880	0.992	323	364
S418	25	40	1200	1.010	368	393
S442	35	55	445	0.940	238	247
S426	35	21	872	0.956	311	316
S430	35	39	1225	0.946	422	487
			16x15-6R, 2-PR, Terra-Tire			
S650A	15	50	223	0.655	110	
S645	15	18	227	0.675	107	
S648	15	36	449	0.683	171	
S652	15	40	703	0.702	223	
S653	15	54	723	0.694	254	
S658	25	21	214	0.630	103	
S659	25	40	230	0.617	136	
S661	25	55	450	0.619	228	
S657	25	19	438	0.635	223	
S663	25	57	736	0.625	297	

(Sheet 3 of 3 sheets)

Table 6

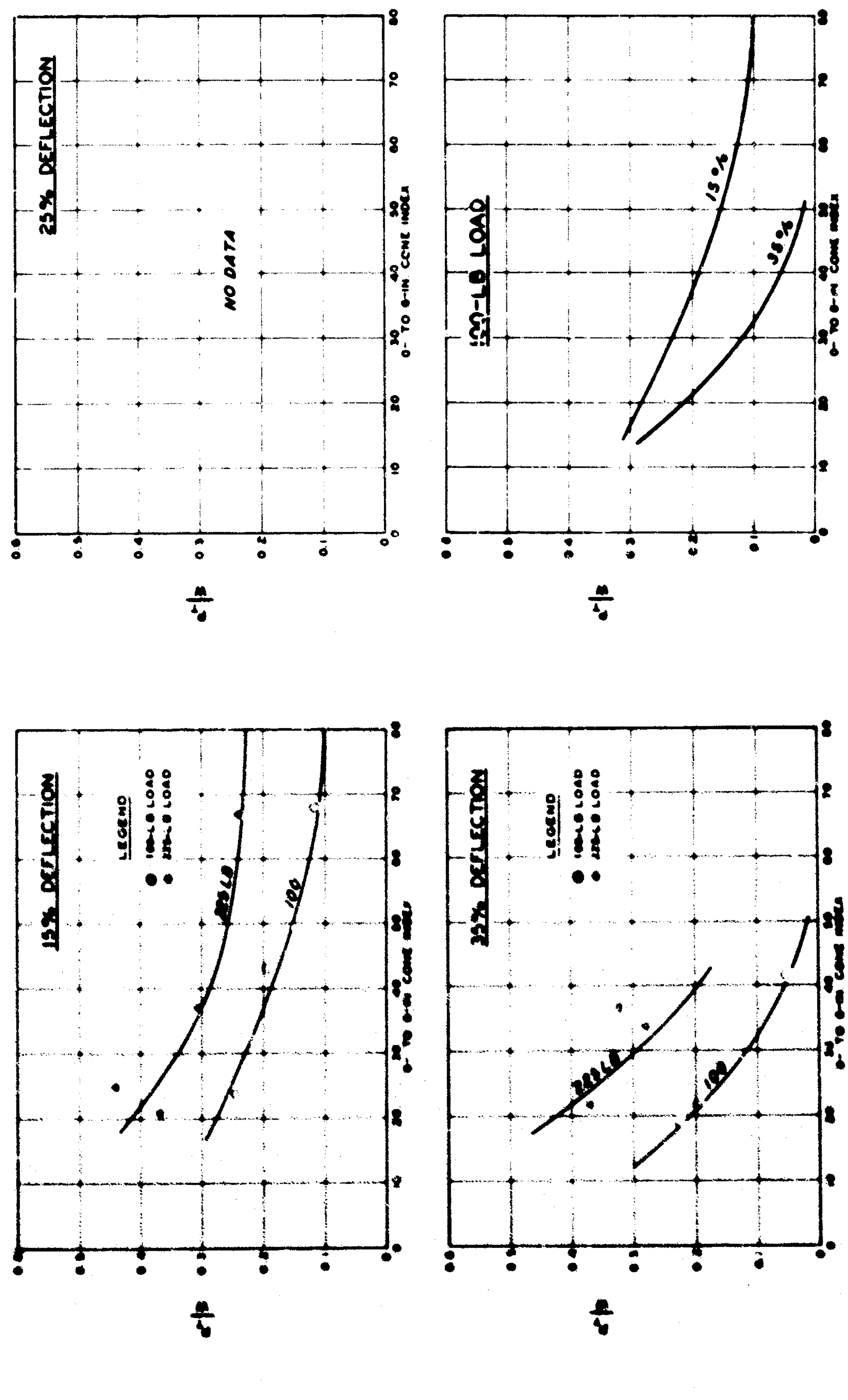
Predicted Sinkage and Towed-Force Computations, 4.50-18, 4-PR

Test No.	n	k_c $lb/in.^{n+1}$	k_ϕ $lb/in.^{n+2}$	b Hard Surface in.	P_H Hard Surface psi	Predicted Sinkage in.	First-Pass Sinkage, in. Towed Point	First-Pass Sinkage, in. Maximum-Pull Point	b Yuma Sand in.	Predicted Towed Force (Experimental Sinkage) lb	Measured Towed Force lb	Predicted Towed Force (Predicted Sinkage) lb
8161	0.64	3.1	10.4	2.4	37.9	6.25	2.04		4.78	104	136	647
8172	0.72	4.6	14.6			3.16	0.92			38	84	312
8206	0.63	3.7	13.4			4.40	1.17			54	89	466
8356	0.69	-0.5	11.9			5.50	1.91	2.05		100	126	597
8162	0.64	2.6	13.0			4.70	1.27			58	105	500
8189	0.64	5.2	14.7			3.54	0.83			34	69	366
8190	0.69	7.0	15.7			2.80	0.66			24	58	277
8205	0.60	2.6	11.6			6.23	2.17			126	148	678
8182	0.66	6.4	15.2			3.12	0.73			28	87	328
8171	0.74	-0.1	10.6			5.61	2.45			140	156	581
8181	0.65	3.3	14.4			3.85	1.44			80	109	403
8133	0.89	3.8	14.2			2.68	0.70	1.14		19	45	245
8141	0.83	2.6	14.9			2.74	0.78	0.97		26	65	262
8366	0.66	3.4	16.5	[illegible].3	59.8	6.18	1.22	1.77	4.80	69	139	1020
8360	0.62	0.6	14.8			9.20	1.98	2.49		134	209	1604
8163	0.64	3.1	10.4	2.4	70.4	16.50	4.21		4.90	350	417	3295
8188	0.68	4.0	13.9			9.18	1.60			94	239	1780
8164	0.64	2.6	13.0			12.30	3.03			250	368	2470
8187	0.63	7.2	17.6			7.08	0.92			30	189	1390
8142	0.83	3.6	14.9			5.78	1.62	2.08		101	229	1039
8353	0.68	2.6	8.1	3.4	12.4	1.64	1.19	1.62	4.70	32	[illegible]	137
8192	0.69	7.0	15.7			0.59	0.05			0.3		20
8134	0.75	7.9	14.6			0.66	0.69	0.78		23	18	21
8191	0.64	5.2	14.7			0.65	0.03			0.1	18	22
8201	0.72	-0.7	9.5			1.45	1.0			26	45	48
8165	0.71	0.5	10.0			1.32	0.98			27	42	45
8147	0.70	1.1	9.1			1.48	1.17	1.72		34	40	50
8166	0.64	3.5	11.9	3.4	12.4	0.94	0.45		4.70	10	26	33
8198	0.66	8.1	15.1			0.60	0.43			2	19	20
8202	0.71	1.3	12.3			0.97	0.45			9	29	33
8138	0.88	3.8	13.1			0.85	1.03	0.97		37	20	26
8197	0.63	5.1	15.1			0.63	0.25			5	20	22
8136	0.94	2.5	13.6			0.86	1.09	1.13		35	26	26
8145	0.73	0.4	9.7	3.4	19.8	2.61	2.37	2.90	4.78	121	111	142
8159	0.69	1.1	9.5			2.76	1.47			53	105	150
8185	0.63	7.2	17.6			1.00	0.38			12	31	56
8186	0.68	4.0	13.9			1.49	0.45			11	42	82
8132	0.89	3.8	14.2			1.33	1.44	1.05		76	32	65
8174	0.75	-7.1	24.1			0.87	0.43			14	31	48
8365	0.66	3.4	16.5	3.3	31.5	2.43	0.45	0.85	4.76	13	62	216
8195	0.67	1.2	10.8	3.4	38.7	6.39	4.86		4.78	442	423	698
8176	0.75	-7.1	24.1			2.15	0.56			22	89	236
8196	0.67	4.4	14.4			3.85	1.50			86	173	417
885	0.68	2.7	11.6	4.2	12.9	[illegible]	2.58		4.70	168	140	39
8143	0.70	2.3	8.1			1.84	1.62	2.66		53	96	65
8193	0.67	1.2	10.8			1.25	1.23			44	68	45
8157	0.69	0.9	9.9			1.42	0.98			27	59	51
8160	0.69	1.1	9.5			1.50	0.91			23	82	54
8194	0.67	4.4	14.4			0.79	0.29			54	35	29
891	0.66	3.0	13.2			0.89	0.48	0.58		12	42	32
898	0.71	1.9	13.8			0.87	0.55			14	42	41
8169	0.74	-0.1	10.6			1.31	0.86			22	58	46
8131	0.87	1.4	16.1			0.76	0.55	0.75		14	30	25
8170	0.72	4.6	14.6	4.2	12.9	0.76	0.50		4.70	11	35	27
890	0.60	4.3	13.2			0.85	0.73	0.99		25	49	[illegible]
8177	0.60	3.5	15.0			0.71	0.52			16	41	27
894	0.67	4.0	13.1			0.98	0.60	1.22		17	53	32
8103	0.86	0.6	12.2			1.05	0.64	1.18		14	54	44
8178	0.65	7.6	16.4			0.57	0.17			3	40	20
893	0.67	4.0	13.1			0.88	0.91	0.92		34	50	[illegible]
8130	0.87	1.4	16.1			0.76	0.88	0.95		31	35	25
8146	0.73	0.4	9.7	4.0	26.0	3.79	3.18	5.51	4.78	200	296	370
8158	0.69	0.9	9.9			3.93	3.66			255	329	292
8184	0.66	6.4	15.2			1.94	0.57			19	79	[illegible]
895	0.74	2.4	11.6			2.78	2.04	2.06		115	227	197
897	0.71	1.9	13.8			2.33	1.45			75	170	169
899	0.77	-0.1	15.3			1.99	0.82			29	176	139
8180	0.65	7.6	16.4			1.72	0.36			10	55	[illegible]
8159	0.72	1.3	13.8			2.33	0.65	1.19		19	118	106
896	0.7[illegible]	2.4	11.6			2.73	1.69	1.64		83	190	197
8100	0.77	-0.1	15.3			1.99	1.22			59	105	[illegible]
8104	0.86	0.6	12.2			2.37	2.28			147	123	[illegible]
8156	0.69	1.1	12.7			2.74	1.61			89	154	301
8183	0.65	3.3	14.4			2.39	0.84			33	94	178
8151	0.72	1.2	13.8			2.34	0.48	1.43		11	145	169

(Continued)

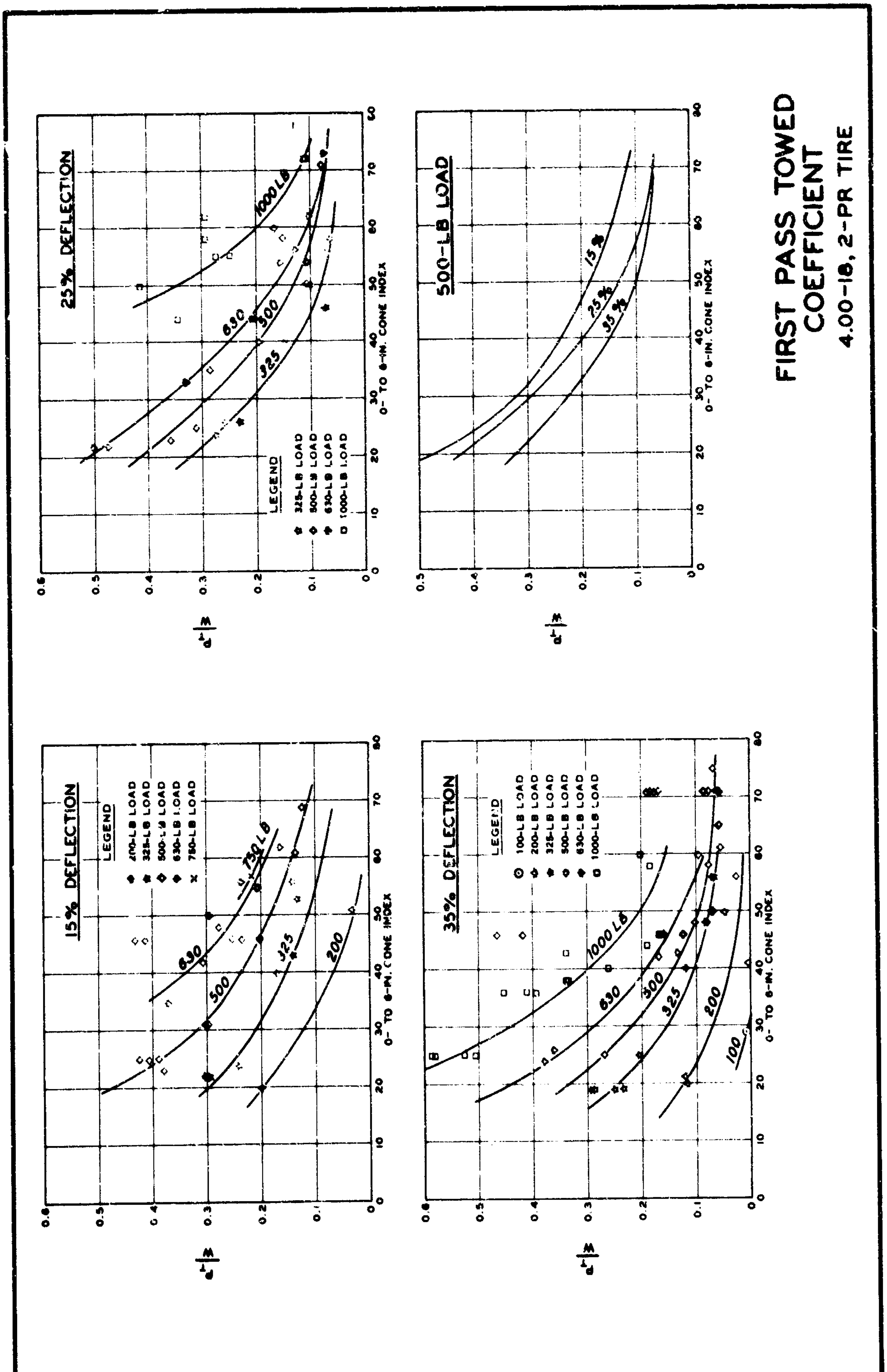
Table 6 (Concluded)

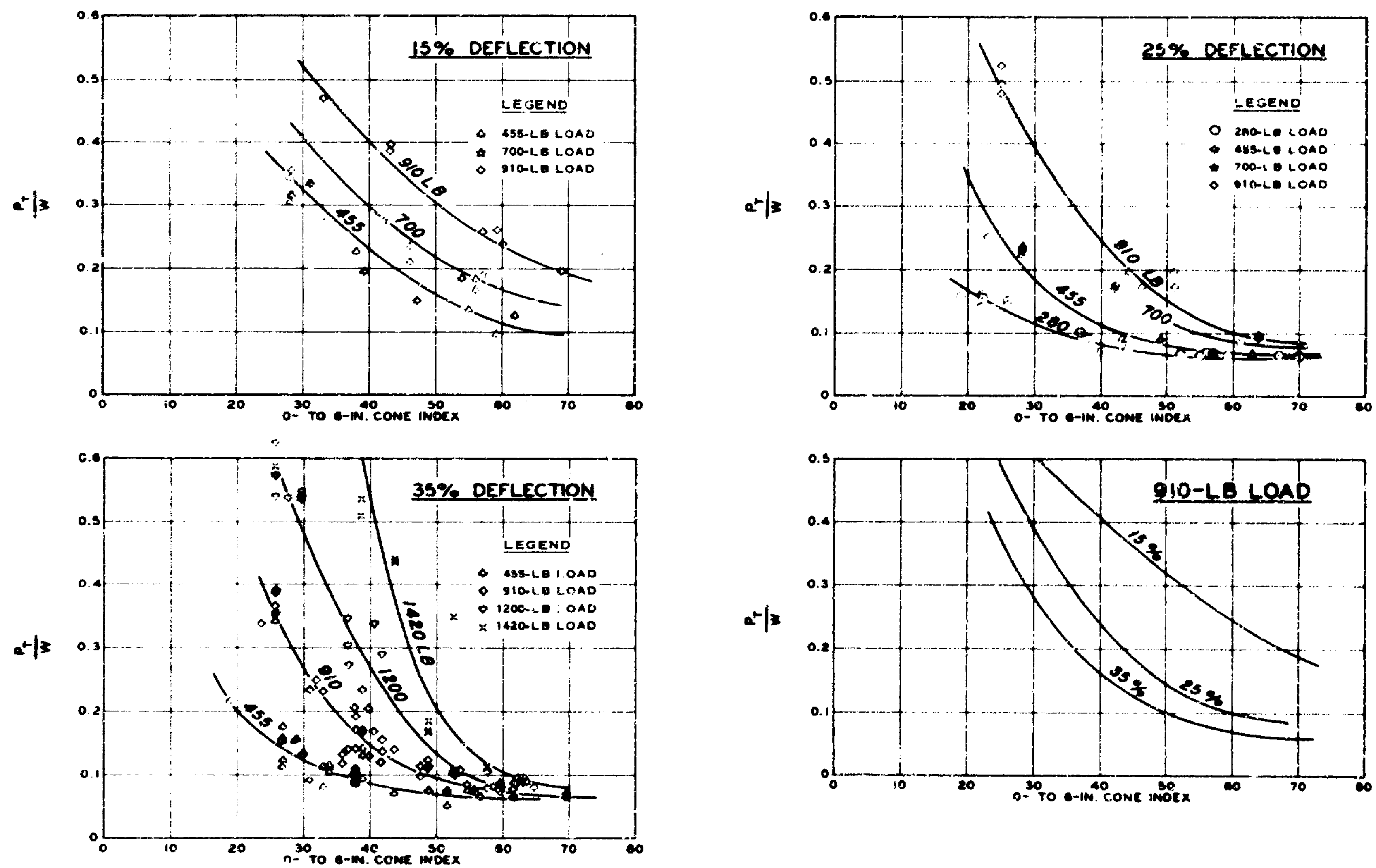
Test No.	n	k_c lb/in.$^{n+1}$	k_ϕ lb/in.$^{n+2}$	b Hard Surface in.	F_H Hard Surface psi	Predicted Sinkage in.	First-Pass Sinkage, in. Towed Point	First-Pass Sinkage, in. Maximum-Pull Point	b Yuma Sand in.	Predicted Towed Force (Experimental Sinkage) lb	Measured Towed Force lb	Predicted Towed Force (Predicted Sinkage) lb
S153	0.69	0.4	12.2			2.95	1.85	2.69		96	220	216
S154	0.69	0.4	12.2			2.95	1.26	2.03		51	158	216
S92	0.61	4.0	14.5			2.34	1.75	1.67		112	218	179
S179	0.60	3.5	15.0			2.28	1.04			50	110	176
S155	0.69	1.1	12.7			2.74	1.90	1.92		108	225	201
S207	0.60	2.6	11.6	4.3	31.6	1.90	5.78		4.78	598	610	460
S203	0.72	-0.7	9.5			5.48	7.13			764	642	486
S87	0.68	2.7	11.6			4.03	7.79			1085	722	360
S208	0.63	3.7	13.4			3.56	2.46			180	434	328
S364	0.62	1.6	16.1			2.86	0.86	1.46		38	124	267
S361	0.61	2.9	14.1			3.48	2.66	2.63		201	356	325
S167	0.71	0.5	10.0			4.97	7.83			956	675	438
S204	0.71	1.3	12.3			3.67	3.32			274	443	325
S362	0.61	2.9	14.1			3.48	3.33	2.75		303	500	325
S200	0.66	8.1	15.1	4.3	36.8	3.24	0.79		4.78	34	141	340
S199	0.63	5.1	15.1			3.66	1.67			110	253	394
S135	0.75	7.9	14.6			2.92	1.54	1.49		95	166	289
S168	0.64	3.5	11.9			5.26	5.69			637	650	560
S137	0.94	2.5	13.6			2.76	1.78	1.77		106	158	250
S149	0.66	-1.1	11.1	2.4	37.9	6.85		3.42				
S355	0.69	0.5	11.9	2.3	59.8	10.7		4.35				
S150	0.65	2.2	11.4	2.4	70.4	14.6		5.21				
S363	0.62	1.6	16.1	2.4	70.4	10.1		2.42				
S352	0.71	1.8	8.2	3.4	19.8	3.18		2.89				
S358	0.70	2.0	21.3	3.4	38.7	2.26		4.21				
S148	0.70	1.1	9.1	3.4	38.7	7.55		6.23				
S351	0.71	1.8	9.2	4.2	12.9	1.75		1.82				
S357	0.70	2.0	21.3	4.0	26.0	1.28		2.69				
S89	0.60	4.3	13.2	4.3	36.8	4.90		3.78				



FIRST PASS TOWED COEFFICIENT

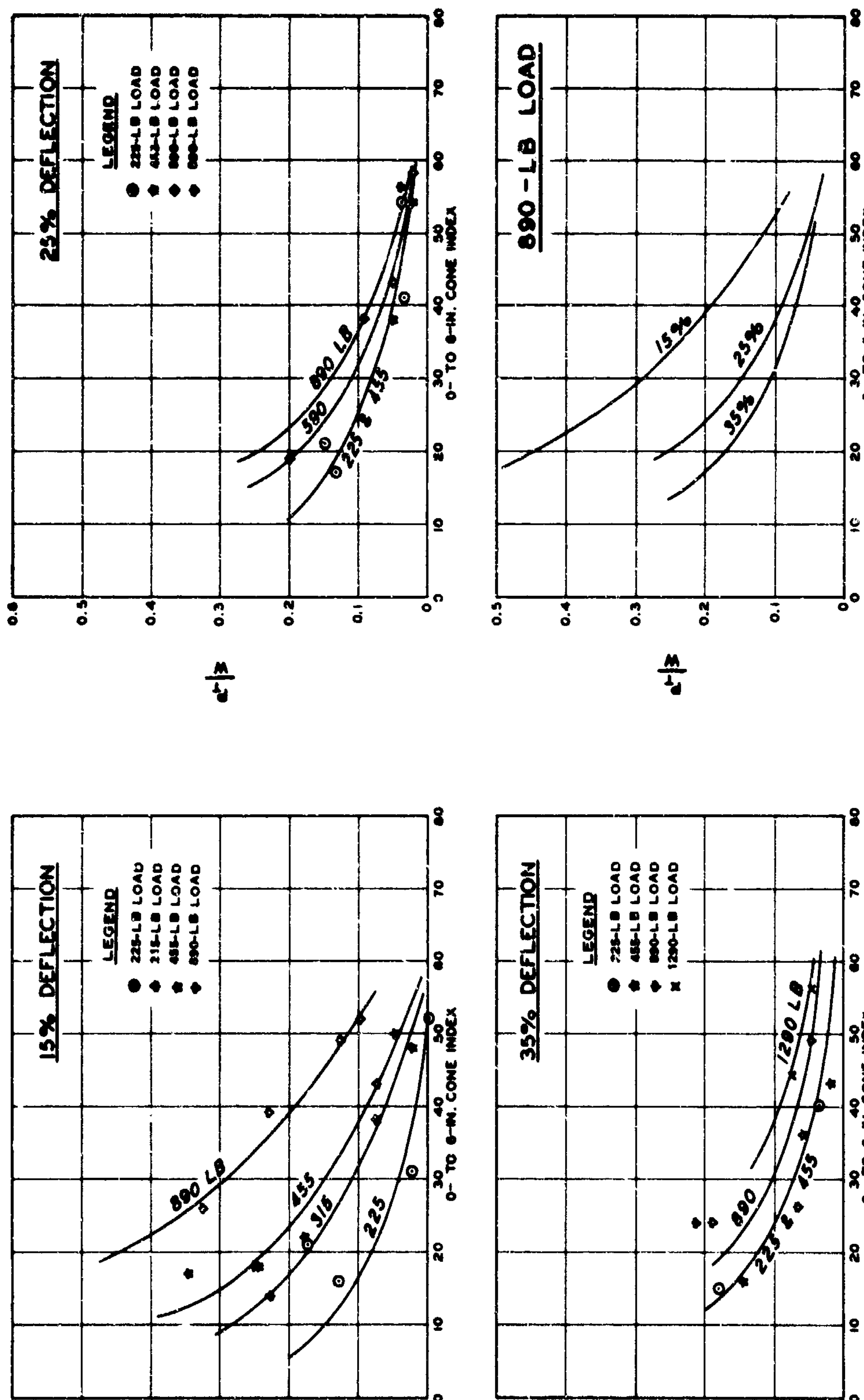
1.75-26 BICYCLE TIRE


FIRST PASS TOWED COEFFICIENT
4.00-18, 2-PR TIRE
15% DEFLECTION
25% DEFLECTION
35% DEFLECTION
500-LB LOAD
LEGEND
200-LB LOAD
325-LB LOAD
500-LB LOAD
630-LB LOAD
750-LB LOAD
1000-LB LOAD
100-LB LOAD
0- TO 6-IN. CONE INDEX
P/W
1000 LB
750 LB
630
500
325
200
100
15%
25%
35%

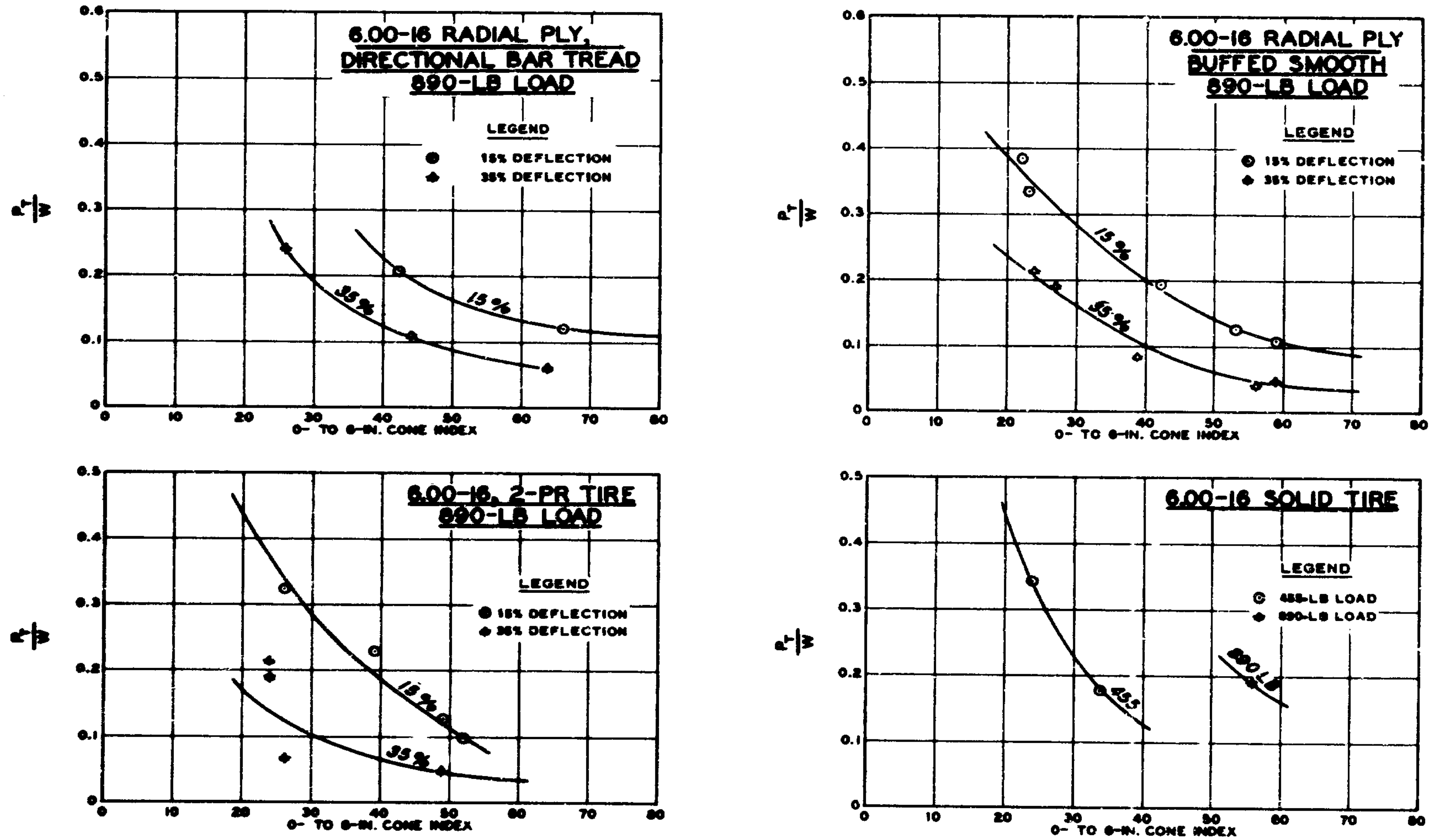


FIRST PASS TOWED COEFFICIENT

4.50-15, 4-PR TIRE

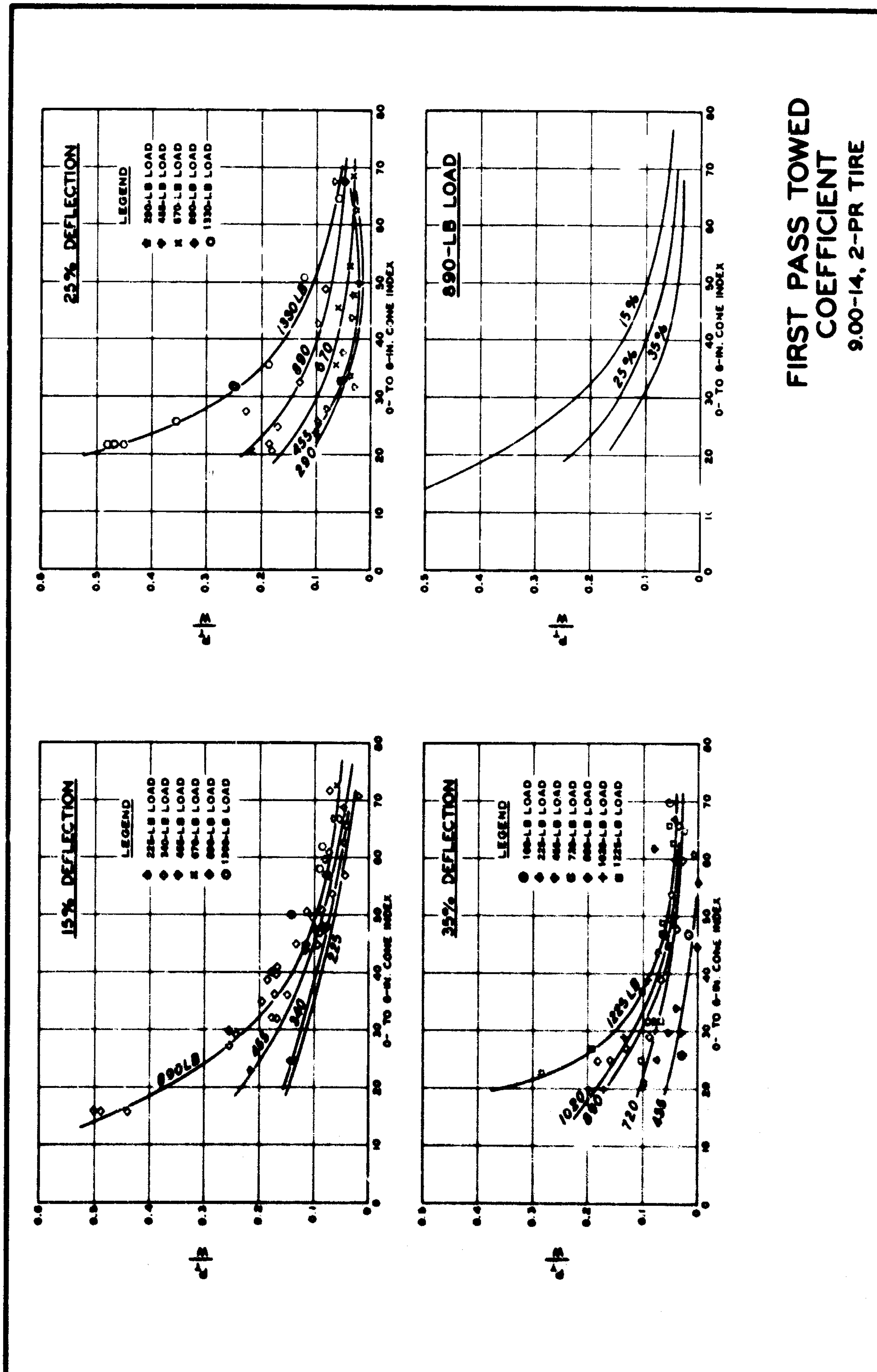


FIRST PASS TOWED COEFFICIENT
6.00-16, 2-PR TIRE

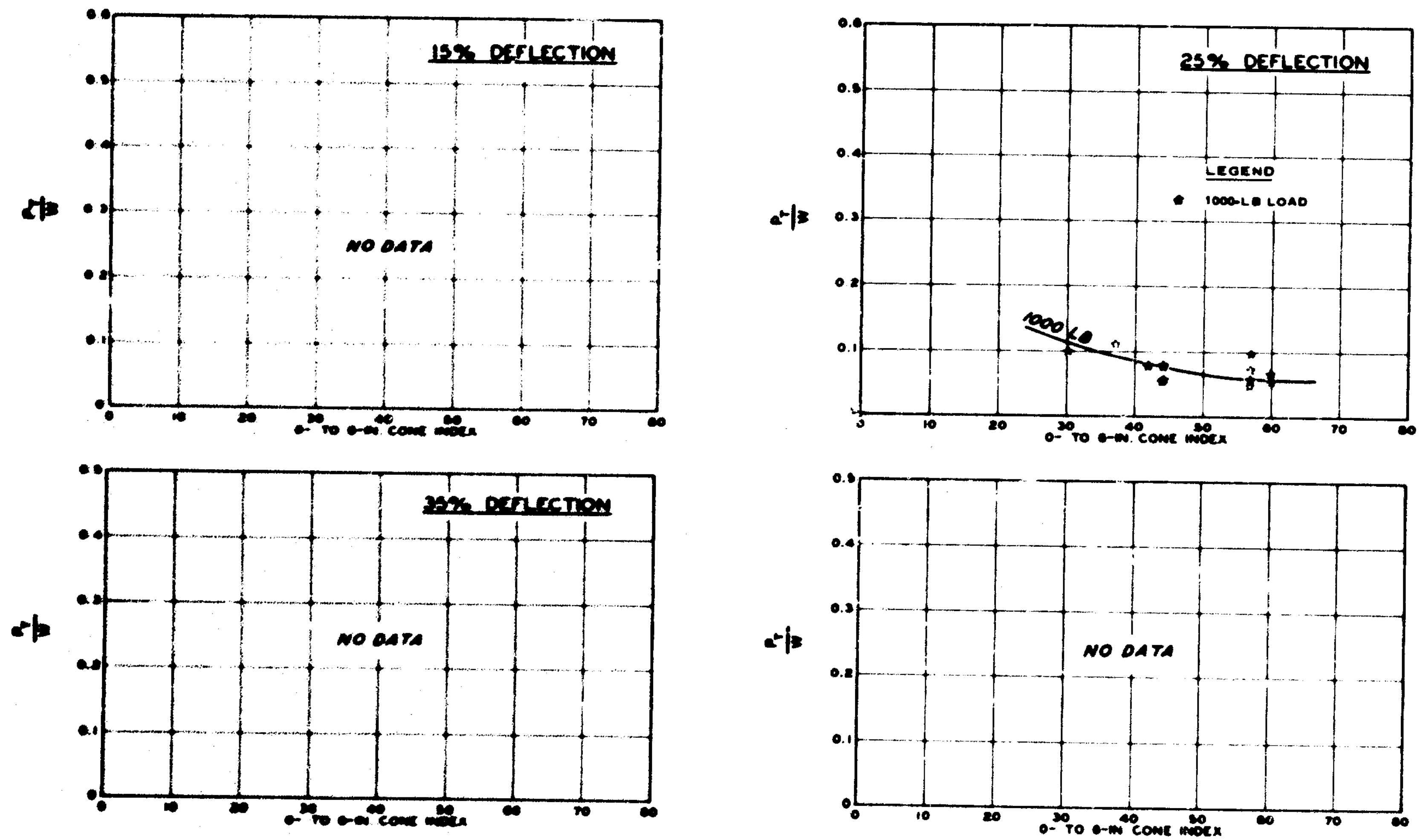


FIRST PASS TOWED COEFFICIENT

6.00-16 TIRES

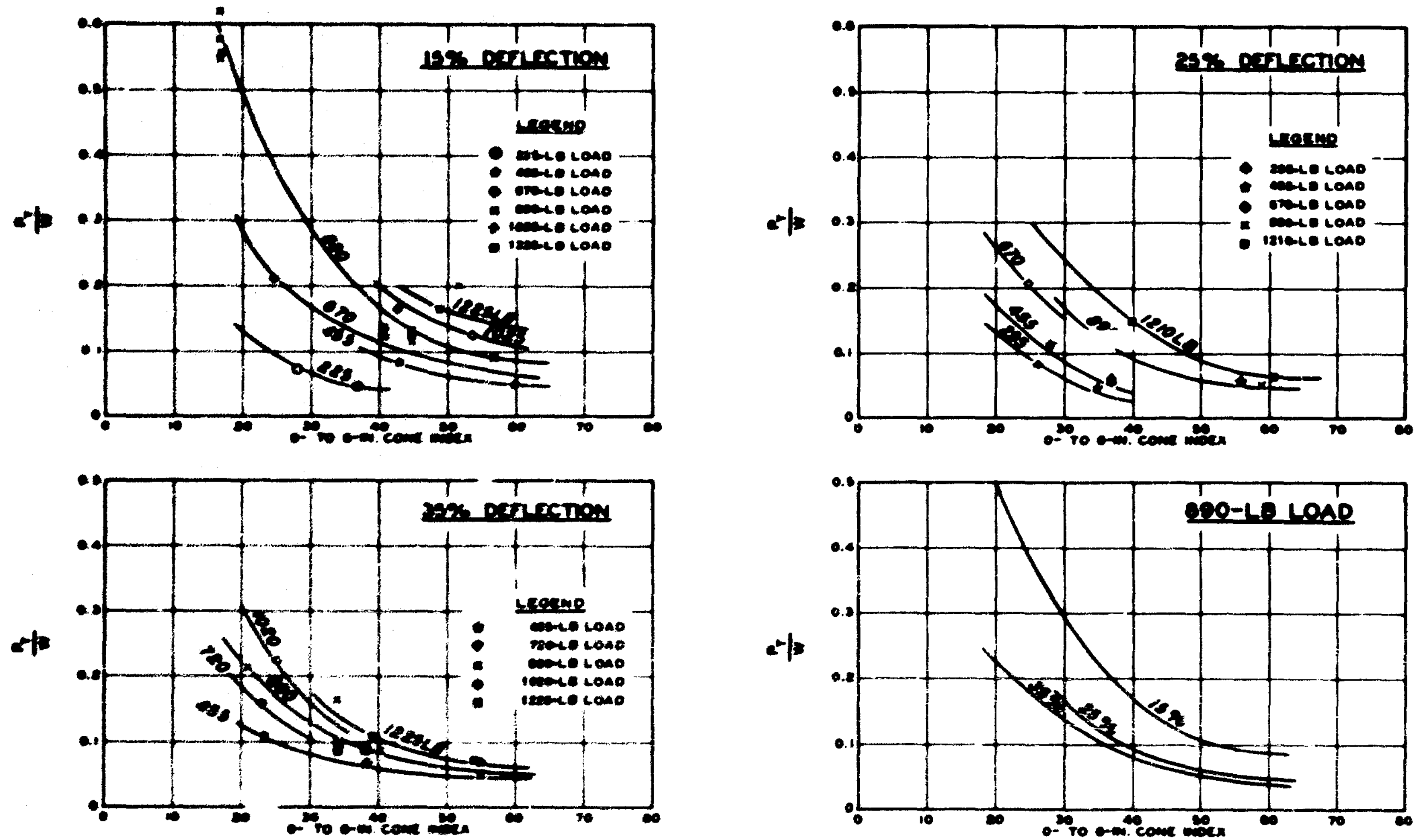


FIRST PASS TOWED COEFFICIENT
9.00-14, 2-PR TIRE
15% DEFLECTION
25% DEFLECTION
35% DEFLECTION
890-LB LOAD
LEGEND
0- TO 6-IN. CONE INDEX



FIRST PASS TOWED COEFFICIENT

9.00-14, 4-PR TIRE



FIRST PASS TOWED COEFFICIENT
9.00-14, 8-PR TIRE

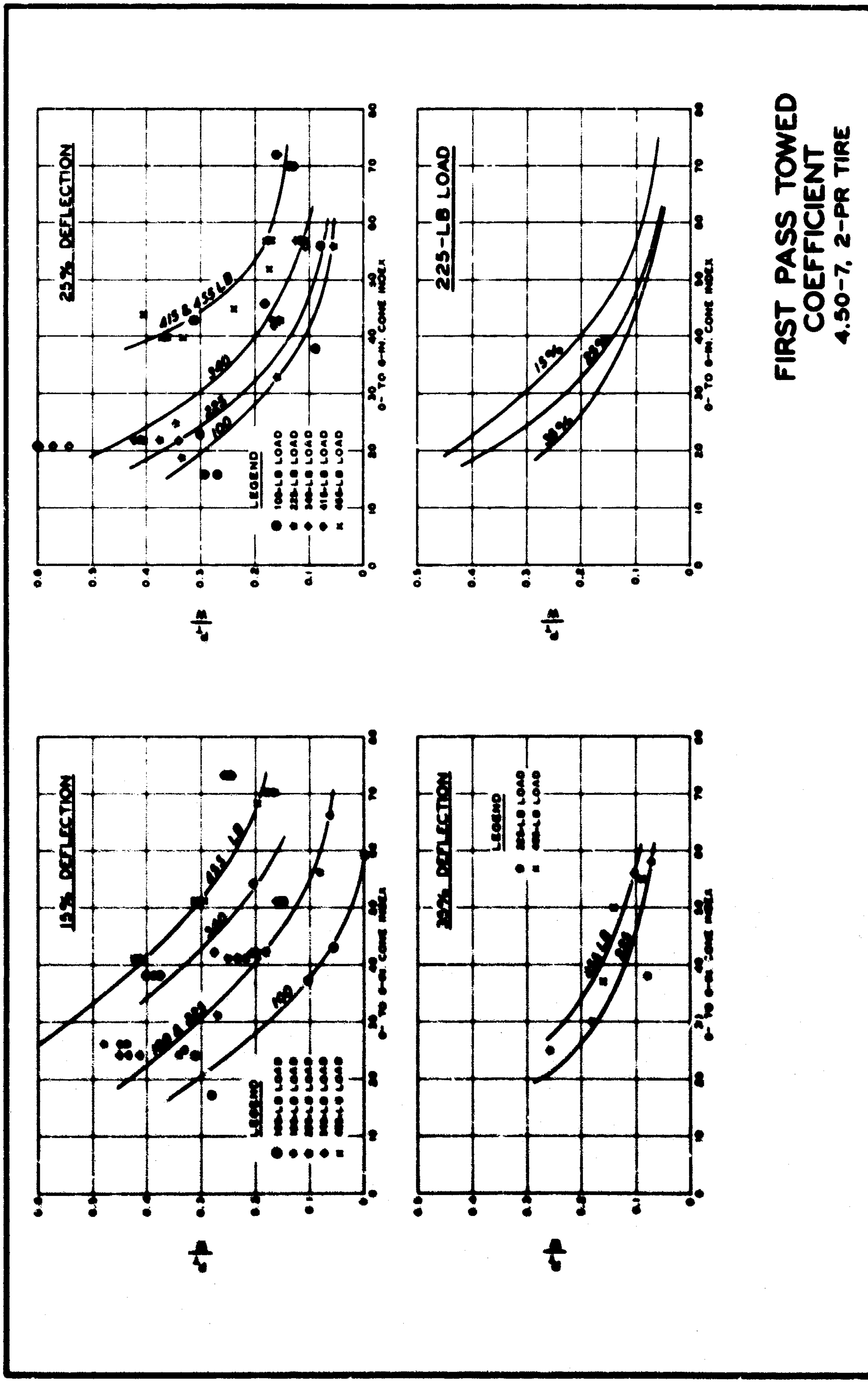
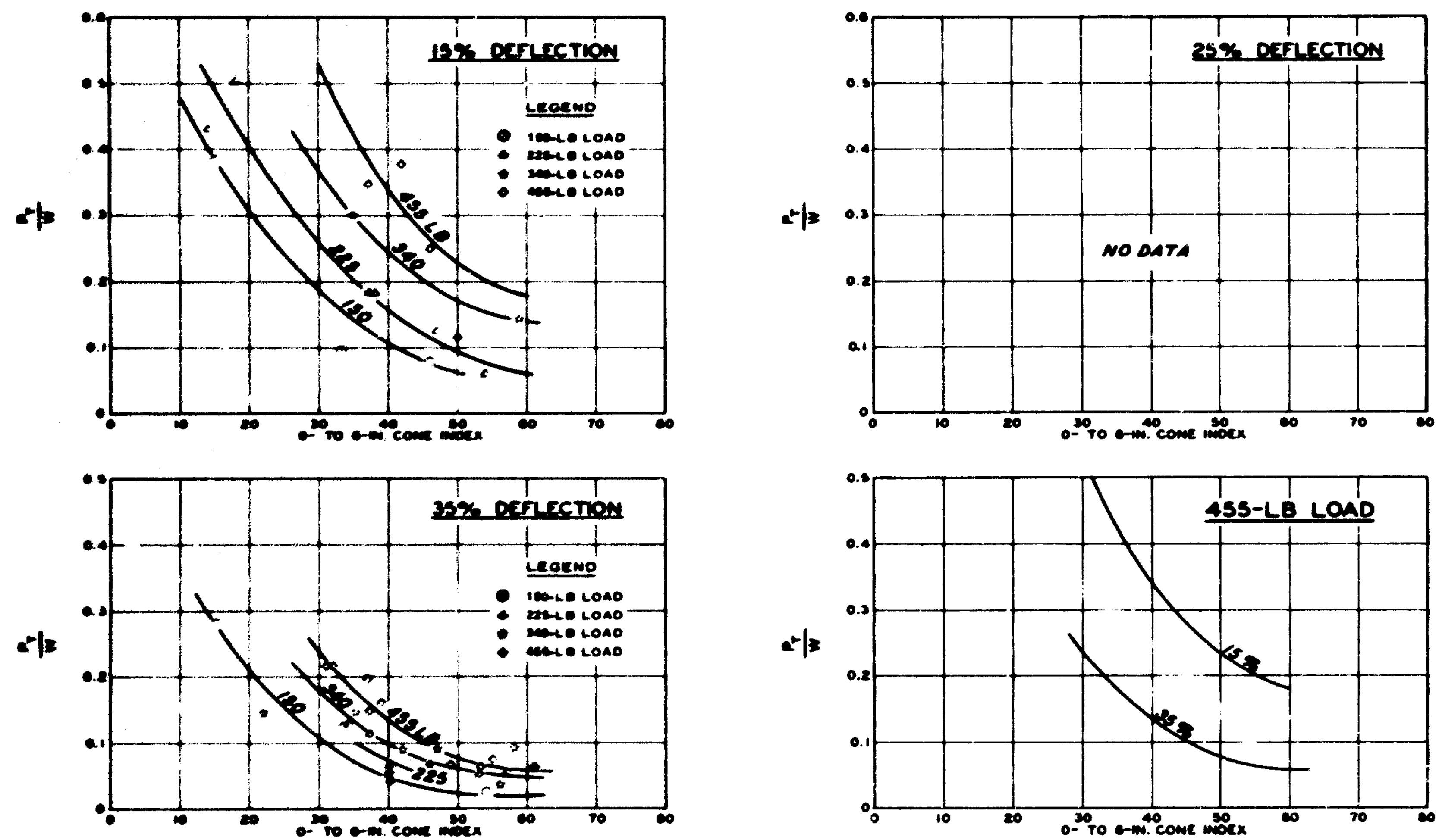
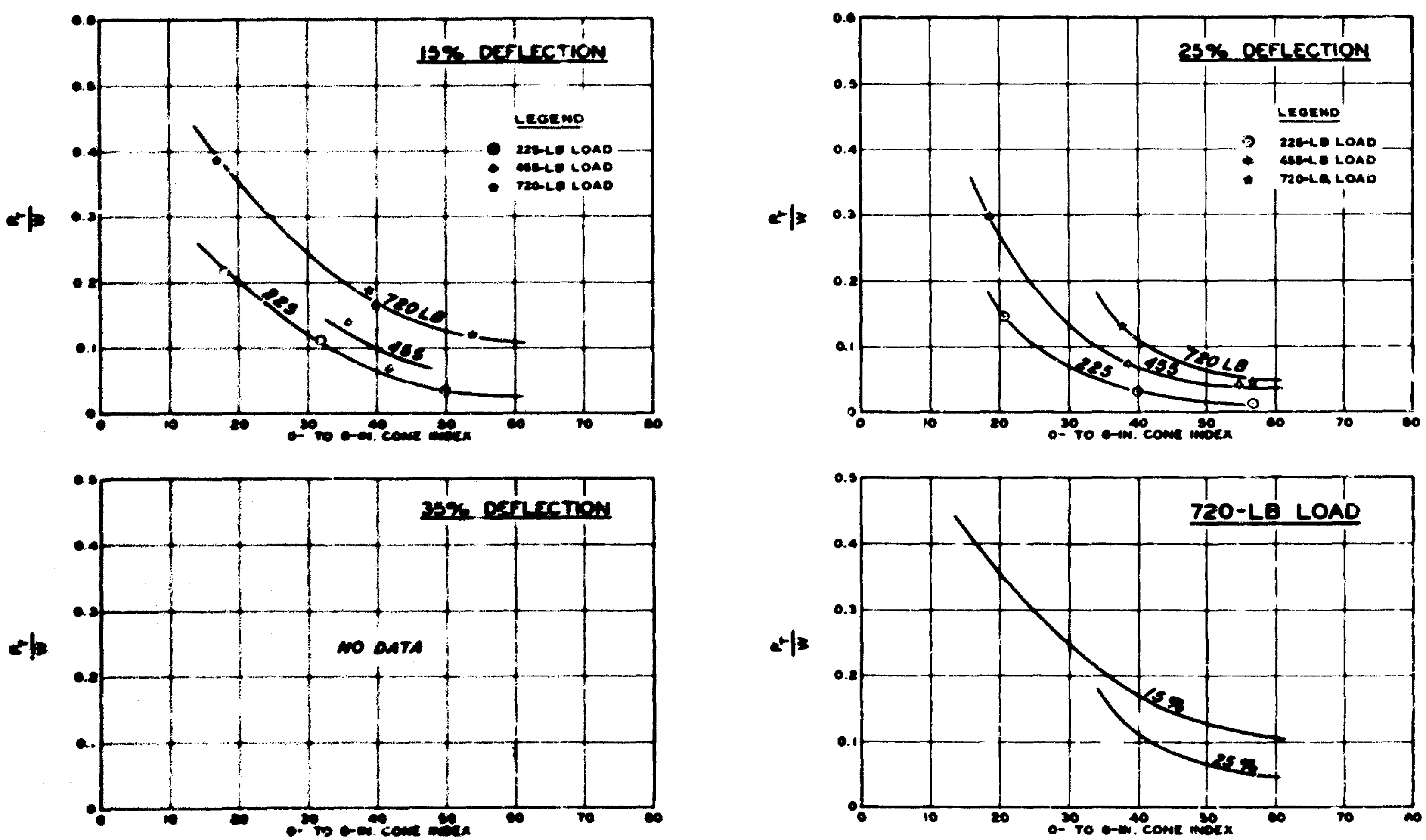

FIRST PASS TOWED
COEFFICIENT
4.50-7, 2-PR TIRE
15% DEFLECTION
25% DEFLECTION
35% DEFLECTION
225-LB LOAD
LEGEND
100-LB LOAD
225-LB LOAD
340-LB LOAD
415-LB LOAD
455-LB LOAD
415 & 455 LB
415 LB
340
225
100
15%
25%
35%
0- TO 6-IN. CONE INDEX

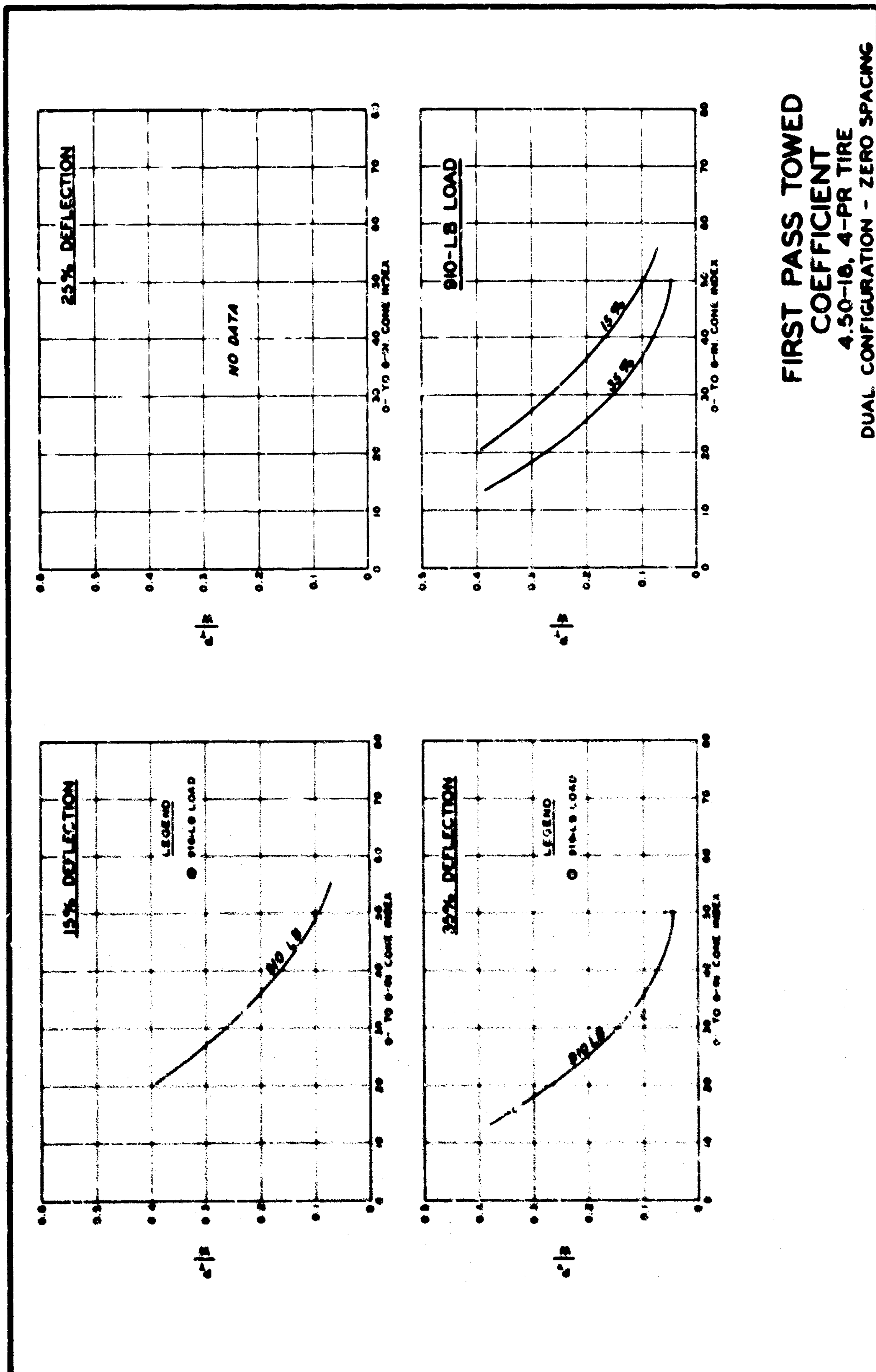
PLATE 9



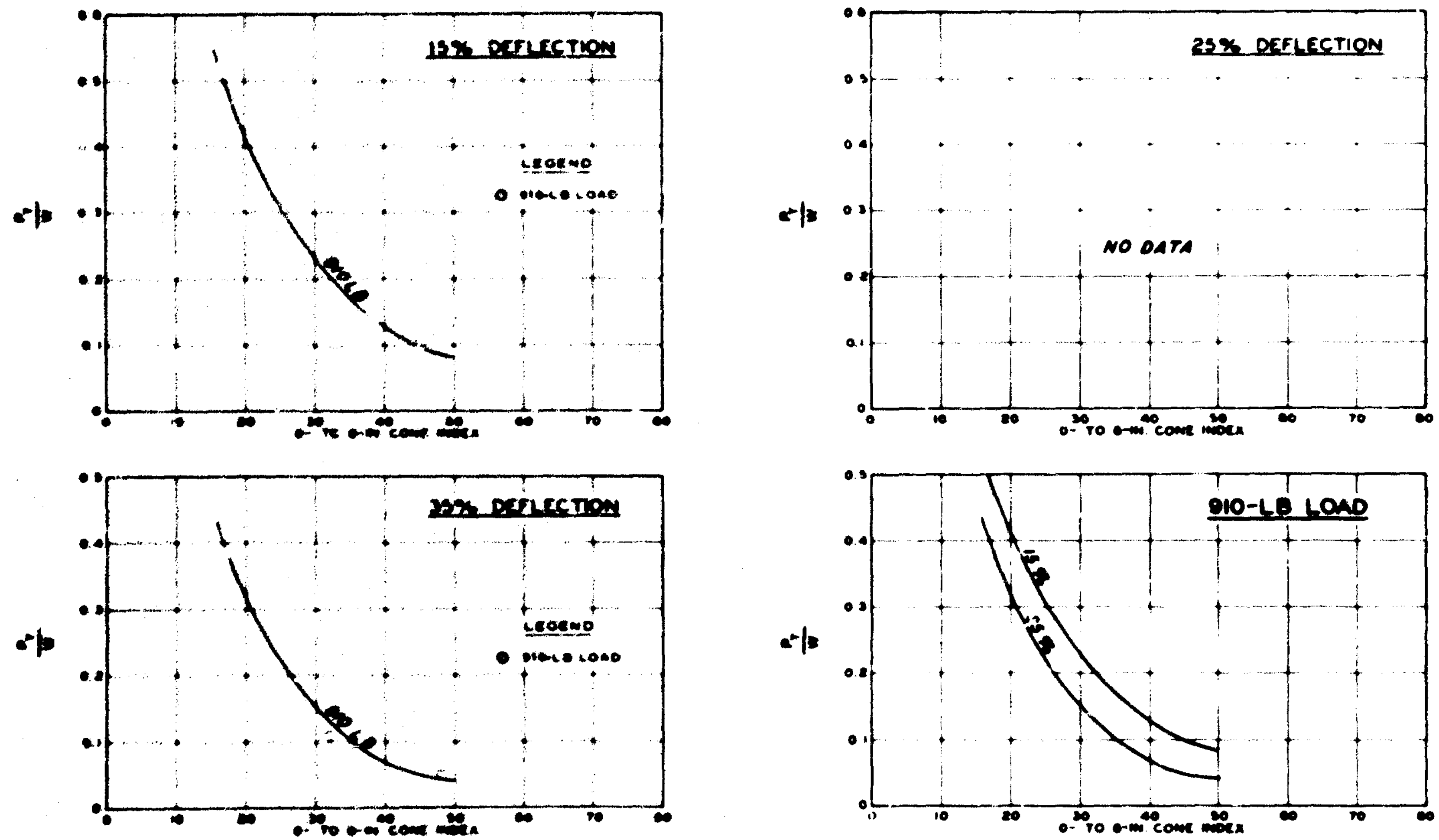
FIRST PASS TOWED COEFFICIENT
5.00-12, 2-PR TIRE



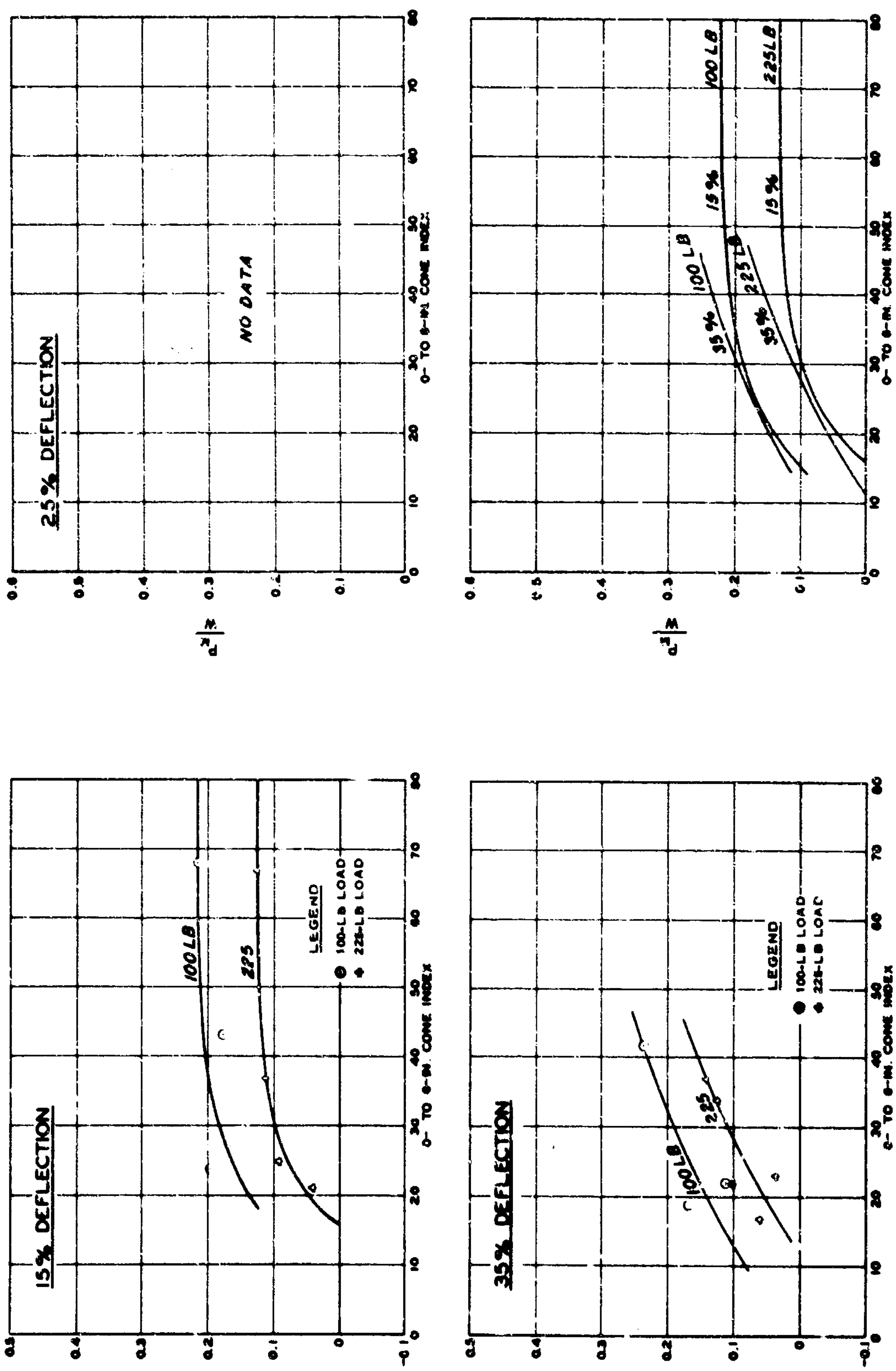
FIRST PASS TOWED COEFFICIENT
16X15-6R, 2-PR TERRA TIRE



FIRST PASS TOWED
COEFFICIENT
4.50-18, 4-PR TIRE
DUAL CONFIGURATION - ZERO SPACING
25% DEFLECTION
NO DATA
910-LB LOAD
15%
35%
15% DEFLECTION
LEGEND
910-LB LOAD
910 LB
35% DEFLECTION
0- TO 6-IN. CONE INDEX

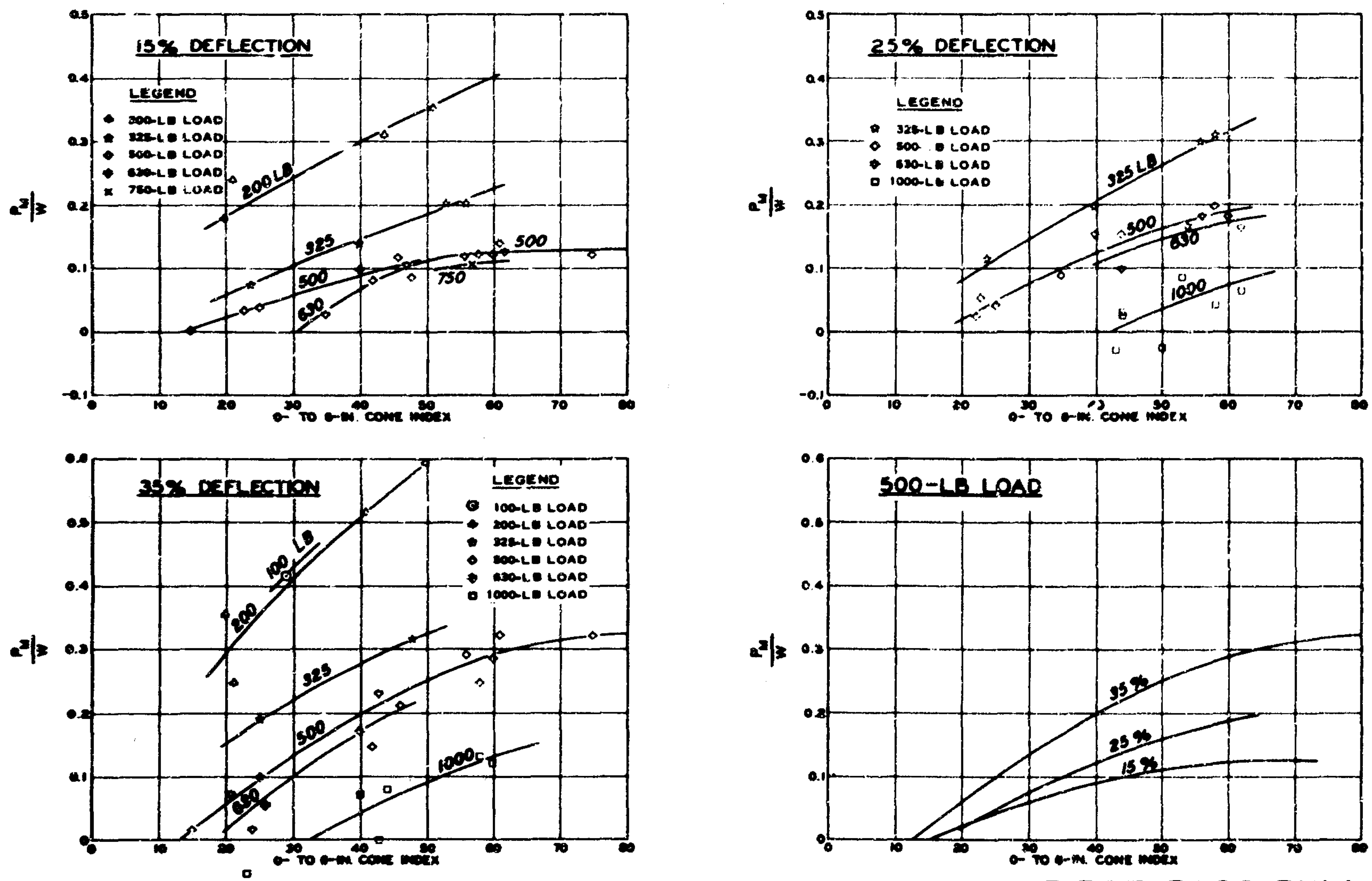


FIRST PASS TOWED COEFFICIENT
4.50-18, 4-PR TIRE
DUAL CONFIGURATION - 1-IN. SPACING



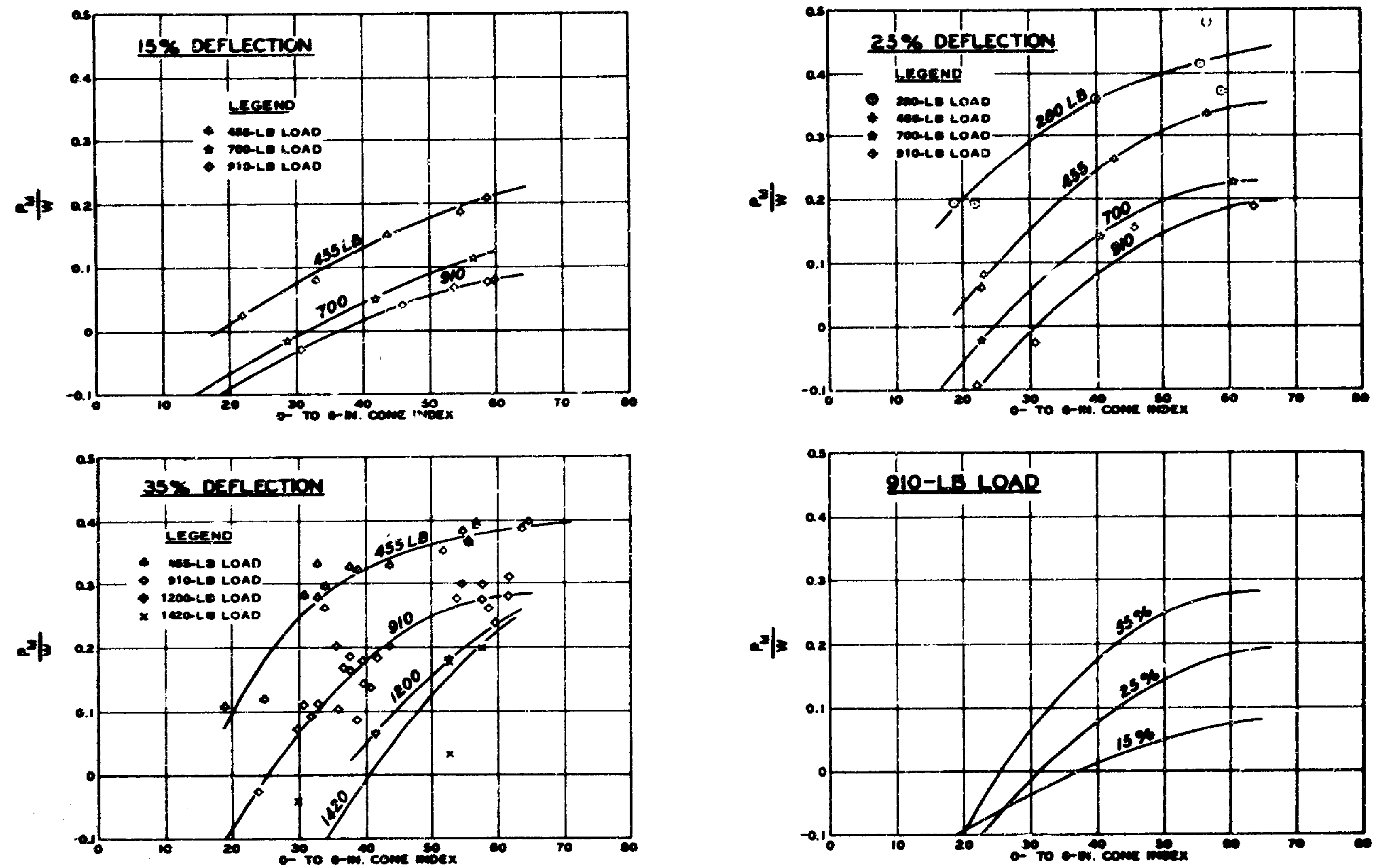
FIRST PASS PULL COEFFICIENT

1.75-26 BICYCLE TIRE



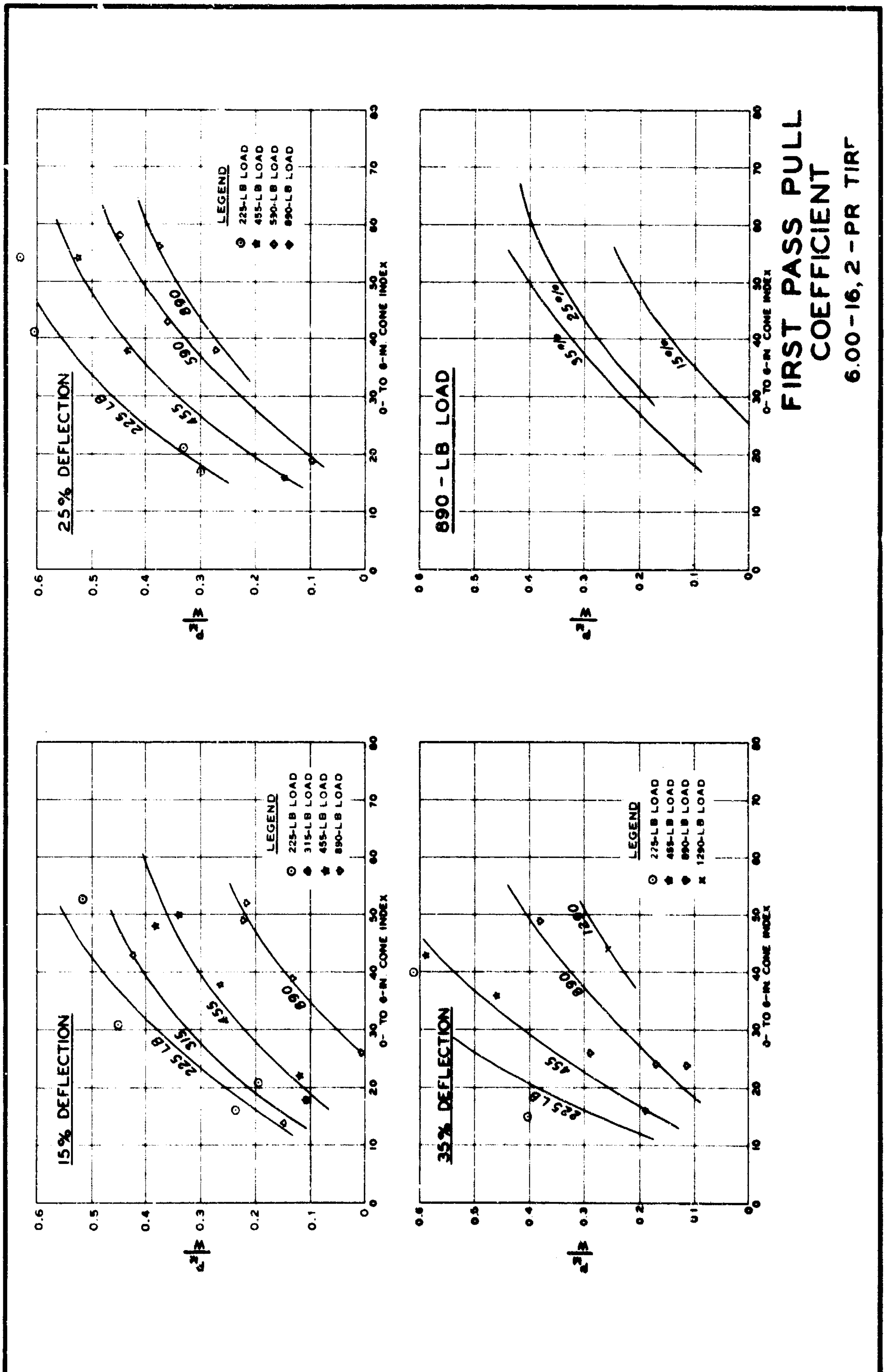
FIRST PASS PULL COEFFICIENT

4.00-18, 2-PR TIRE

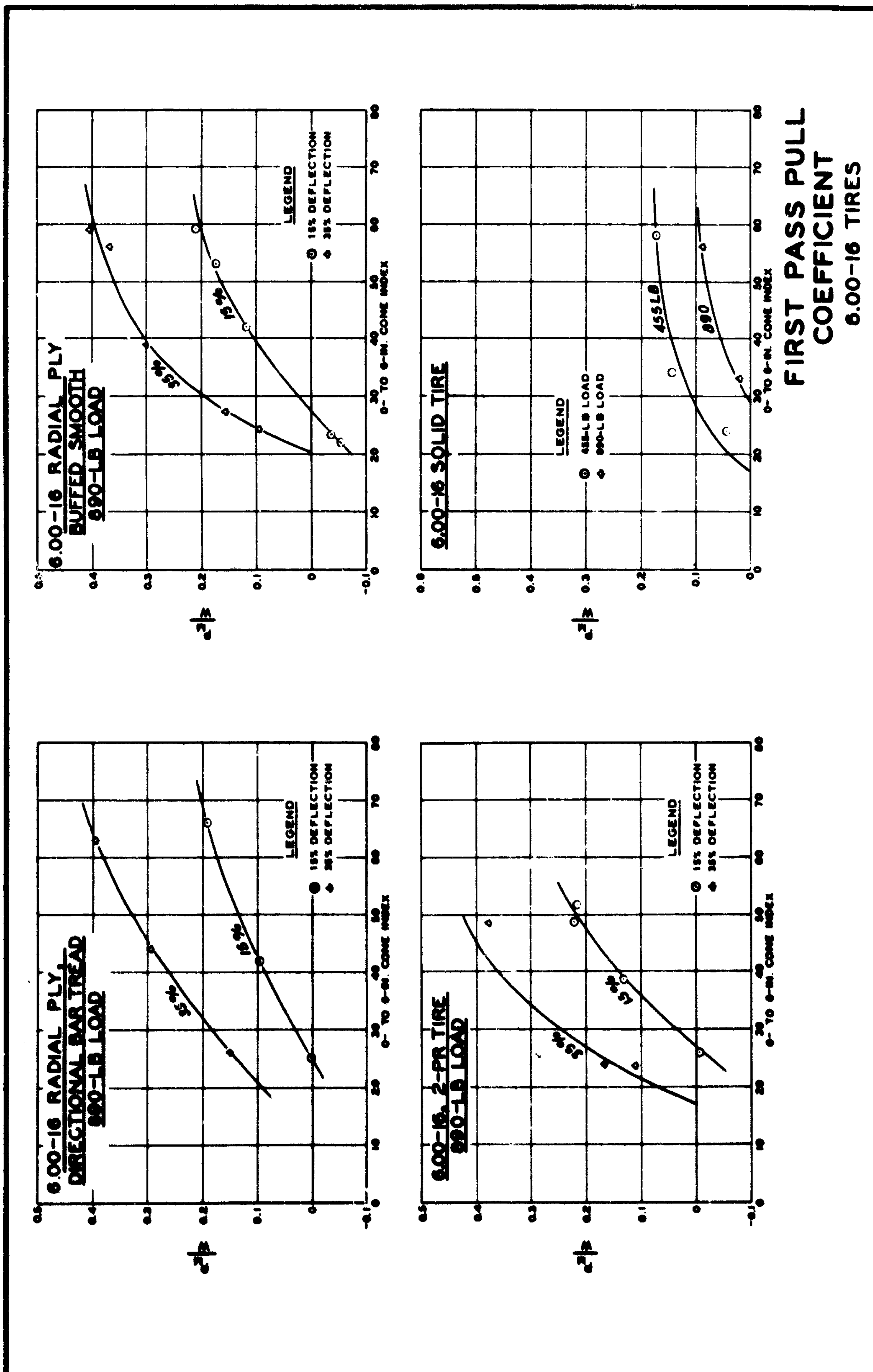


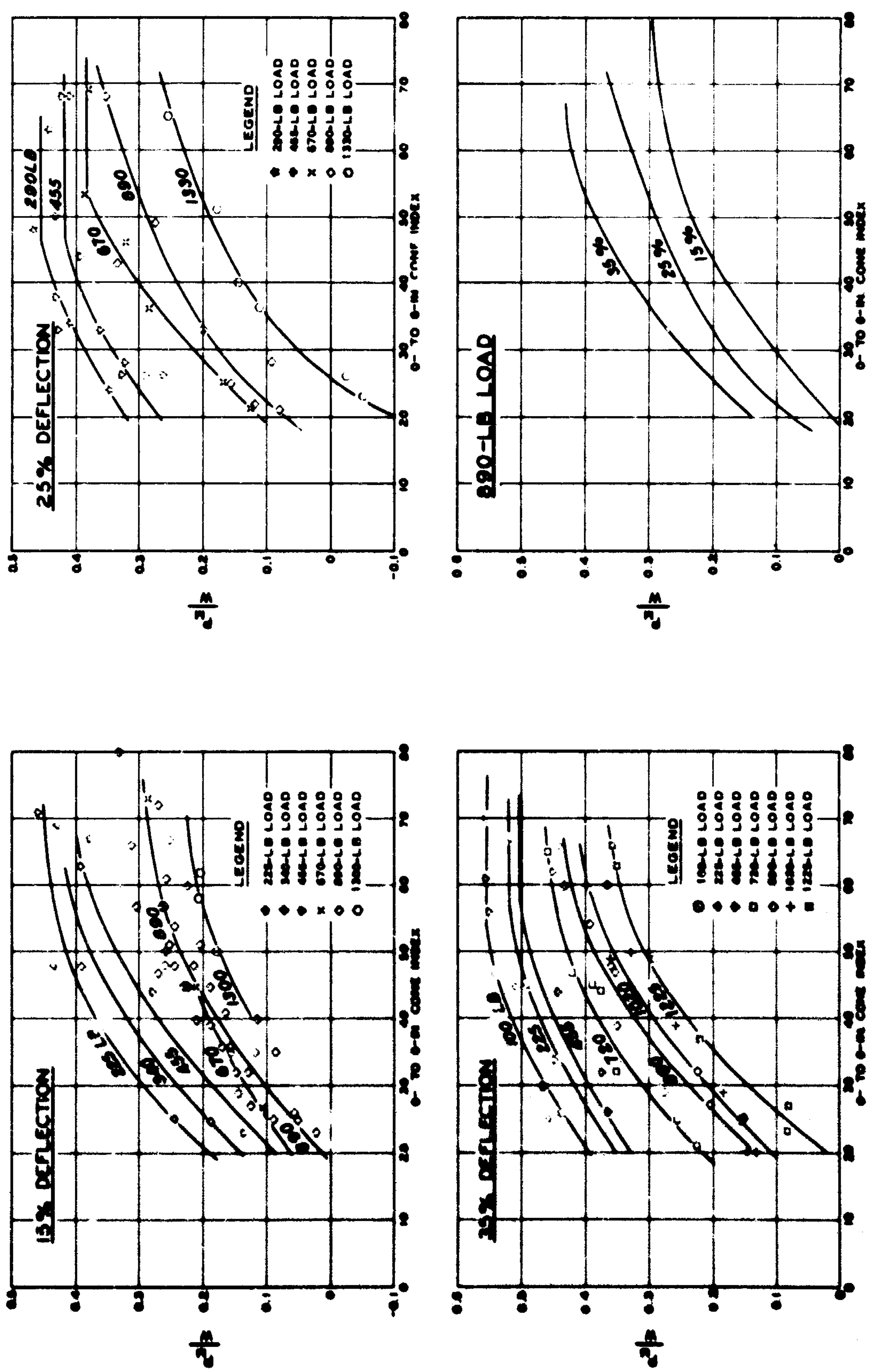
FIRST PASS PULL COEFFICIENT

4.50-18, 4-PR TIRE

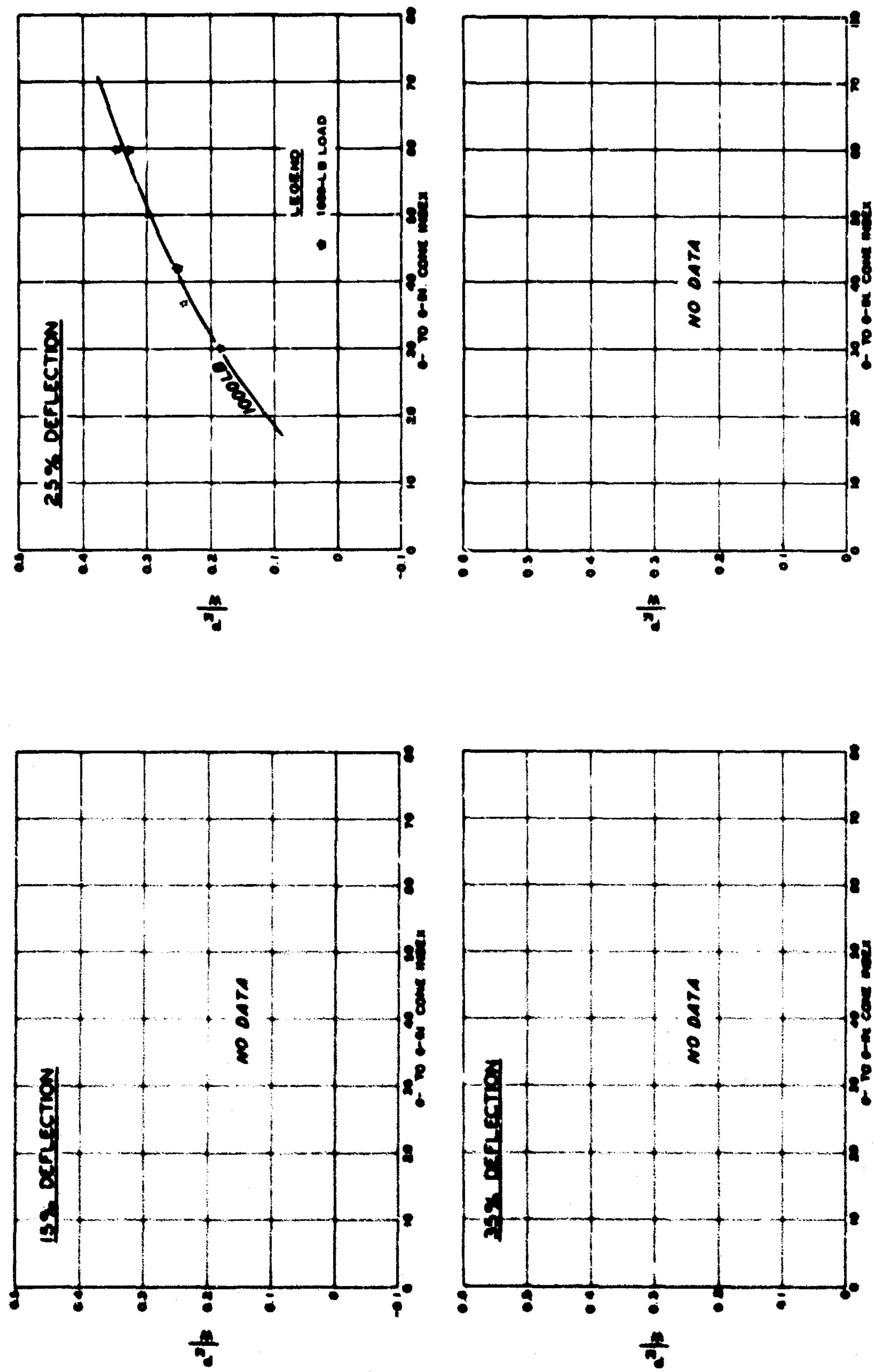


FIRST PASS PULL COEFFICIENT
6.00-16, 2-PR TIRE

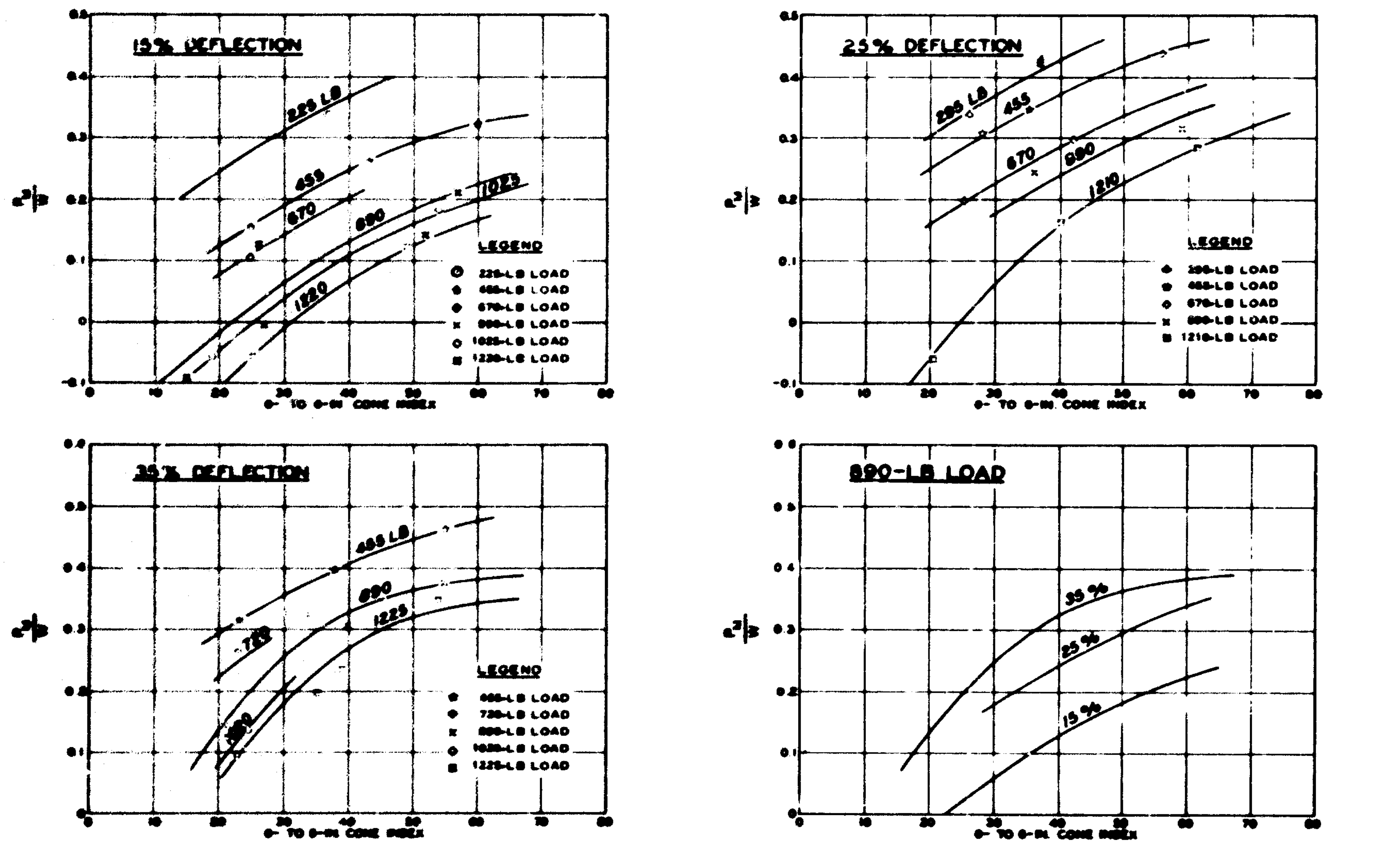

6.00-16 RADIAL PLY, DIRECTIONAL BAR TREAD 890-LB LOAD
LEGEND
15% DEFLECTION
35% DEFLECTION
15%
35%
6.00-16 RADIAL PLY BUFFED SMOOTH 890-LB LOAD
LEGEND
15% DEFLECTION
35% DEFLECTION
15%
35%
6.00-16, 2-PR TIRE 890-LB LOAD
LEGEND
15% DEFLECTION
35% DEFLECTION
15%
35%
6.00-16 SOLID TIRE
LEGEND
455-LB LOAD
890-LB LOAD
455 LB
890
0- TO 6-IN. CONE INDEX
FIRST PASS PULL COEFFICIENT
6.00-16 TIRES



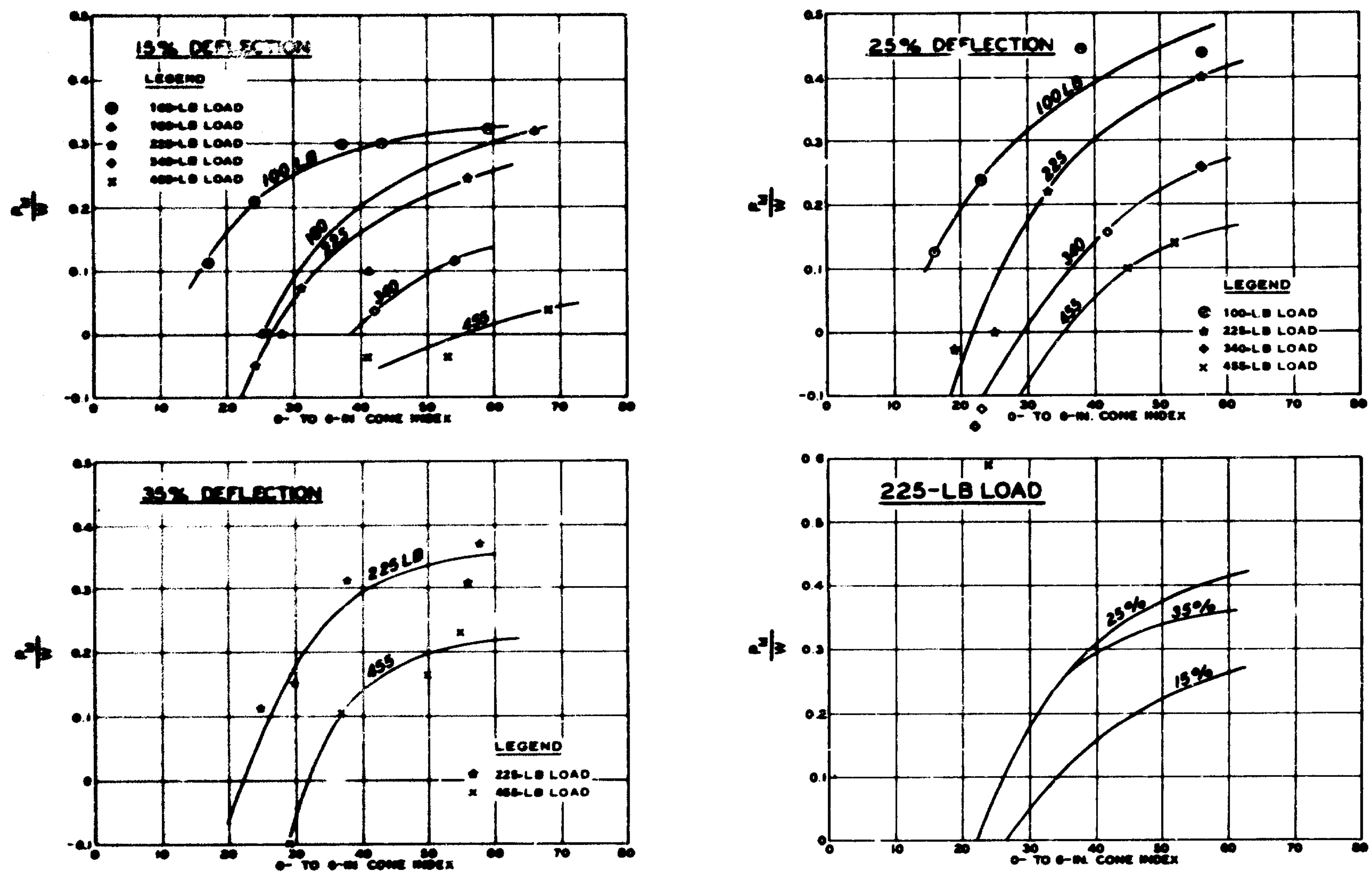
FIRST PASS PULL COEFFICIENT
9.00-14, 2-PR TIRE



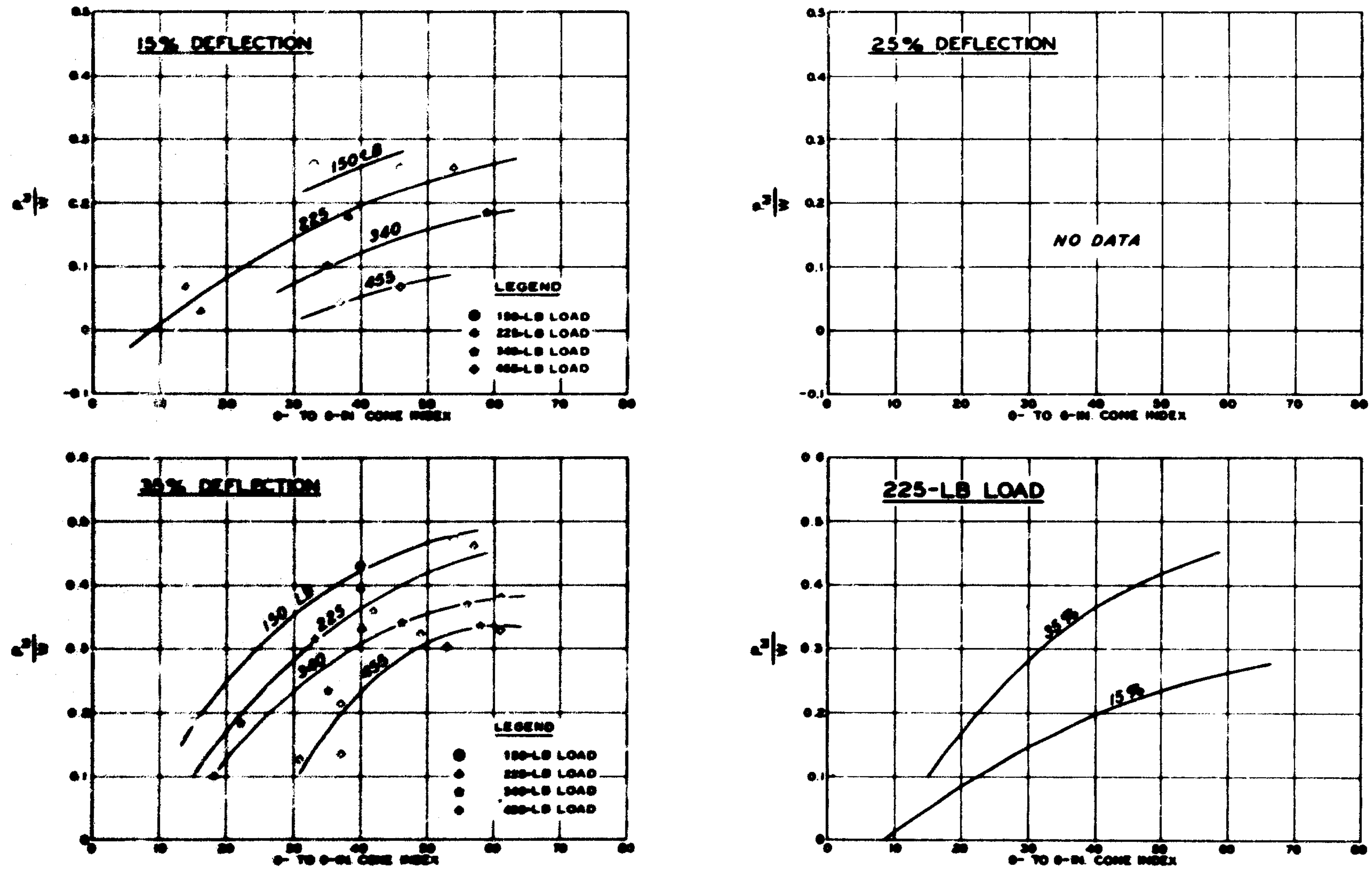
FIRST PASS PULL COEFFICIENT
9.00-14, 4-PR TIRE



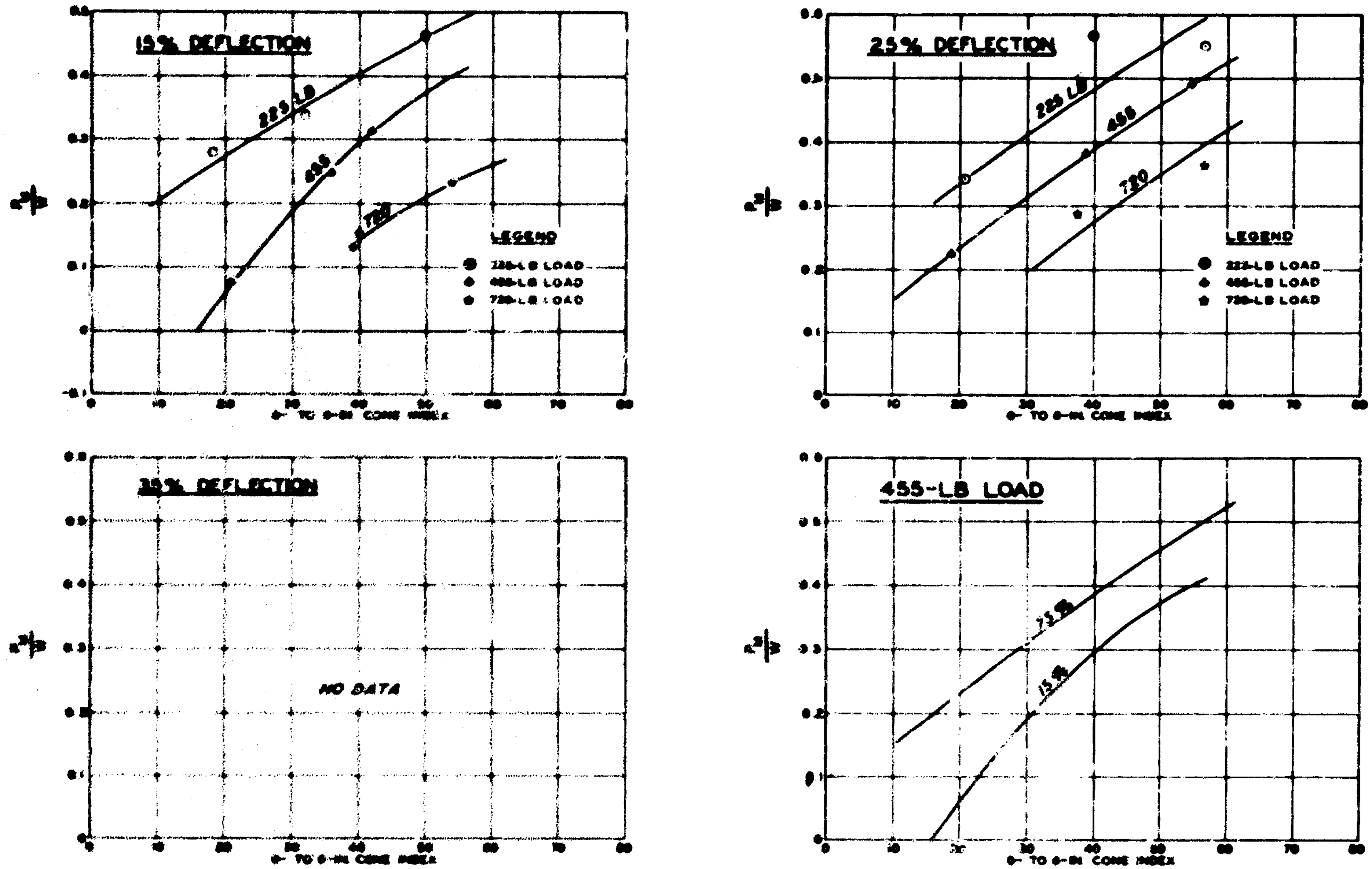
FIRST PASS PULL COEFFICIENT
9.00-14, 8-PR TIRE



FIRST PASS PULL
COEFFICIENT
4.50-7, 2-PR TIRE

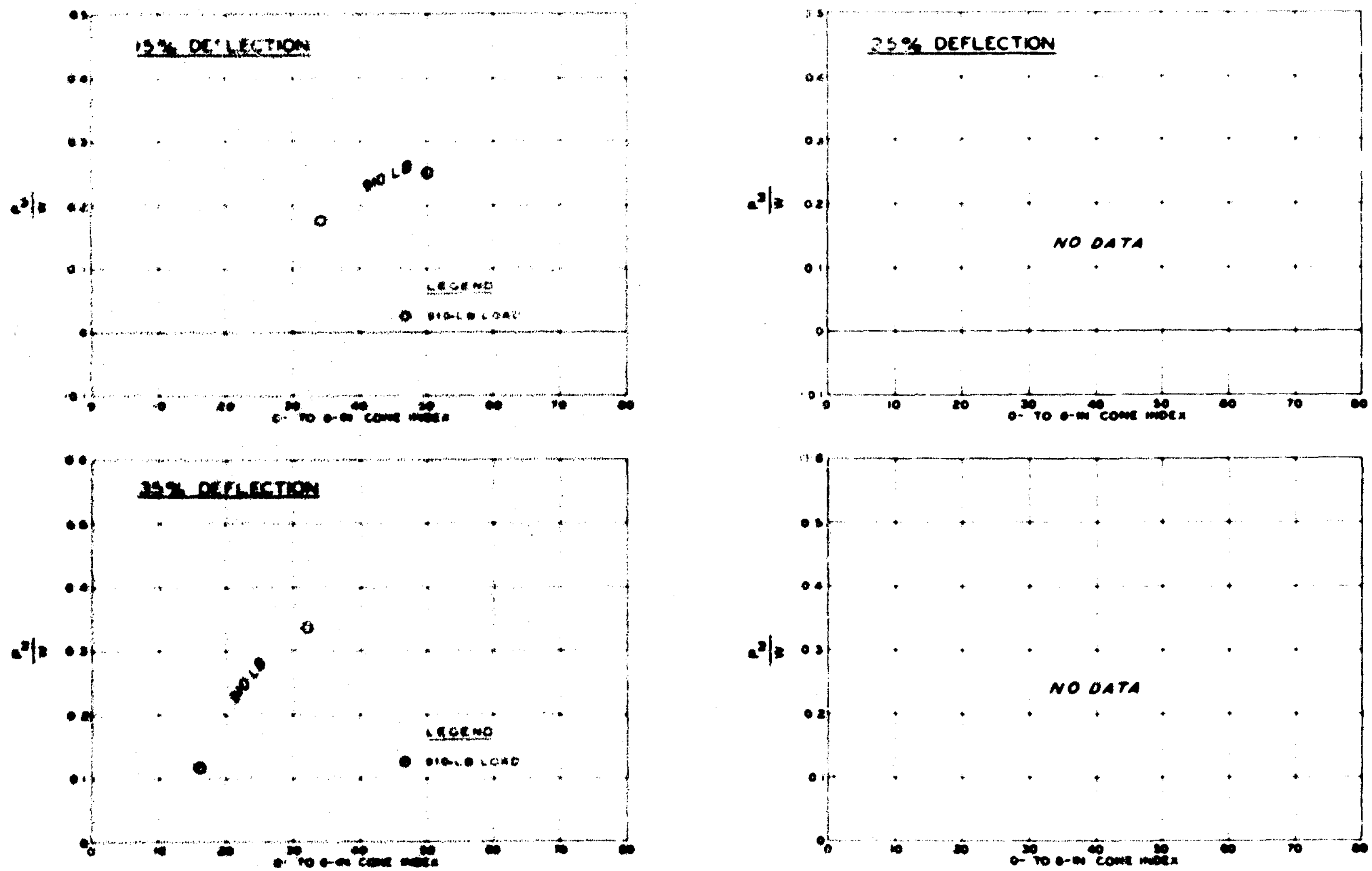


FIRST PASS PULL
COEFFICIENT
5.00-12, 2-PR TIRE



FIRST PASS PULL COEFFICIENT

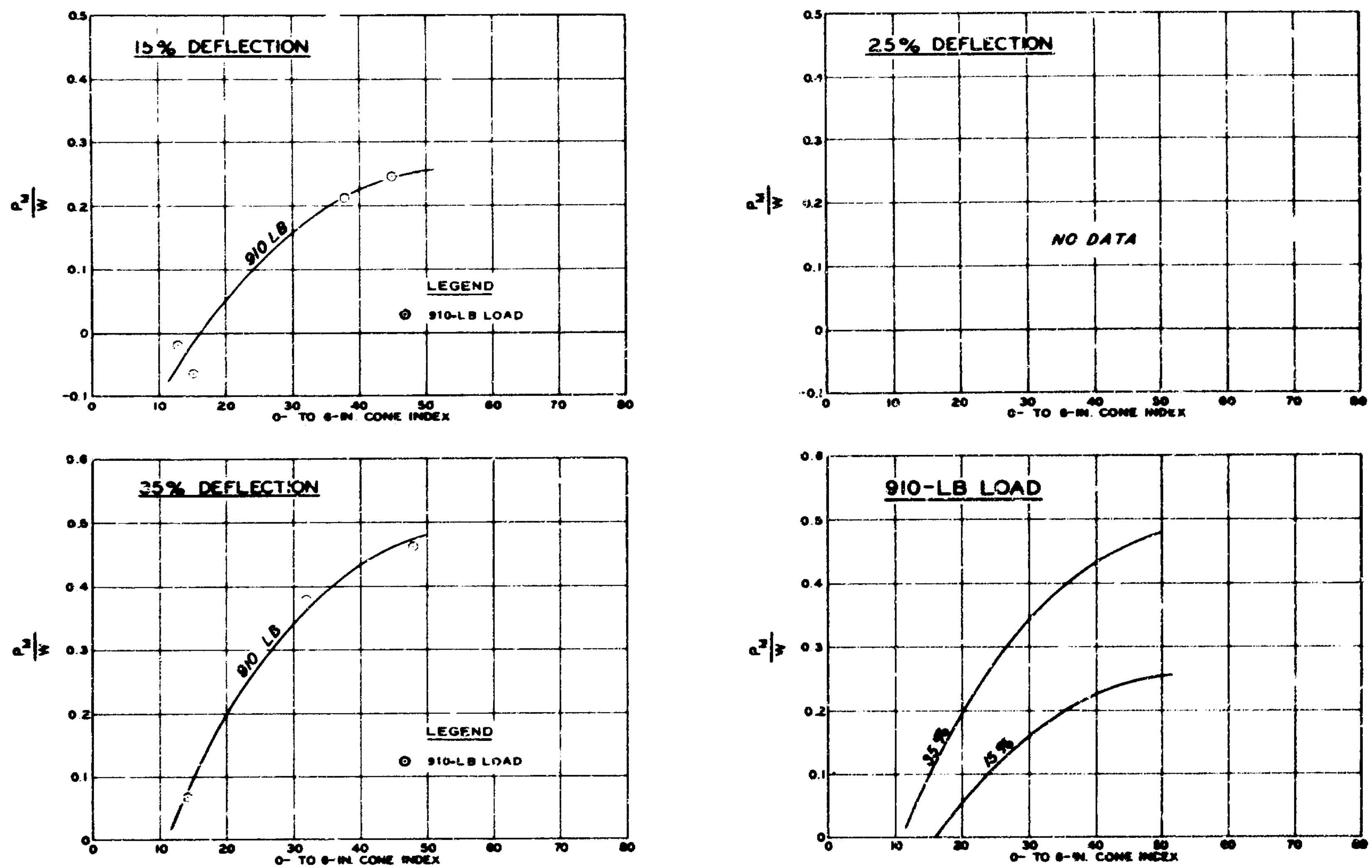
16 X 15-6R, 2-PR TERRA TIRE



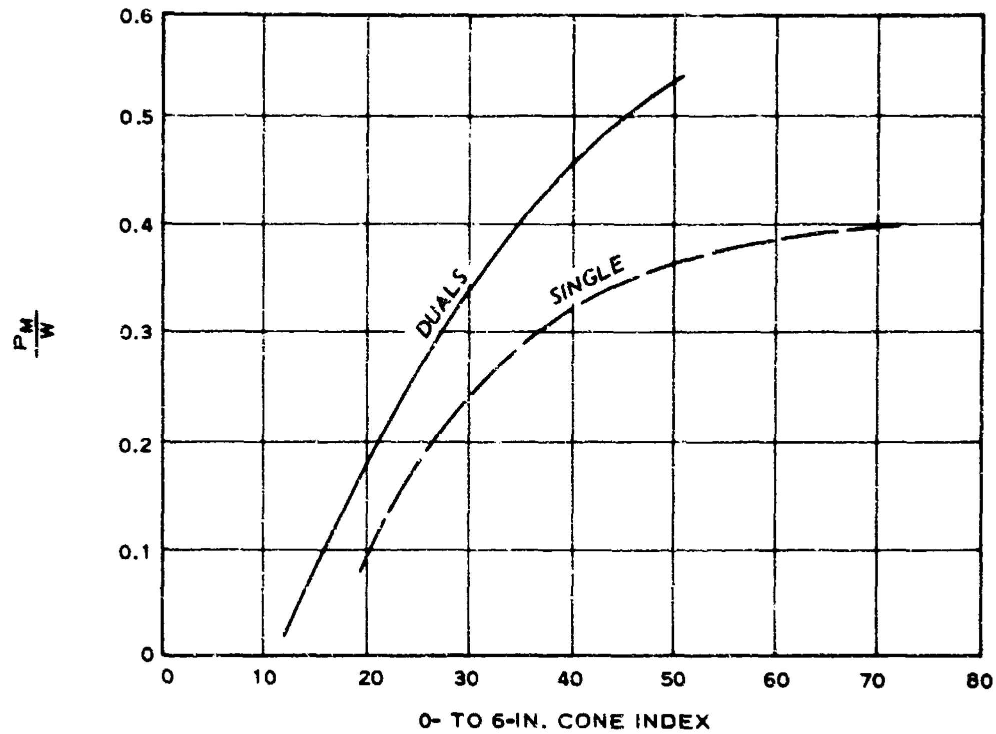
FIRST PASS PULL COEFFICIENT

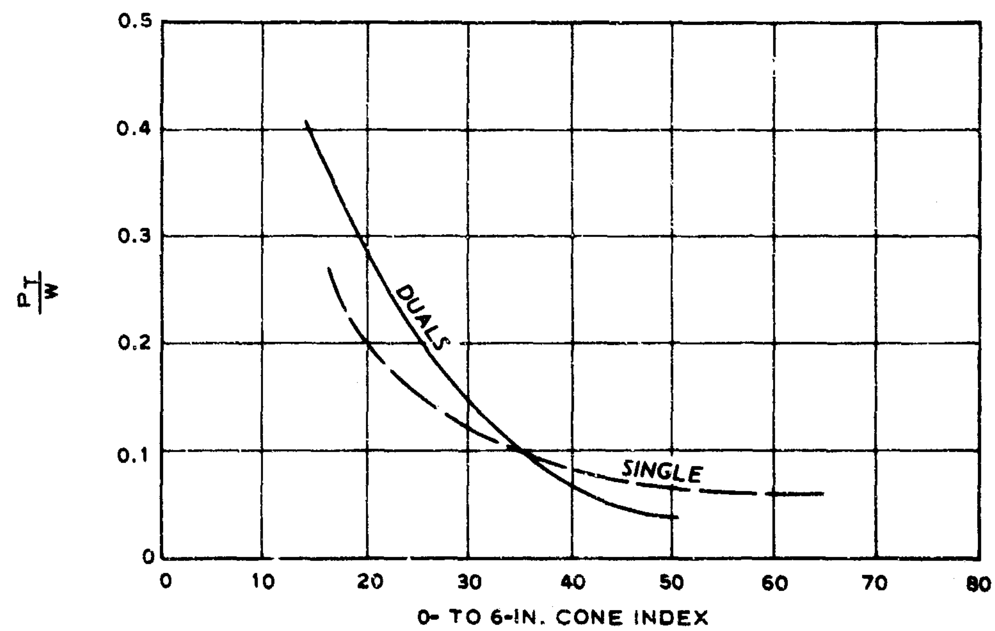
4.50-18, 4-PR TIRE

DUAL CONFIGURATION - ZERO SPACING



FIRST PASS PULL COEFFICIENT
4.50-18, 4-PR TIRE
DUAL CONFIGURATION - 1-IN. SPACING



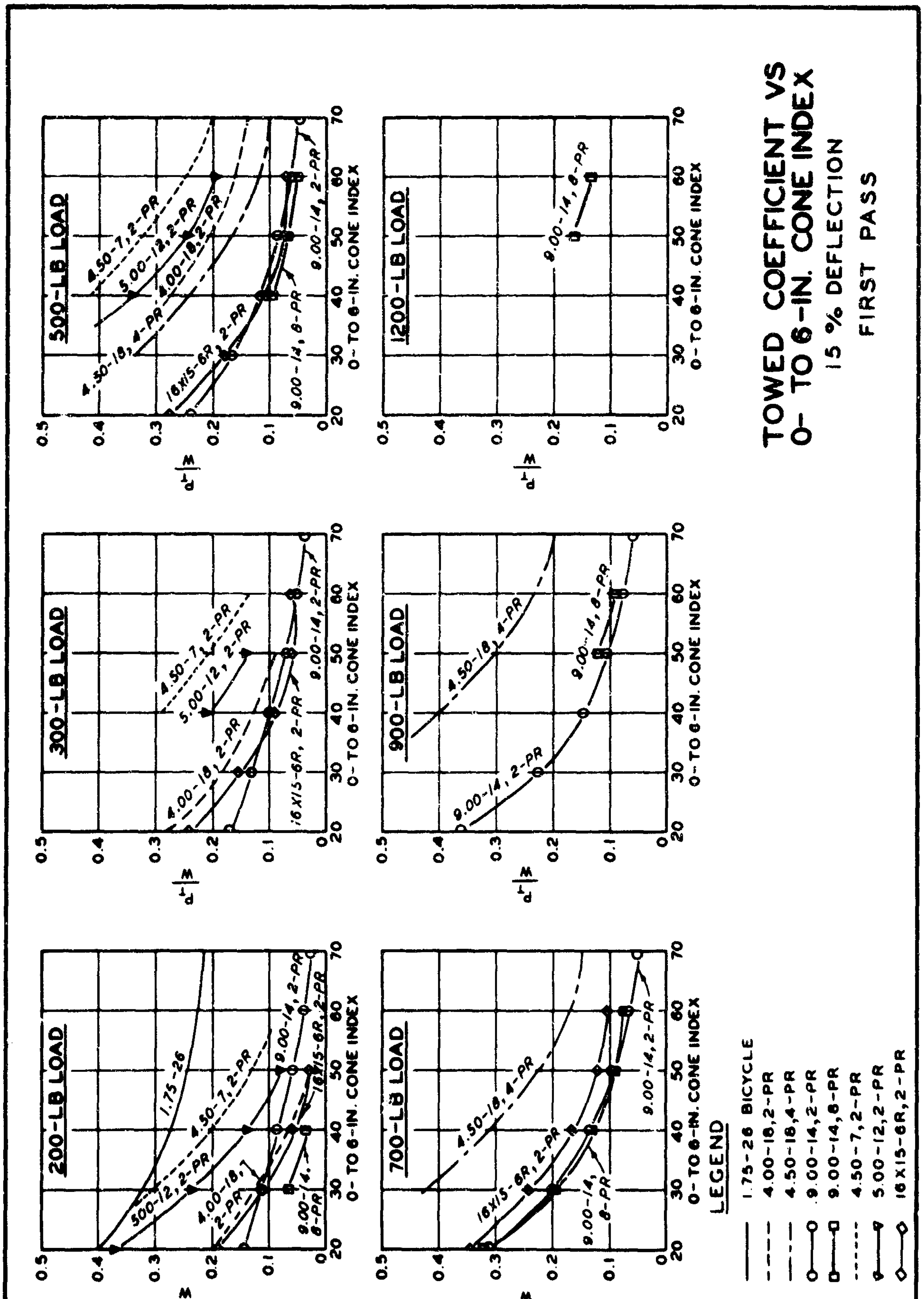


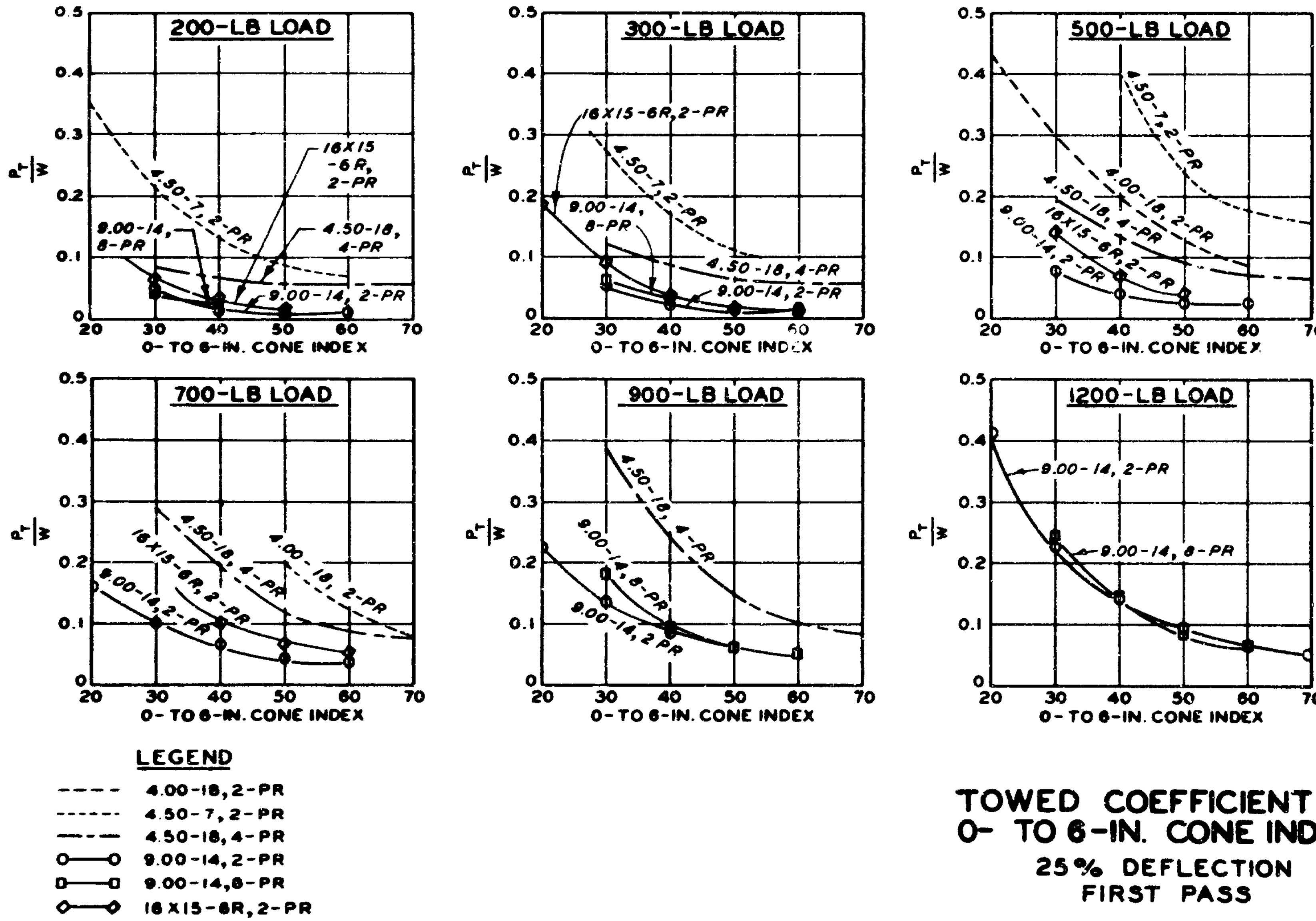
NOTE: CURVES FOR DUALS ARE AVERAGES OF DATA FROM 0- AND 1-IN. SPACINGS.

LOAD PER TIRE IS 455 LB.

COMPARISON OF $\frac{P_M}{W}$ AND $\frac{P_T}{W}$ FOR DUAL AND SINGLE CONFIGURATIONS

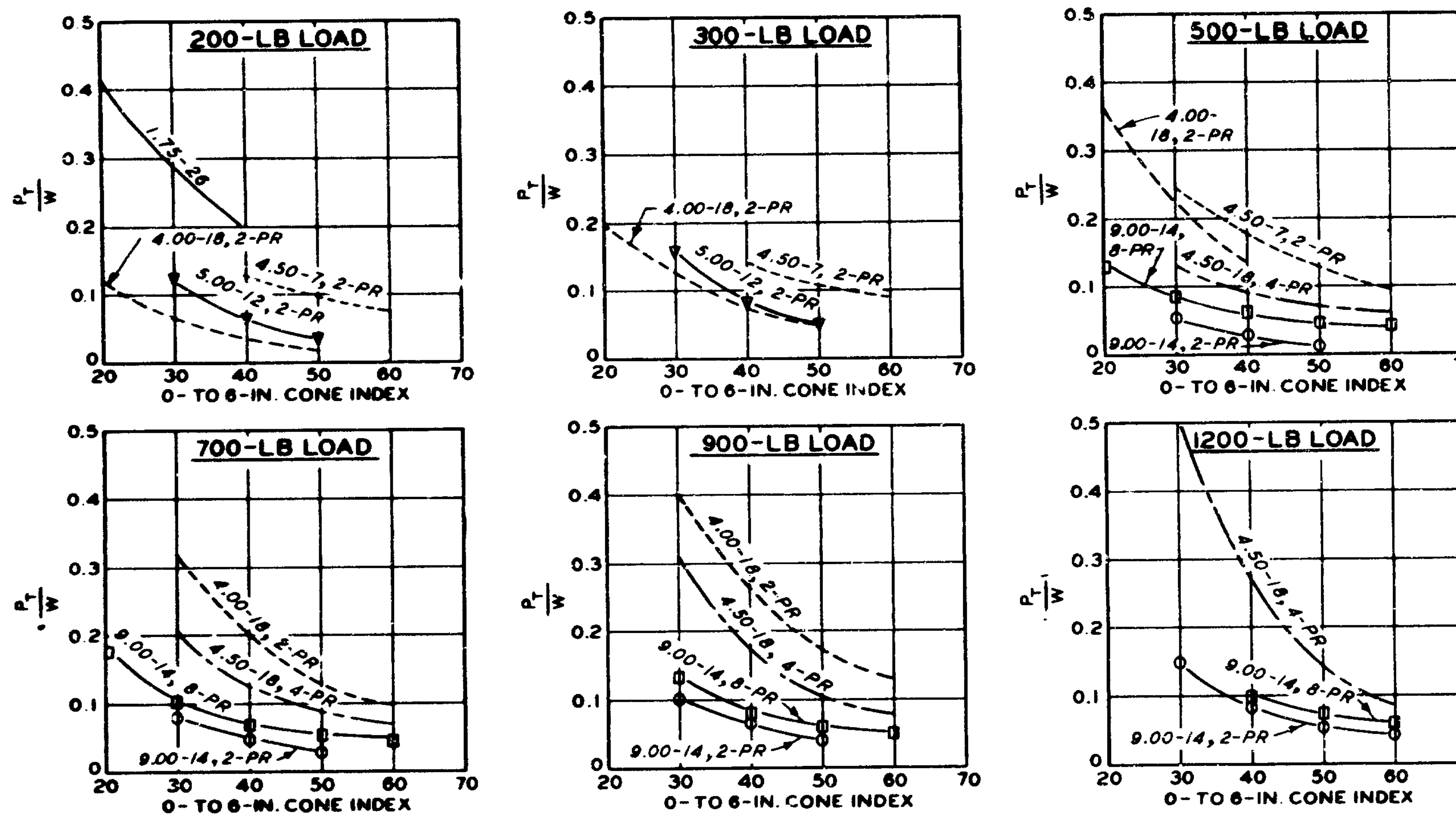
4.50-18, 4-PR TIRE
35 PERCENT DEFLECTION


TOWED COEFFICIENT VS
0- TO 6-IN. CONE INDEX
15 % DEFLECTION
FIRST PASS
200-LB LOAD
300-LB LOAD
500-LB LOAD
700-LB LOAD
900-LB LOAD
1200-LB LOAD
0- TO 6-IN. CONE INDEX
LEGEND
1.75-26 BICYCLE
4.00-18,2-PR
4.50-18,4-PR
9.00-14,2-PR
9.00-14,8-PR
4.50-7,2-PR
5.00-12,2-PR
16X15-6R,2-PR



TOWED COEFFICIENT VS 0- TO 6-IN. CONE INDEX

25% DEFLECTION
FIRST PASS



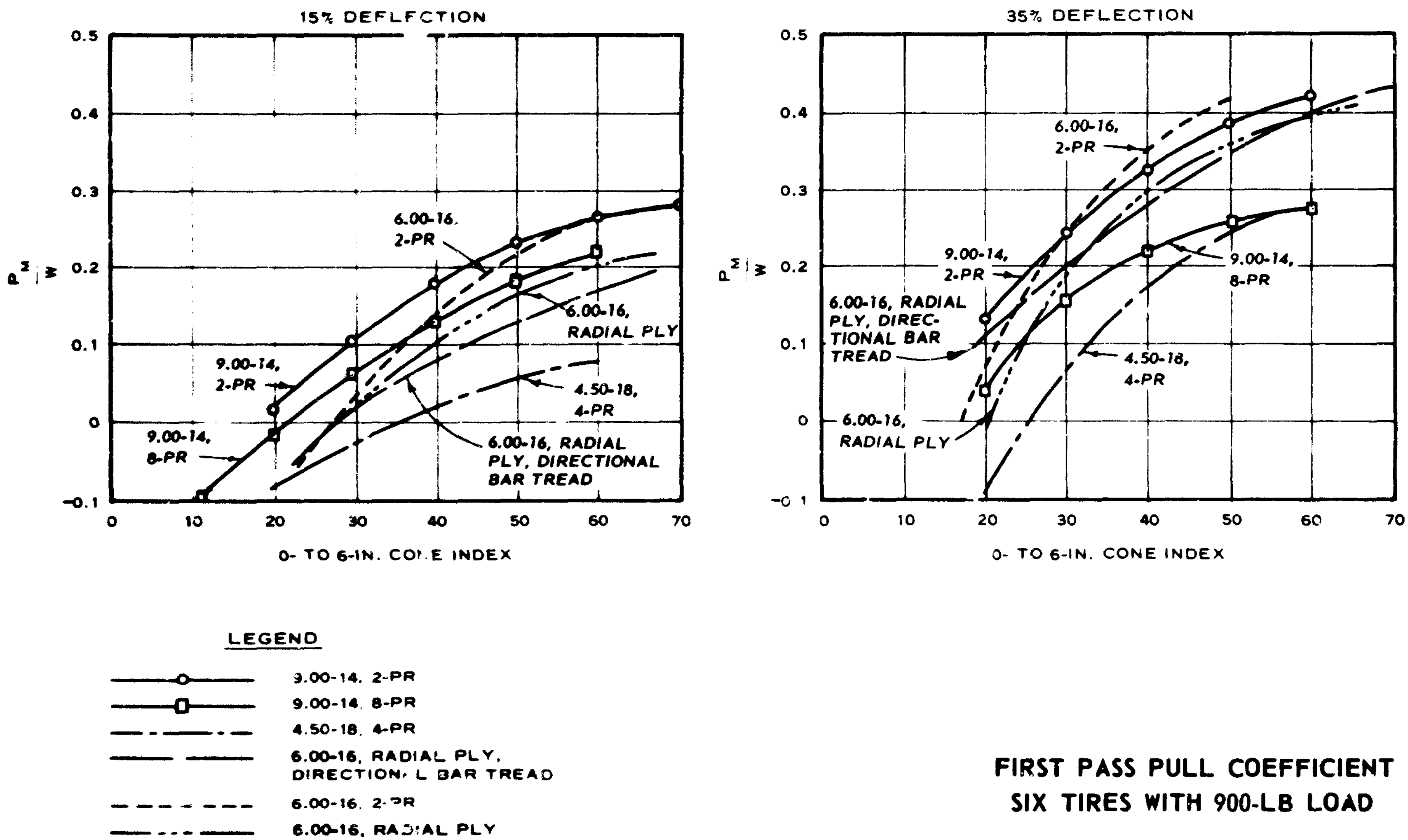
LEGEND

- 1.75-26, BICYCLE
- 4.00-18, 2-PR
- 4.50-18, 4-PR
- 9.00-14, 2-PR
- 9.00-14, 8-PR
- 4.50-7, 2-PR
- 5.00-12, 2-PR

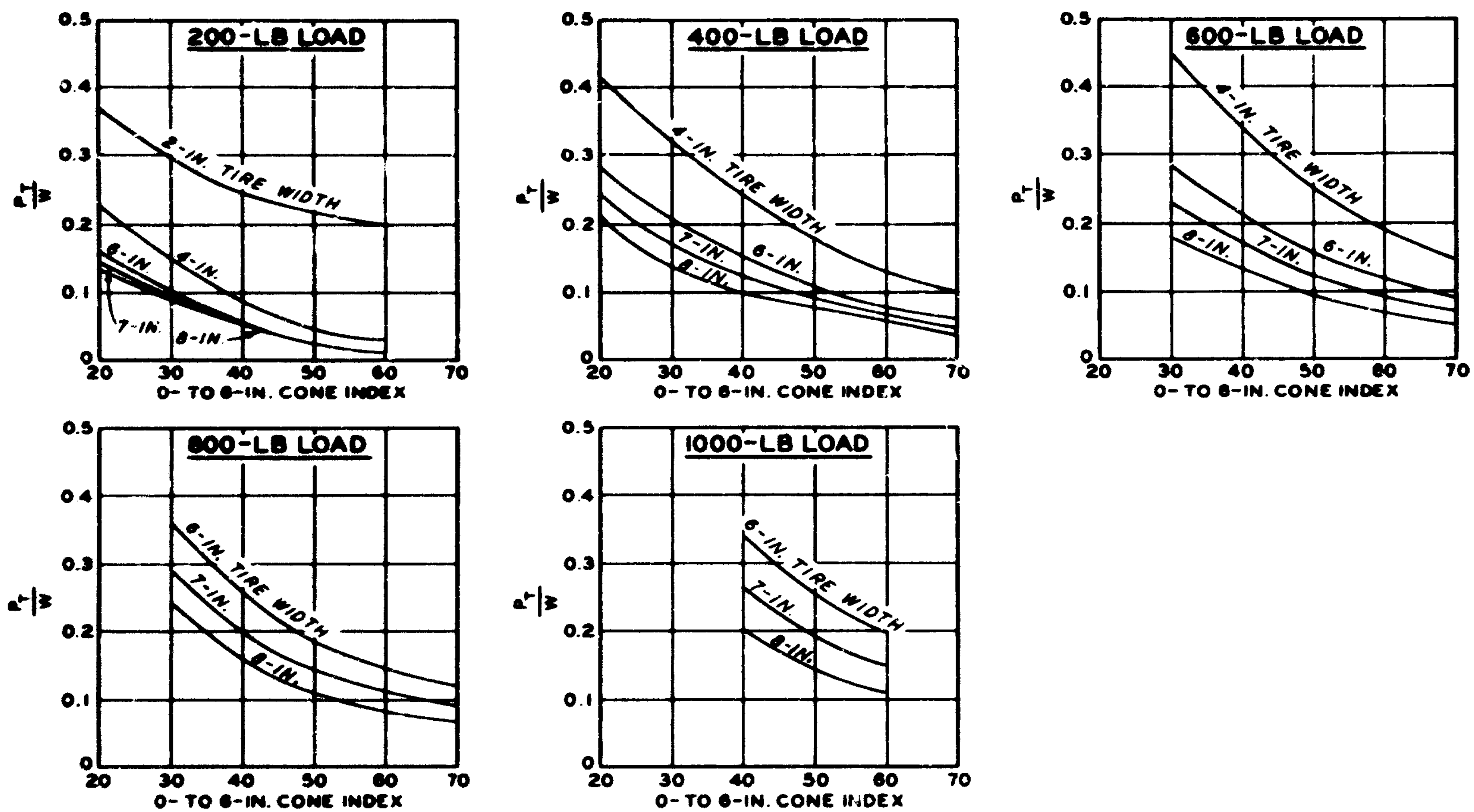
TOWED COEFFICIENT VS 0- TO 6-IN. CONE INDEX

35 % DEFLECTION

FIRST PASS

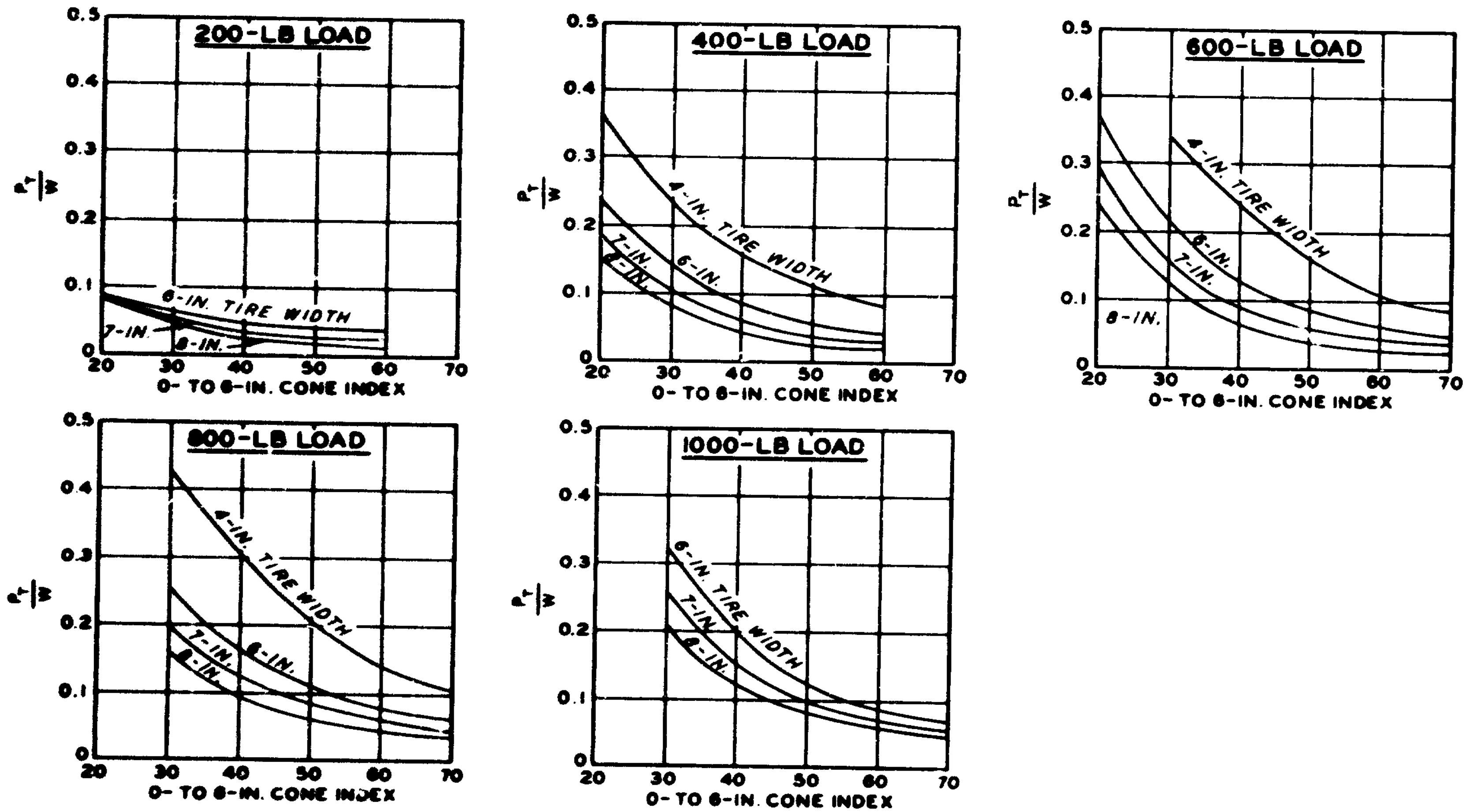


FIRST PASS PULL COEFFICIENT
SIX TIRES WITH 900-LB LOAD

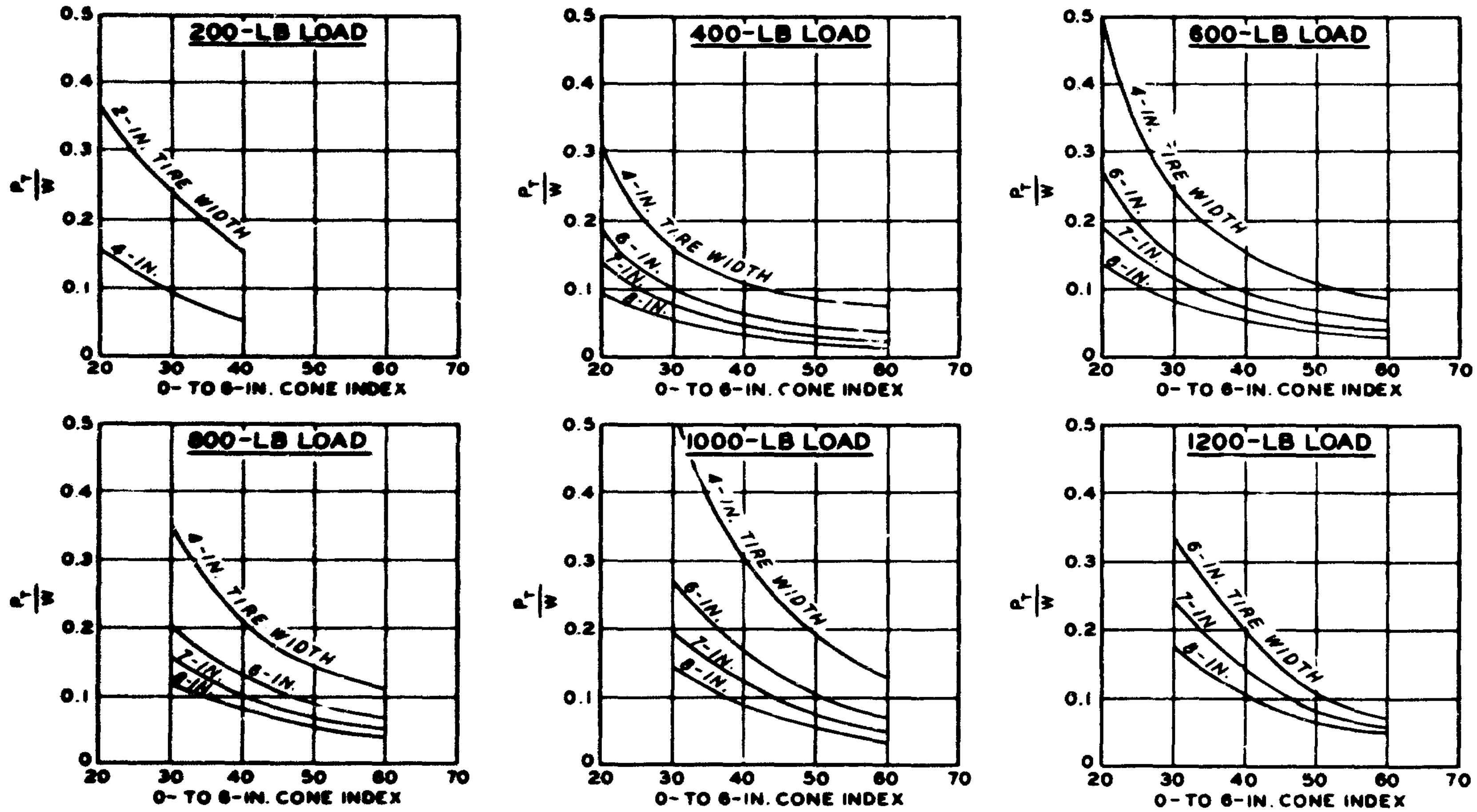


EFFECT OF TIRE WIDTH ON TOWED FORCE

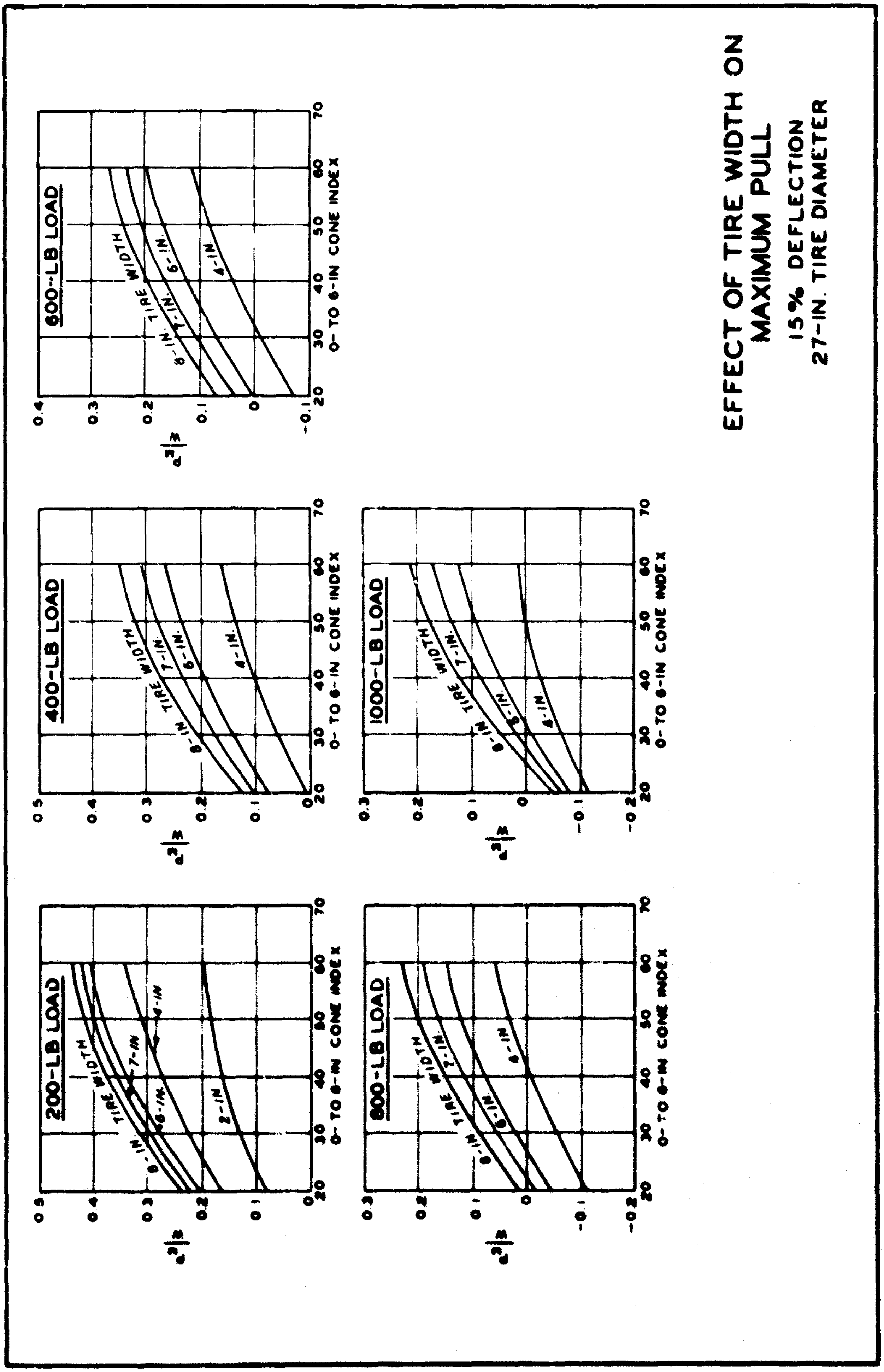
15% DEFLECTION
27-IN. TIRE DIAMETER



EFFECT OF TIRE WIDTH ON TOWED FORCE
25% DEFLECTION
27-IN. TIRE DIAMETER



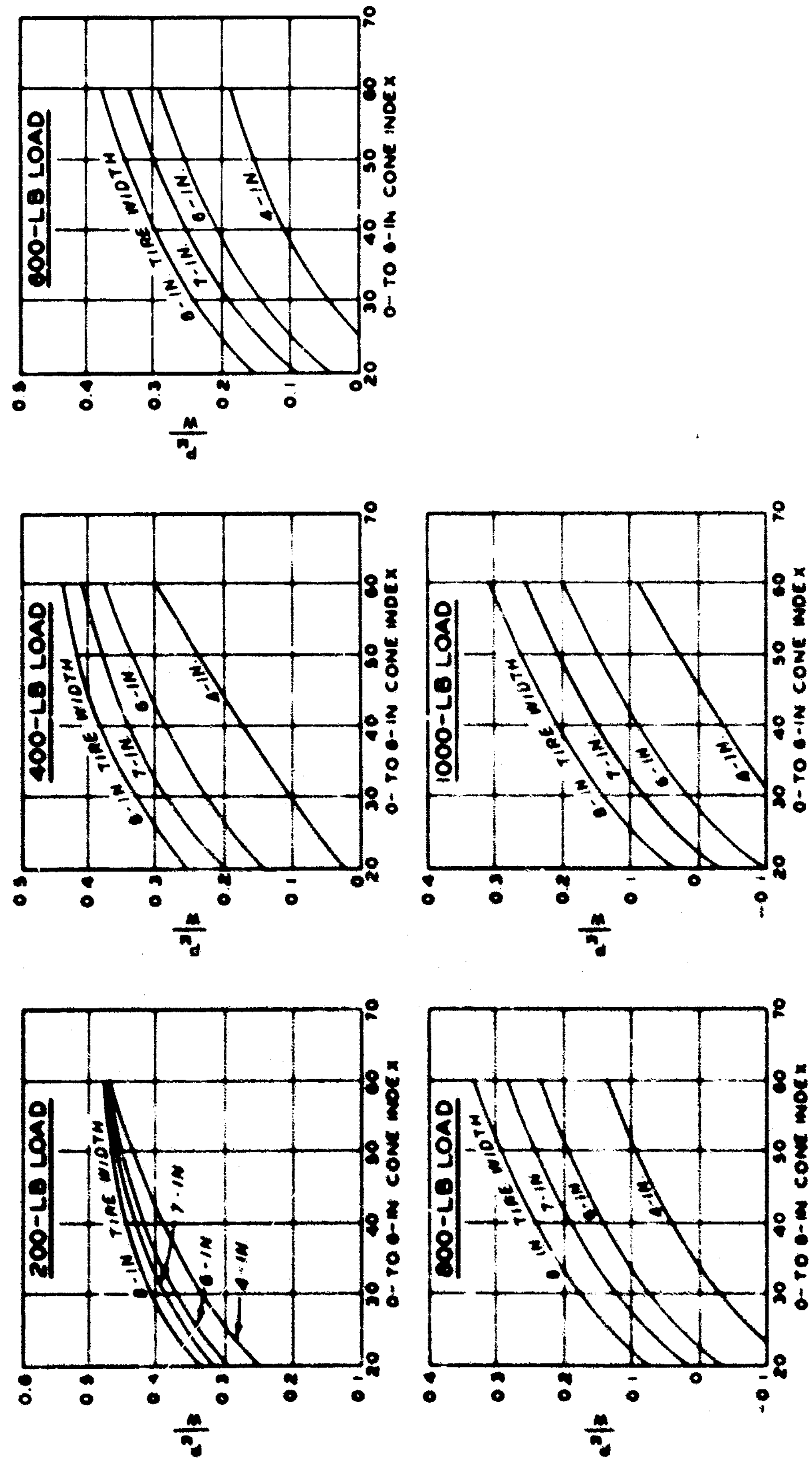
EFFECT OF TIRE WIDTH ON TOWED FORCE
35% DEFLECTION
27-IN. TIRE DIAMETER



EFFECT OF TIRE WIDTH ON MAXIMUM PULL

15% DEFLECTION

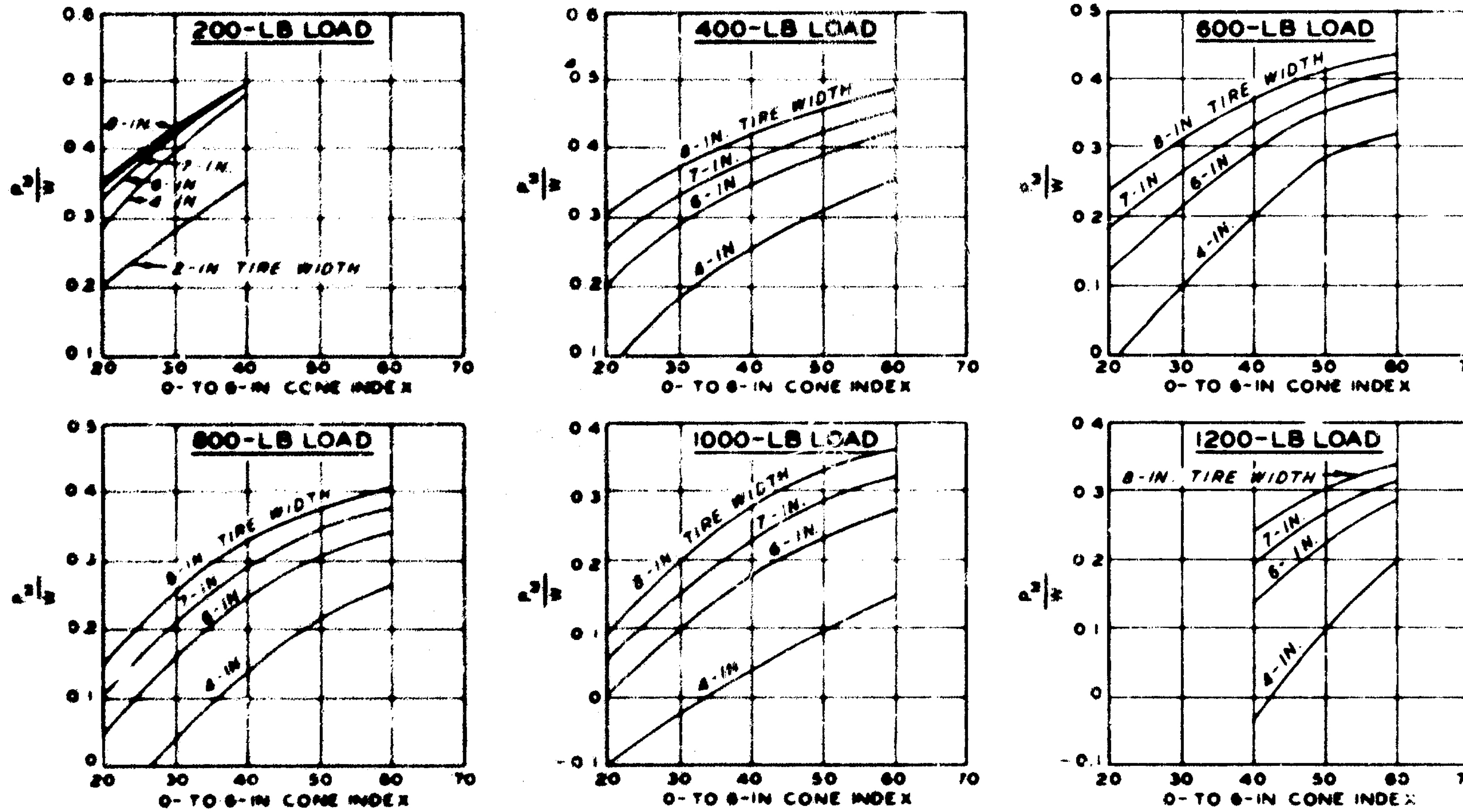
27-IN. TIRE DIAMETER



EFFECT OF TIRE WIDTH ON MAXIMUM PULL

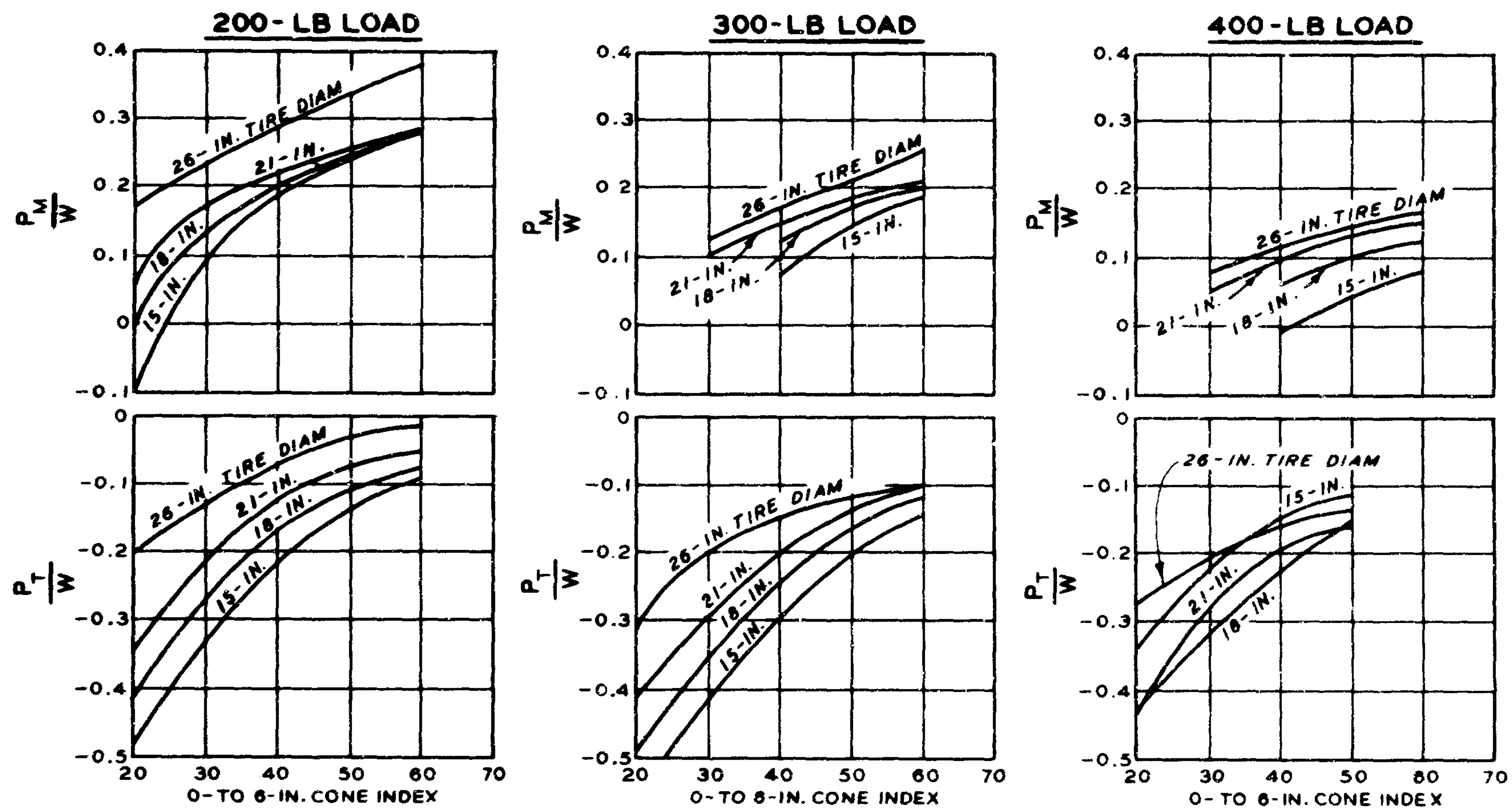
25% DEFLECTION

27-IN. TIRE DIAMETER



EFFECT OF TIRE WIDTH ON MAXIMUM PULL

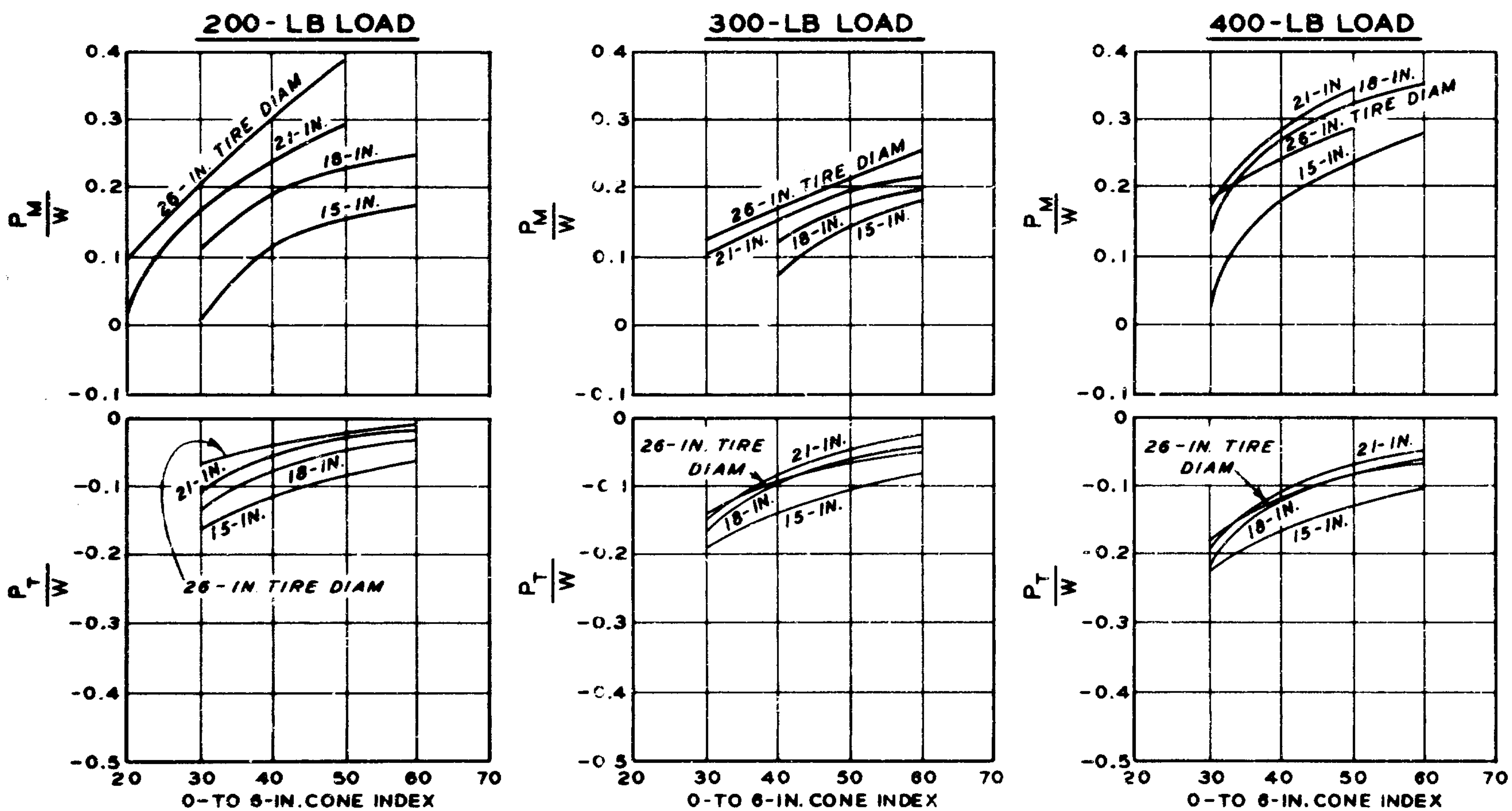
35% DEFLECTION
27-IN. TIRE DIAMETER



EFFECT OF TIRE DIAMETER ON TOWED AND PULL COEFFICIENTS

15% DEFLECTION

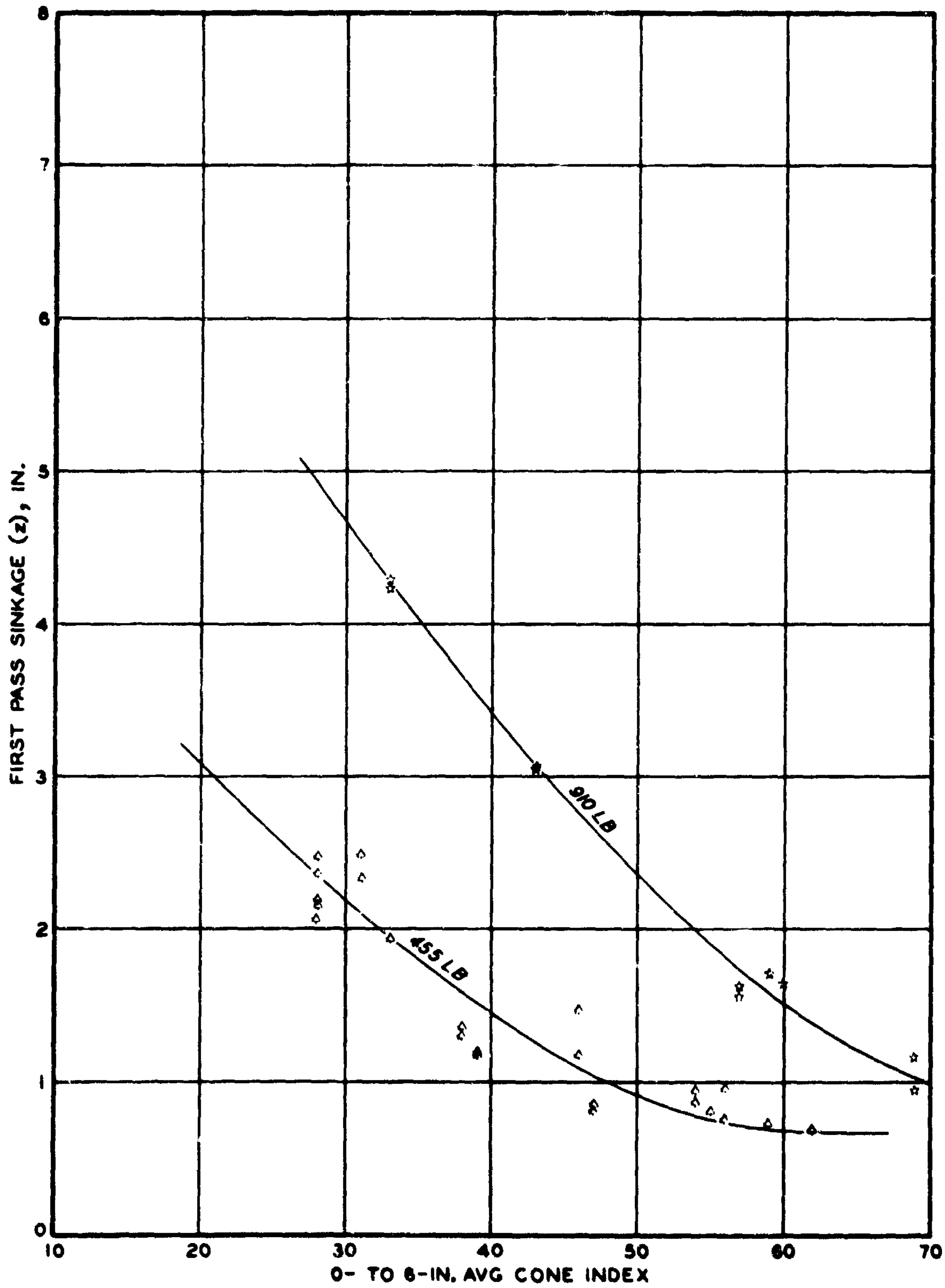
4.5-IN. ± TIRE WIDTH



EFFECT OF TIRE DIAMETER ON TOWED AND PULL COEFFICIENTS

35% DEFLECTION

4.5-IN. ± TIRE WIDTH



LEGEND

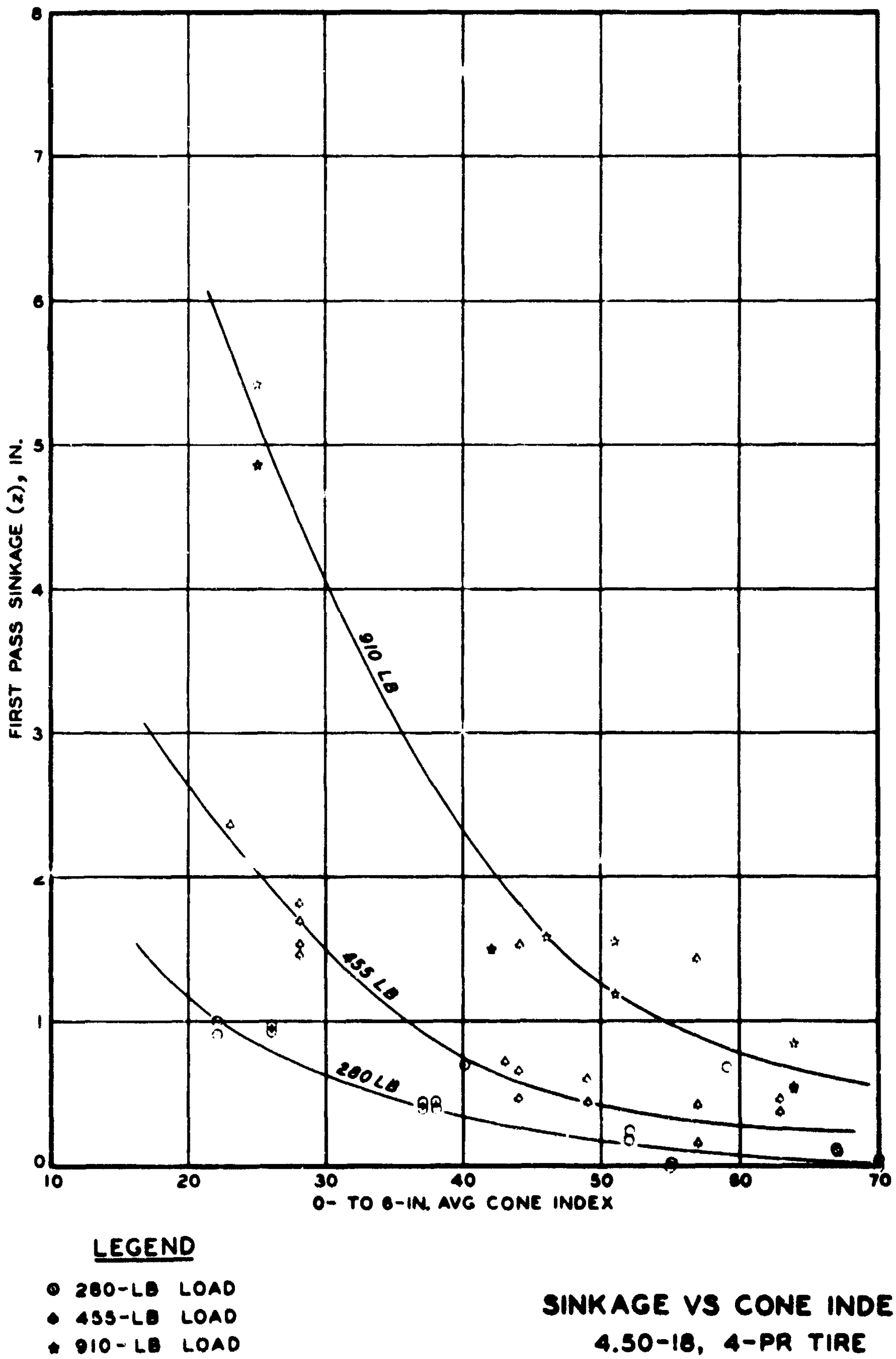
- 455-LB LOAD
- 910-LB LOAD

SINKAGE VS CONE INDEX

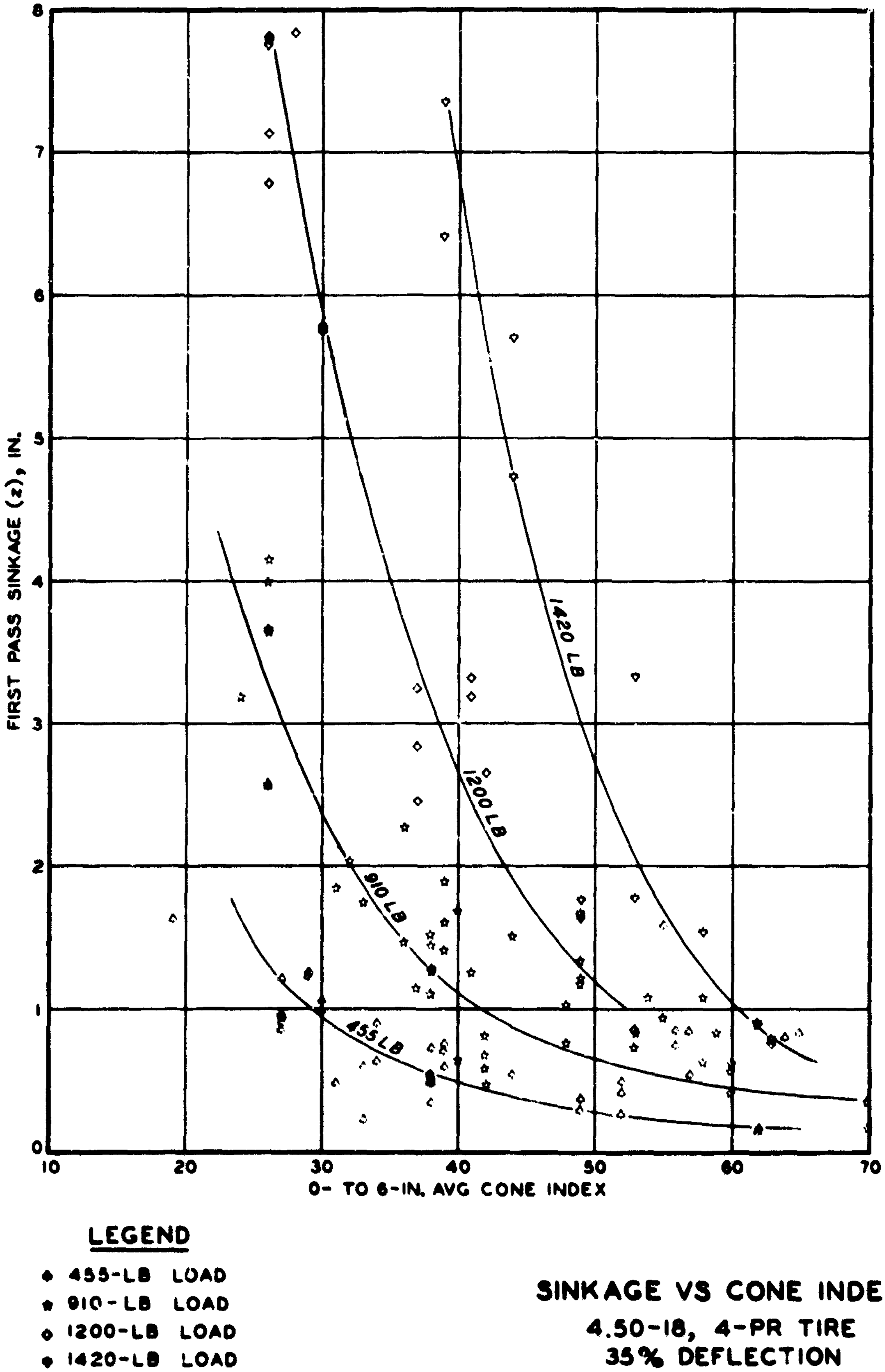
4.50-18, 4-PR TIRE

15% DEFLECTION

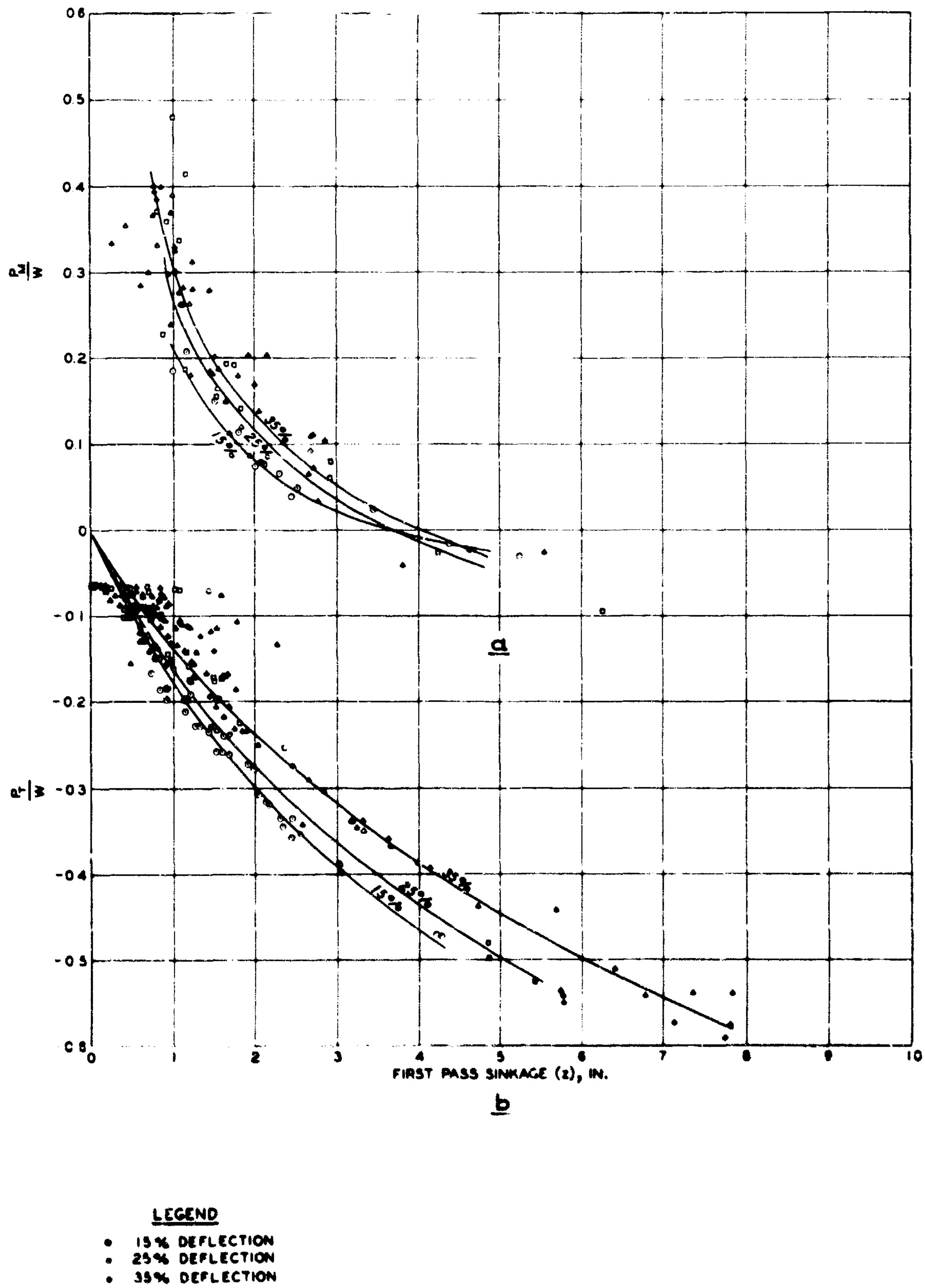
TOWED POINT



SINKAGE VS CONE INDEX
4.50-18, 4-PR TIRE
25% DEFLECTION
TOWED POINT

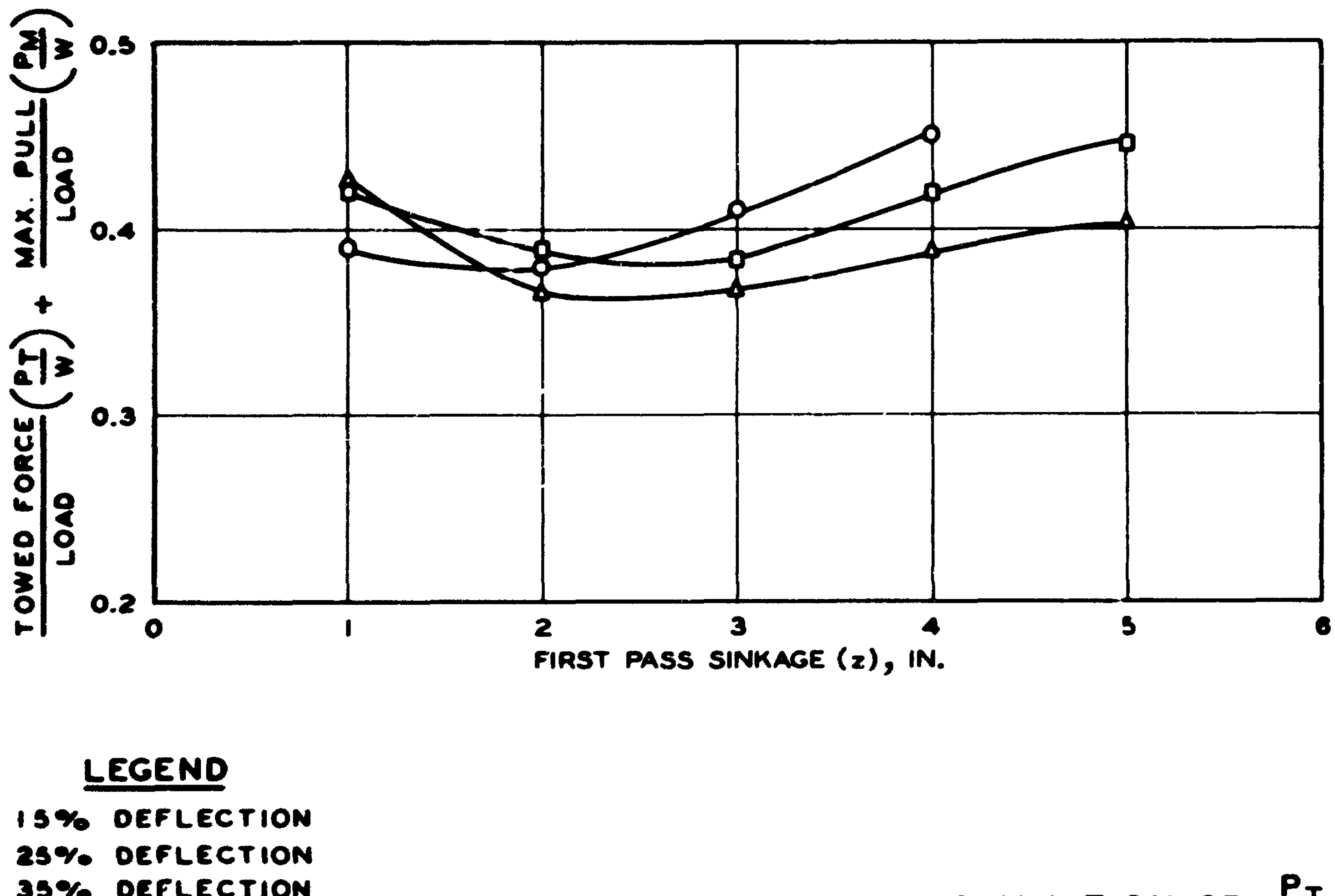


SINKAGE VS CONE INDEX
4.50-18, 4-PR TIRE
35% DEFLECTION
TOWED POINT

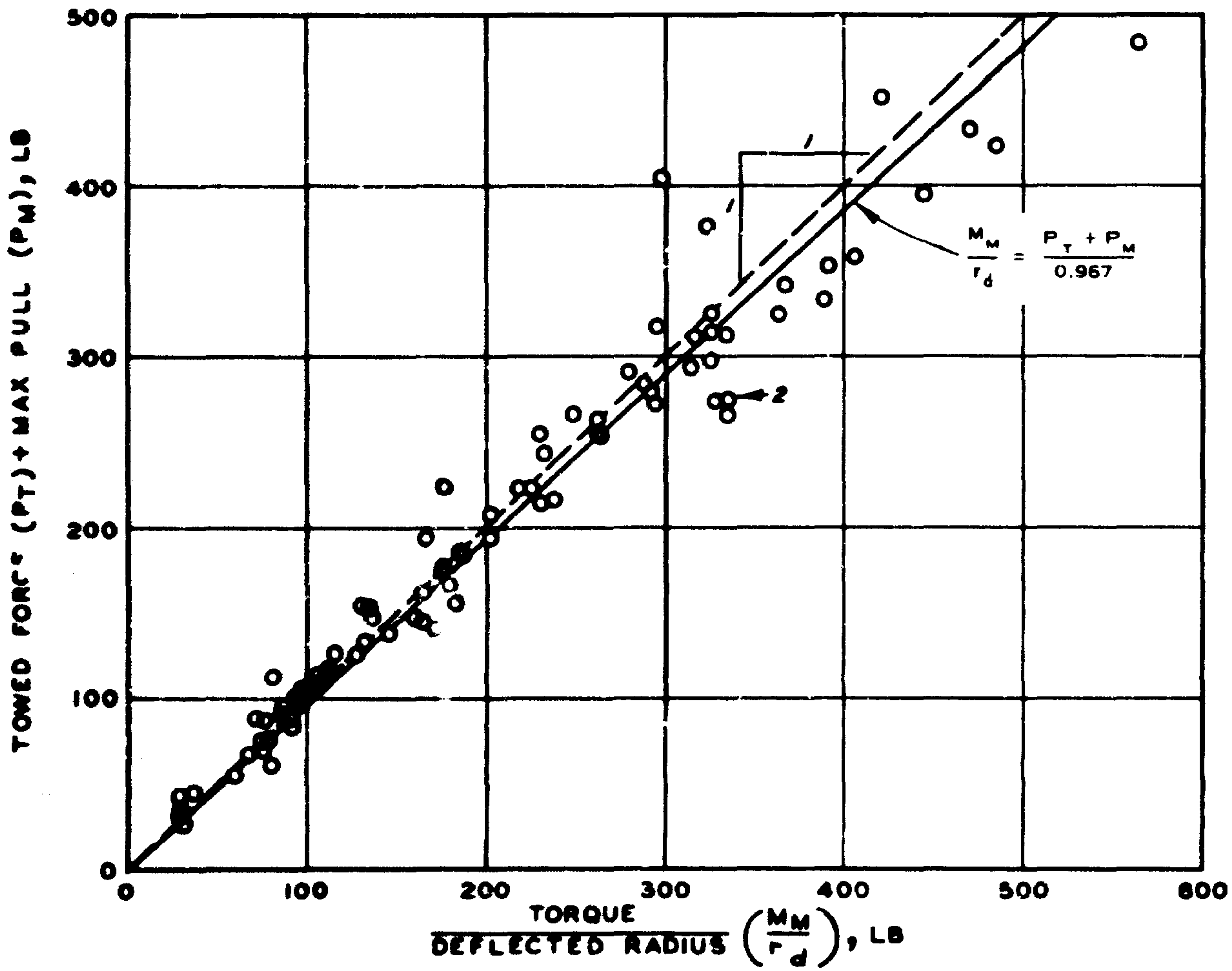


MAXIMUM PULL AND TOWED COEFFICIENTS VS SINKAGE

4.50-18, 4-PR TIRE



SUMMATION OF $\frac{P_T}{W}$ AND $\frac{P_M}{W}$
VS SINKAGE
4.50-18, 4-PR TIRE



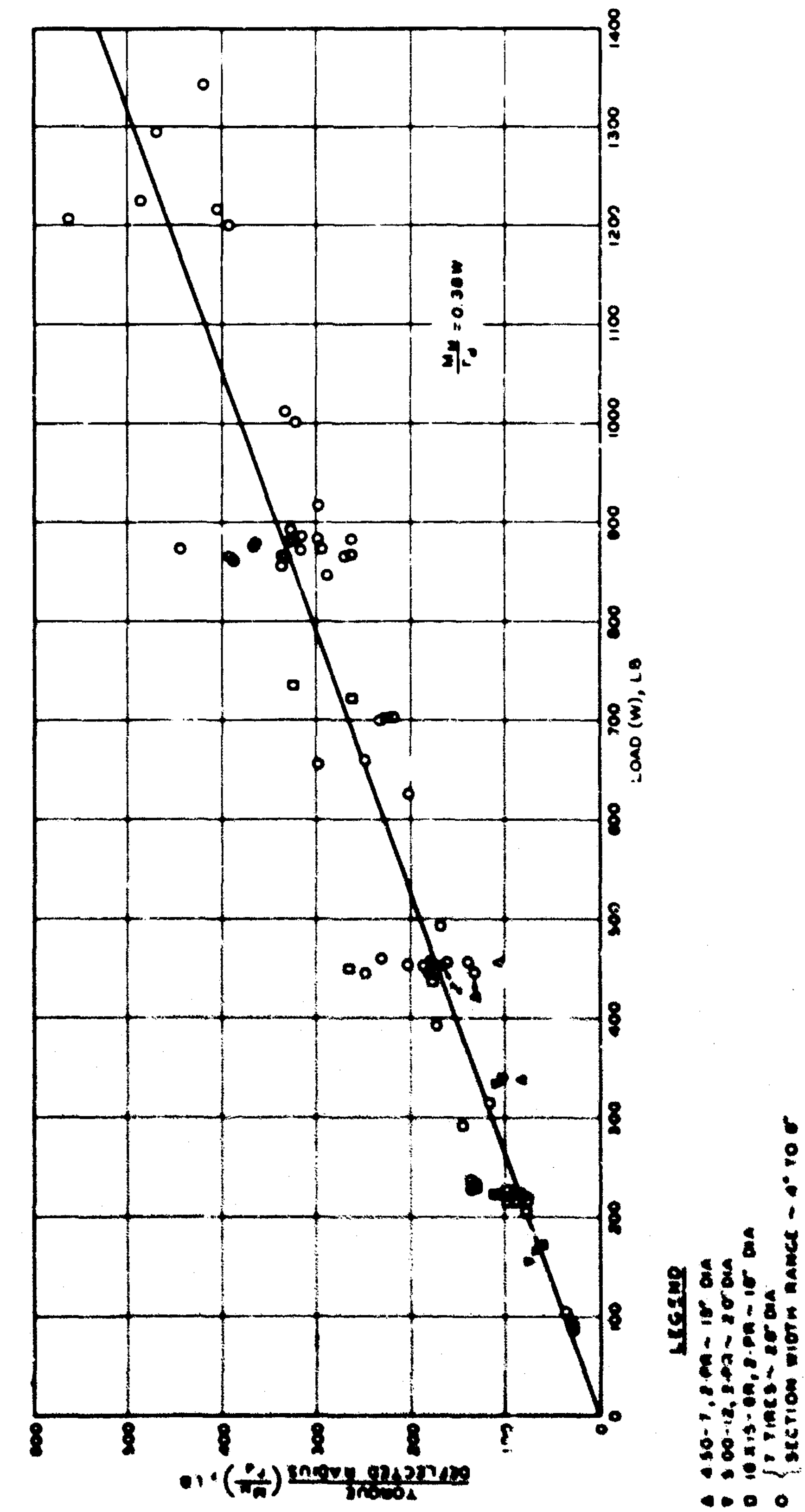
NOTE: M_M = TORQUE AT P_M

$r_d = \frac{D}{2} - \delta_{MH}$ AT P_M

SUMMATION OF TOWED FORCE AND MAXIMUM PULL VS TORQUE/DEFLECTED RADIUS

RANGE OF DEFLECTION (δ_{MH}) = 15 TO 35%

RANGE OF 0- TO 6-IN. CONE INDEX = 14 TO 71

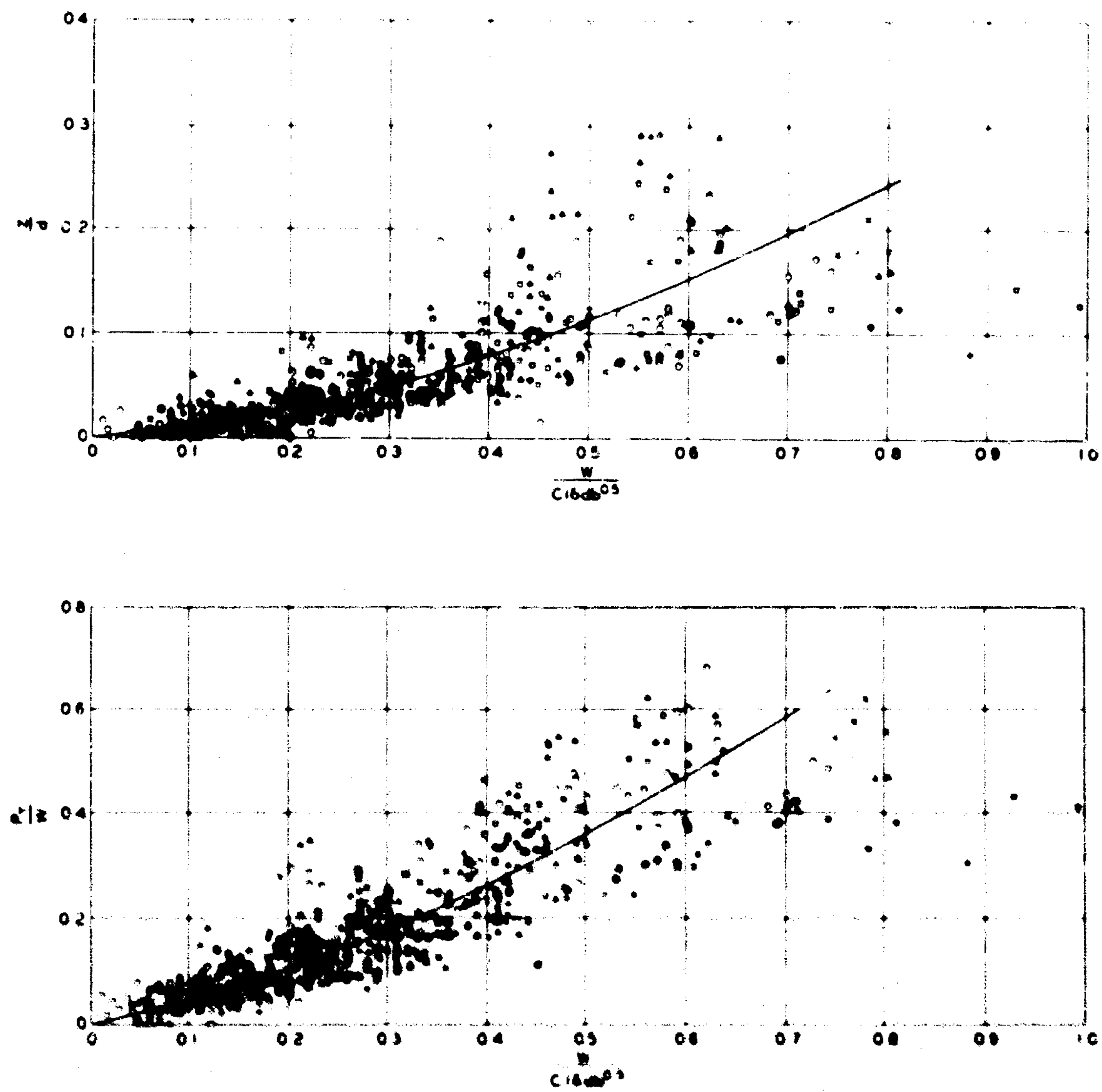


TORQUE / DEFLECTED RADIUS VS LOAD

TEN PNEUMATIC TIRES

RANGE OF DEFLECTION (δ_{NH}) = 15 TO 35%

RANGE OF 0- TO 6-IN. CONE INDEX = 14 TO 71

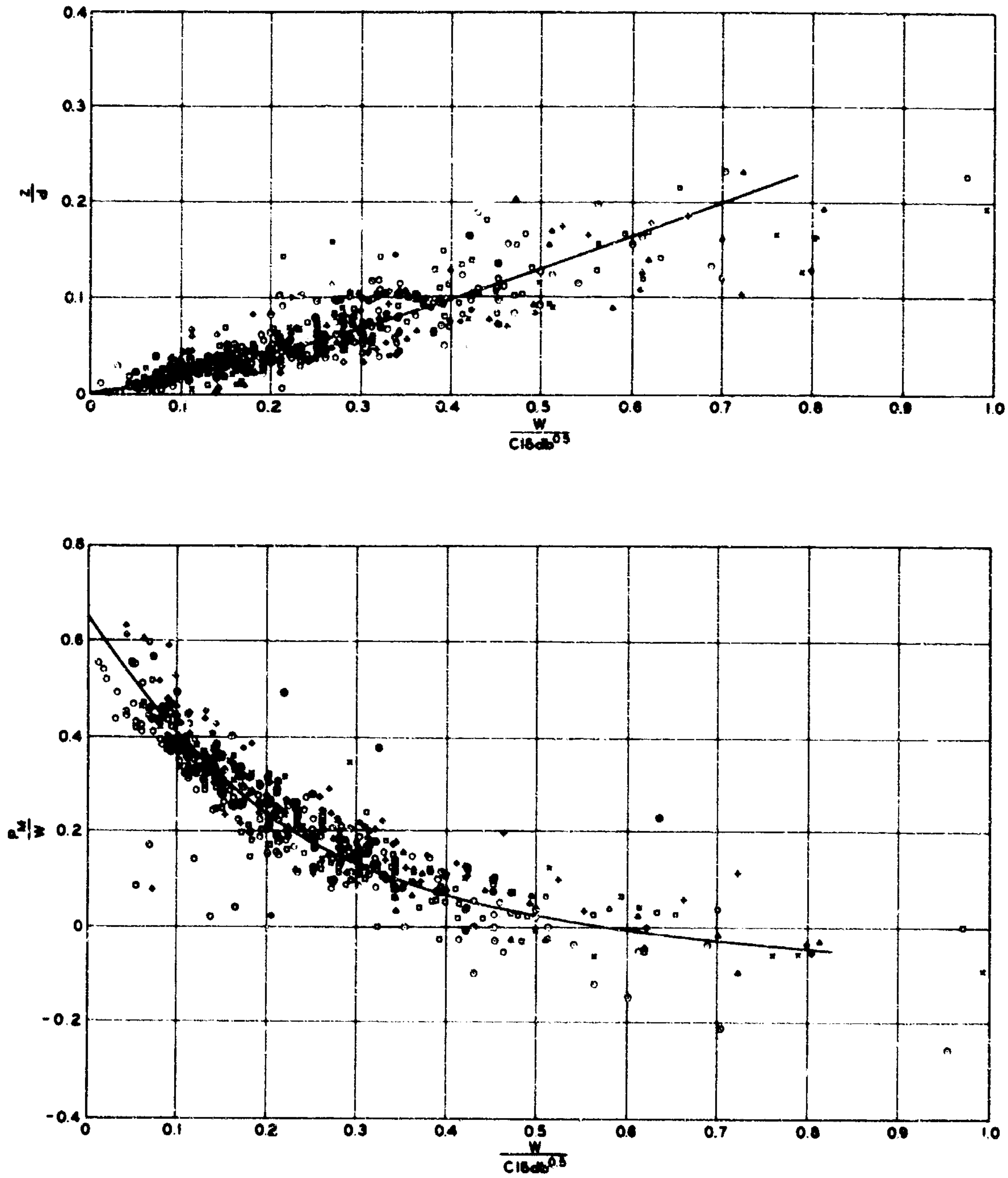


LEGEND

- 1.75-26 BICYCLE TIRE
- 4.00-18, 2-PR TIRE
- 4.50-18, 4-PR TIRE
- 6.00-16, 2-PR TIRE
- 6.00-16 RADIAL PLY
- 6.00-16 RADIAL PLY DIRECTIONAL BAR TREAD
- 6.00-16 SOLID TIRE
- 9.00-14, 2-PR TIRE
- 9.00-14, 4-PR TIRE
- 9.00-14, 8-PR TIRE
- 4.50-7, 2-PR TIRE
- 5.00-12, 2-PR TIRE
- 16x15-6R, 2-PR TERRA TIRE

$\frac{z}{d}$ AND $\frac{R_T}{W}$ VS $\frac{W}{C16db^{0.5}}$

TOWED POINT

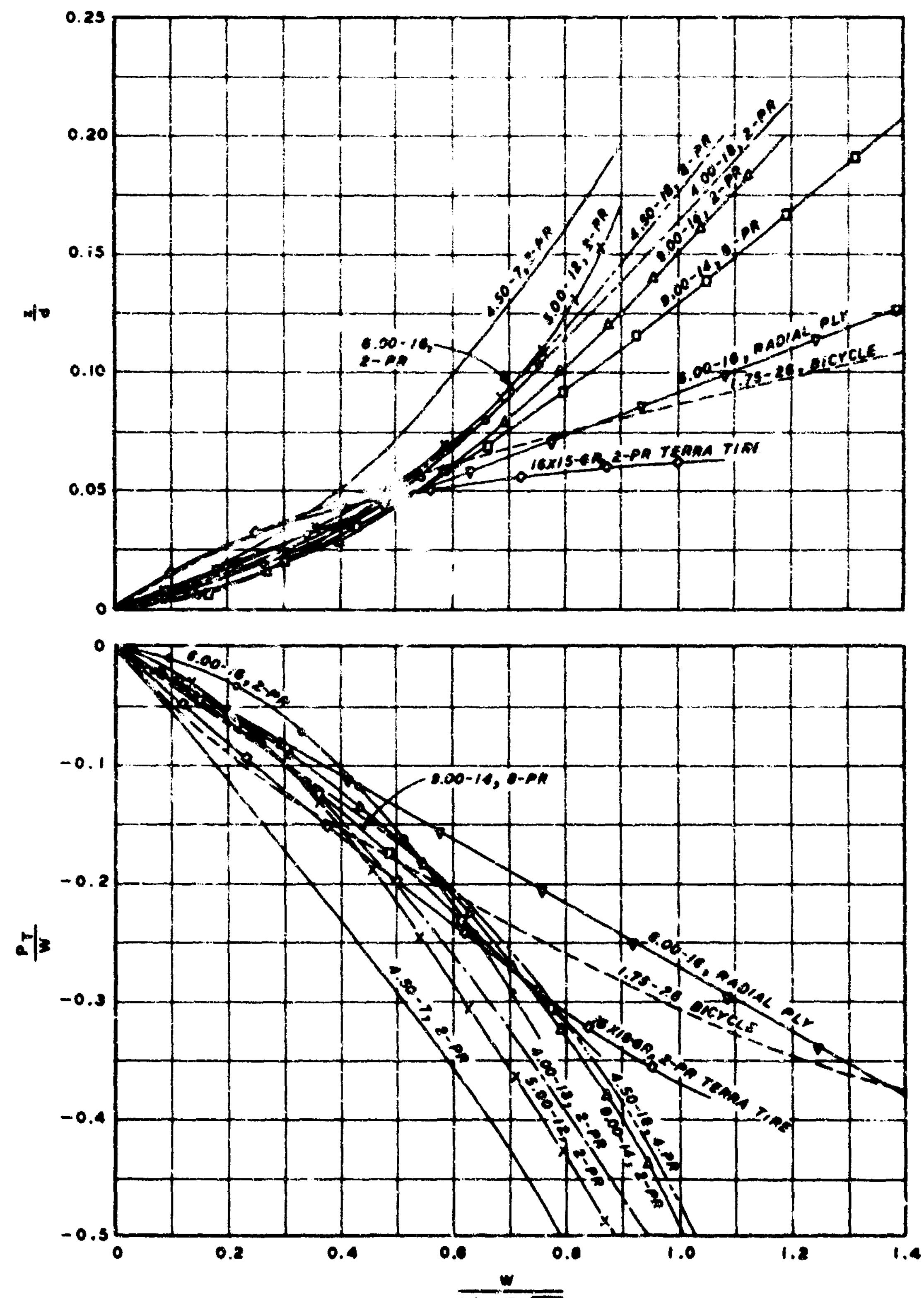


LEGEND

- 1.75-26 BICYCLE TIRE
- 4.00-18, 2-PR TIRE
- 4.50-18, 4-PR TIRE
- 6.00-16, 2-PR TIRE
- 6.00-16 RADIAL PLY
- 6.00-16 RADIAL PLY DIRECTIONAL BAR TREAD
- 9.00-14, 2-PR TIRE
- 9.00-14, 4-PR TIRE
- 9.00-14, 8-PR TIRE
- 4.50-7, 2-PR TIRE
- 5.00-12, 2-PR TIRE
- 16X15-6R, 2-PR TERRA TIRE

$\frac{Z}{d}$ AND $\frac{P_M}{W}$ VS $\frac{W}{C1\delta db^{0.5}}$

MAXIMUM-PULL POINT



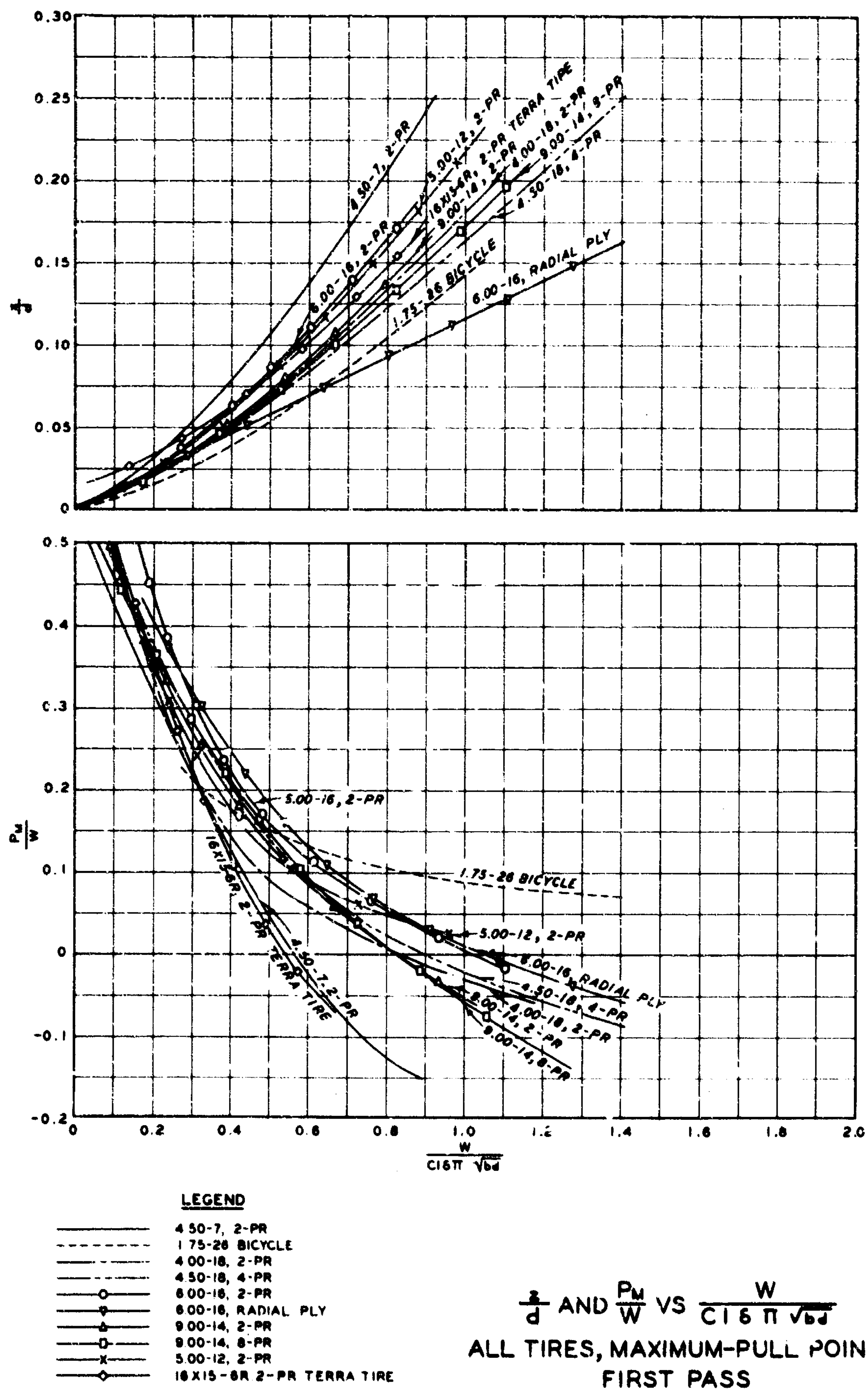
LEGEND

————	4.50-7, 2-PR
- - - - -	1.75-26, BICYCLE
— - —	4.00-18, 2-PR
— - - —	4.50-18, 4-PR
—○—	6.00-16, 2-PR
—▽—	6.00-16, RADIAL PLY
—△—	9.00-14, 2-PR
—□—	9.00-14, 8-PR
—×—	5.00-12, 2-PR
—◇—	16X15-6R, 2-PR TERRA TIRE

$\frac{z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{CI\ \delta\ \pi\ \sqrt{bd}}$

ALL TIRES, TOWED POINT

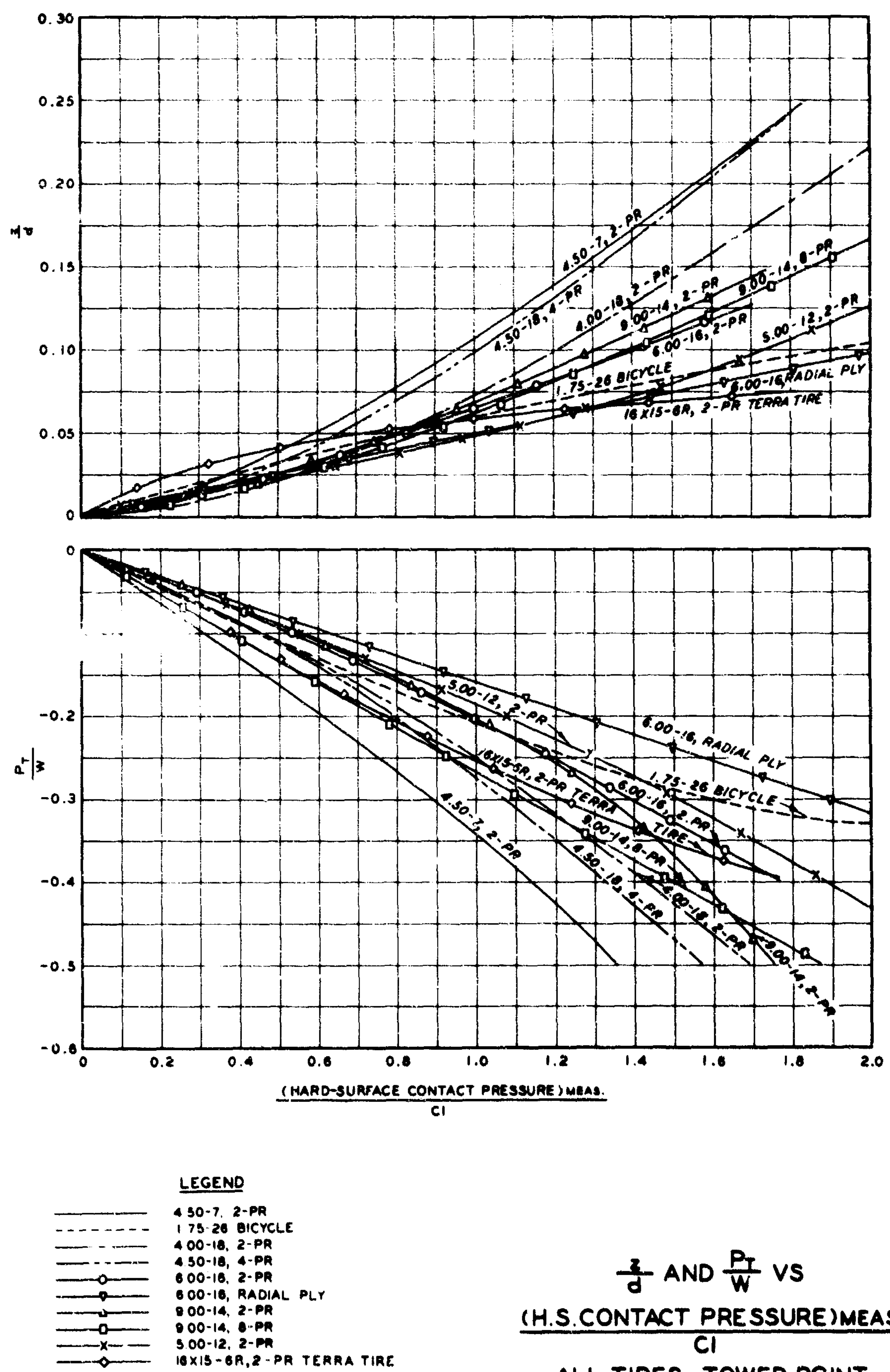
FIRST PASS



$\frac{z}{d}$ AND $\frac{P_M}{W}$ VS $\frac{W}{C1\,6\,\pi\,\sqrt{bd}}$

ALL TIRES, MAXIMUM-PULL POINT

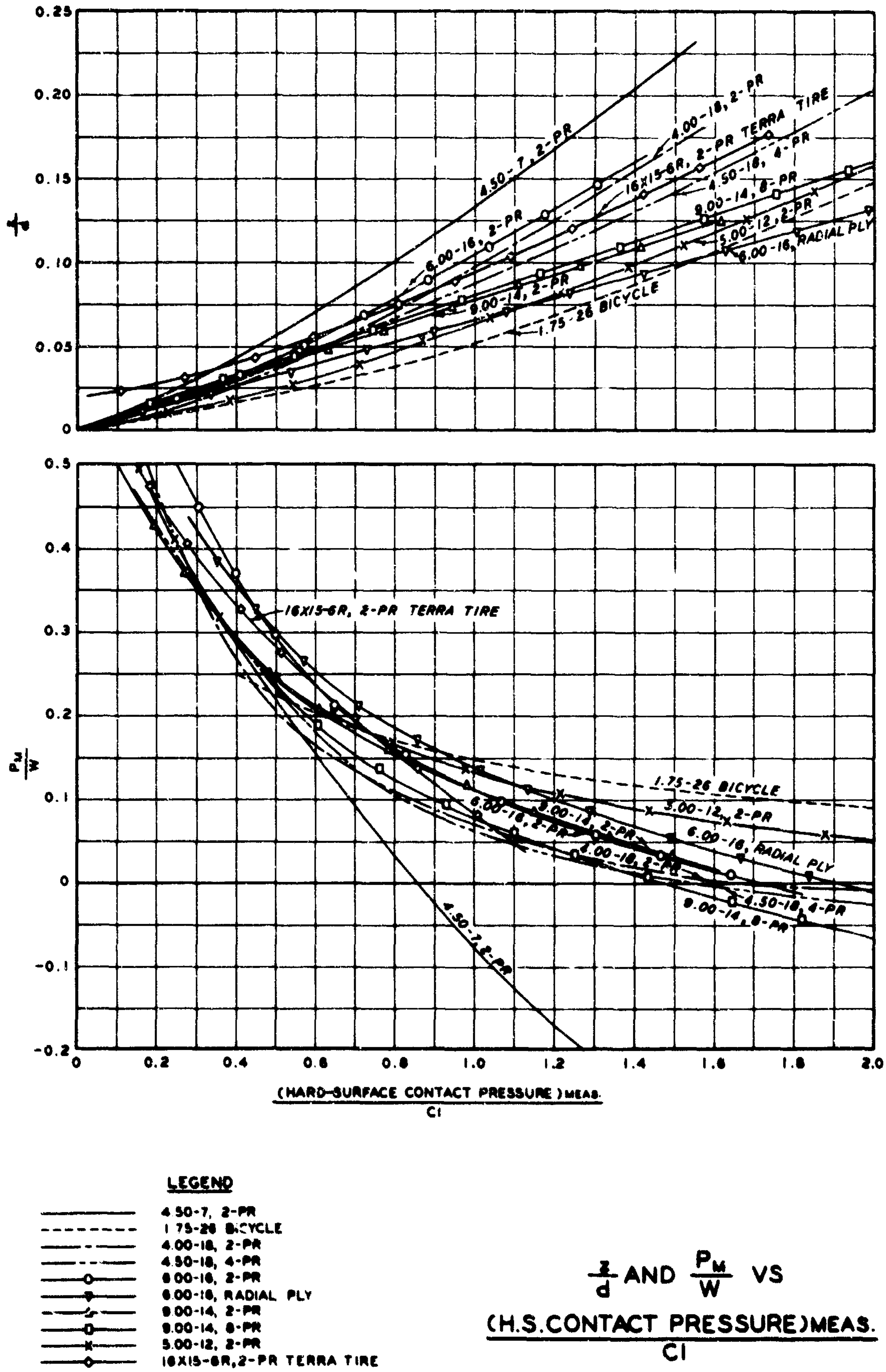
FIRST PASS



$\frac{z}{d}$ AND $\frac{P_T}{W}$ VS

$\frac{\text{(H.S. CONTACT PRESSURE)MEAS.}}{\text{CI}}$

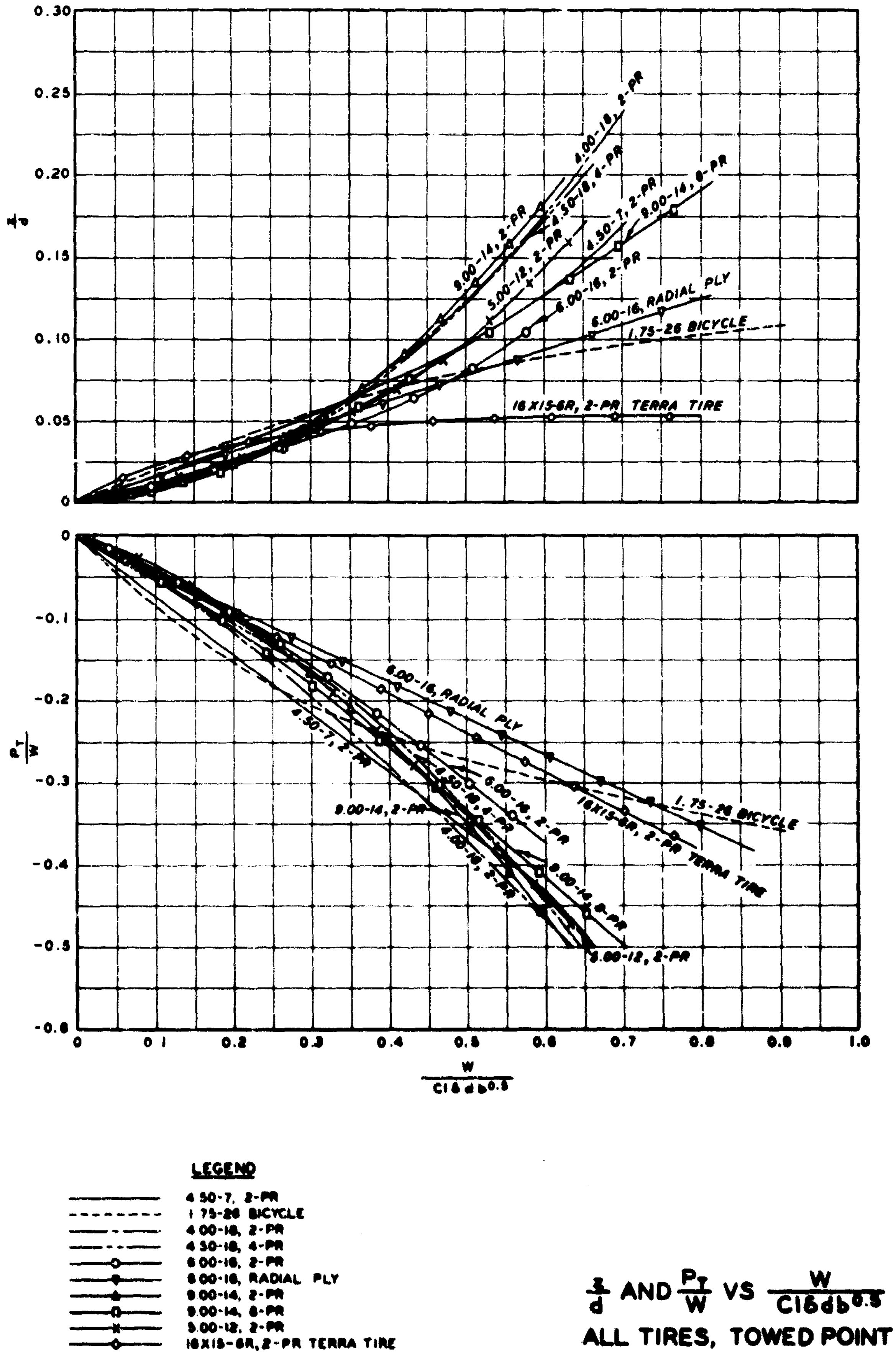
ALL TIRES, TOWED POINT
FIRST PASS



$\frac{z}{d}$ AND $\frac{P_M}{W}$ VS

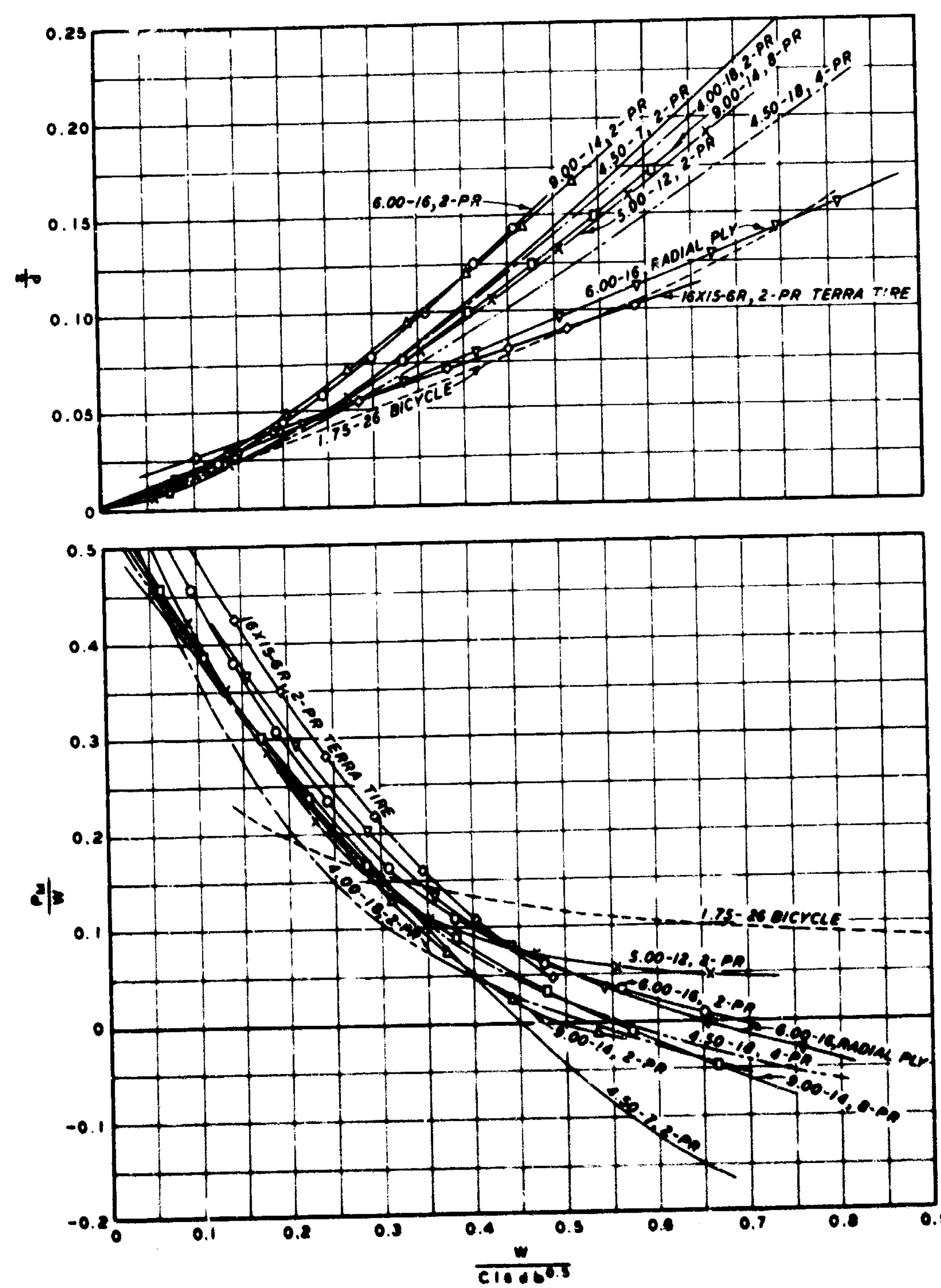
$\frac{\text{(H.S. CONTACT PRESSURE)MEAS.}}{\text{CI}}$

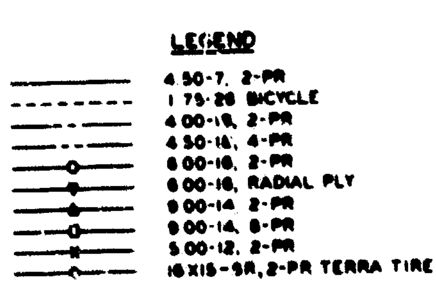
ALL TIRES, MAXIMUM-PULL POINT
FIRST PASS



$\frac{z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{CI\delta db^{0.5}}$

ALL TIRES, TOWED POINT
FIRST PASS

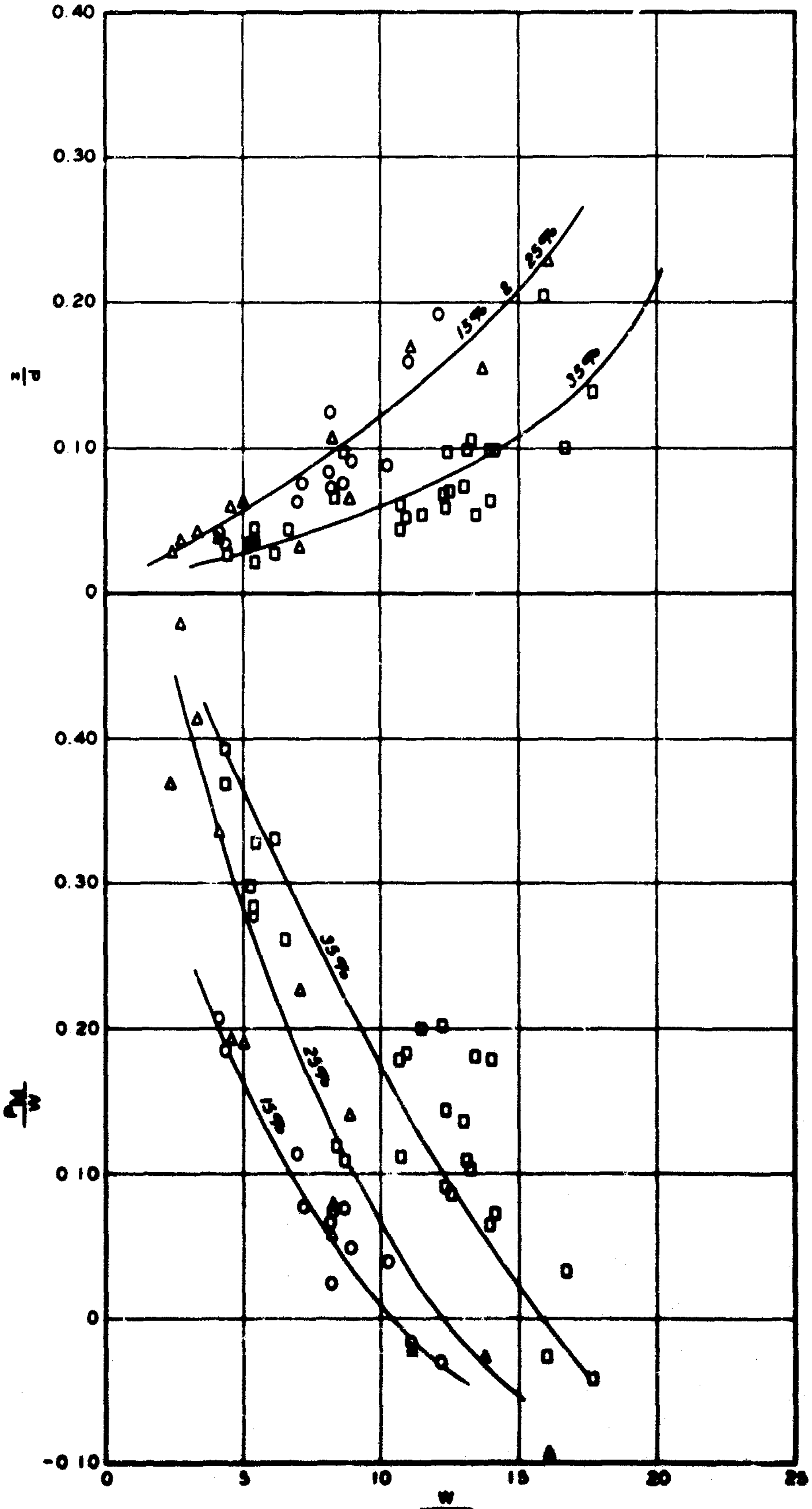




$\frac{z}{d}$ AND $\frac{P_M}{W}$ VS $\frac{W}{Cl\delta d b^{0.5}}$

ALL TIRES, MAXIMUM-PULL POINT
FIRST PASS

PLATE 54

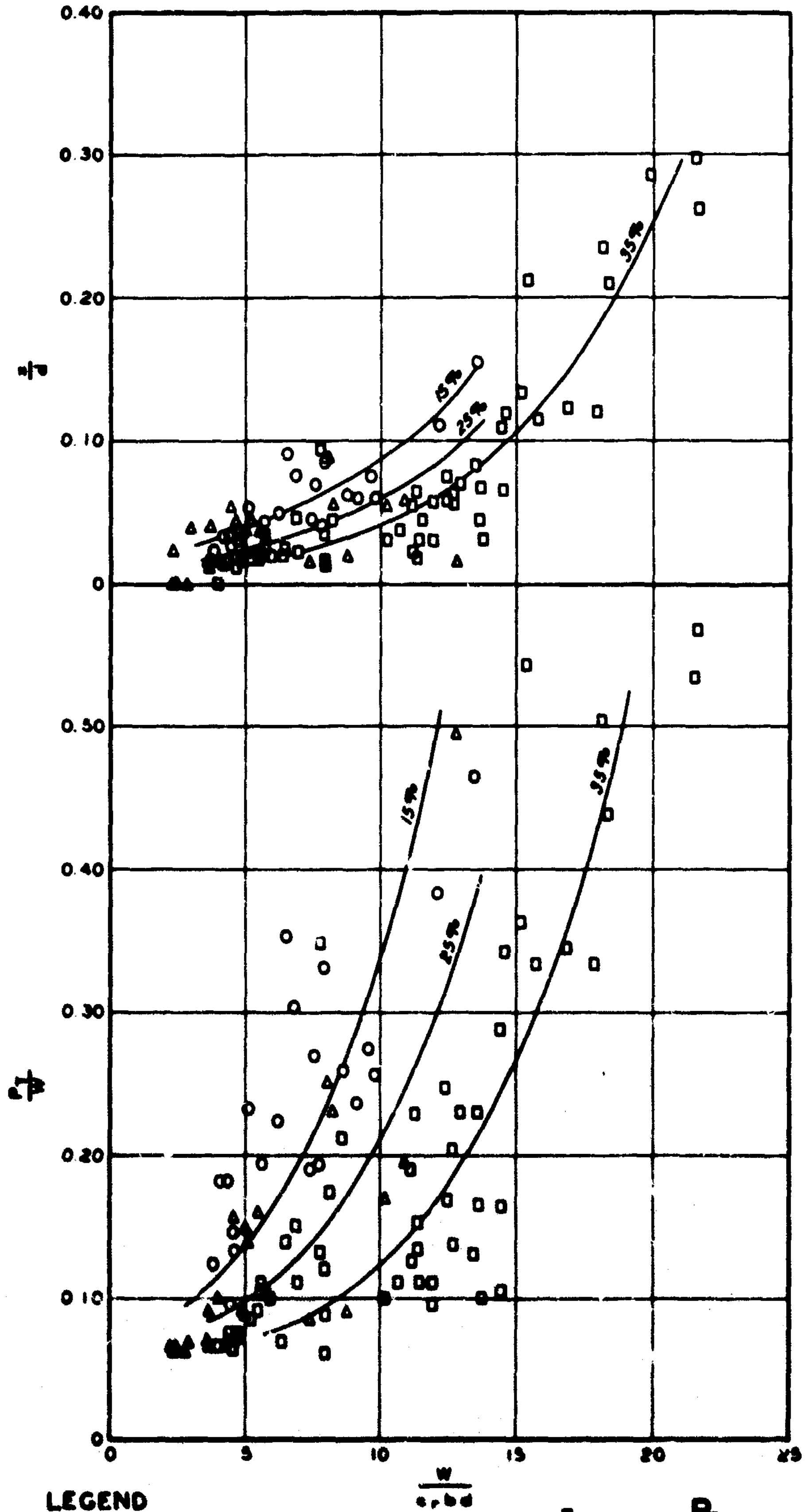


LEGEND

○ 15% DEFLECTION
△ 25% DEFLECTION
□ 35% DEFLECTION

$\frac{z}{d}$ AND $\frac{P_M}{W}$ VS $\frac{W}{c_r\,bd}$

4.50-18, 4-PR TIRE
MAXIMUM-PULL POINT
YUMA SAND

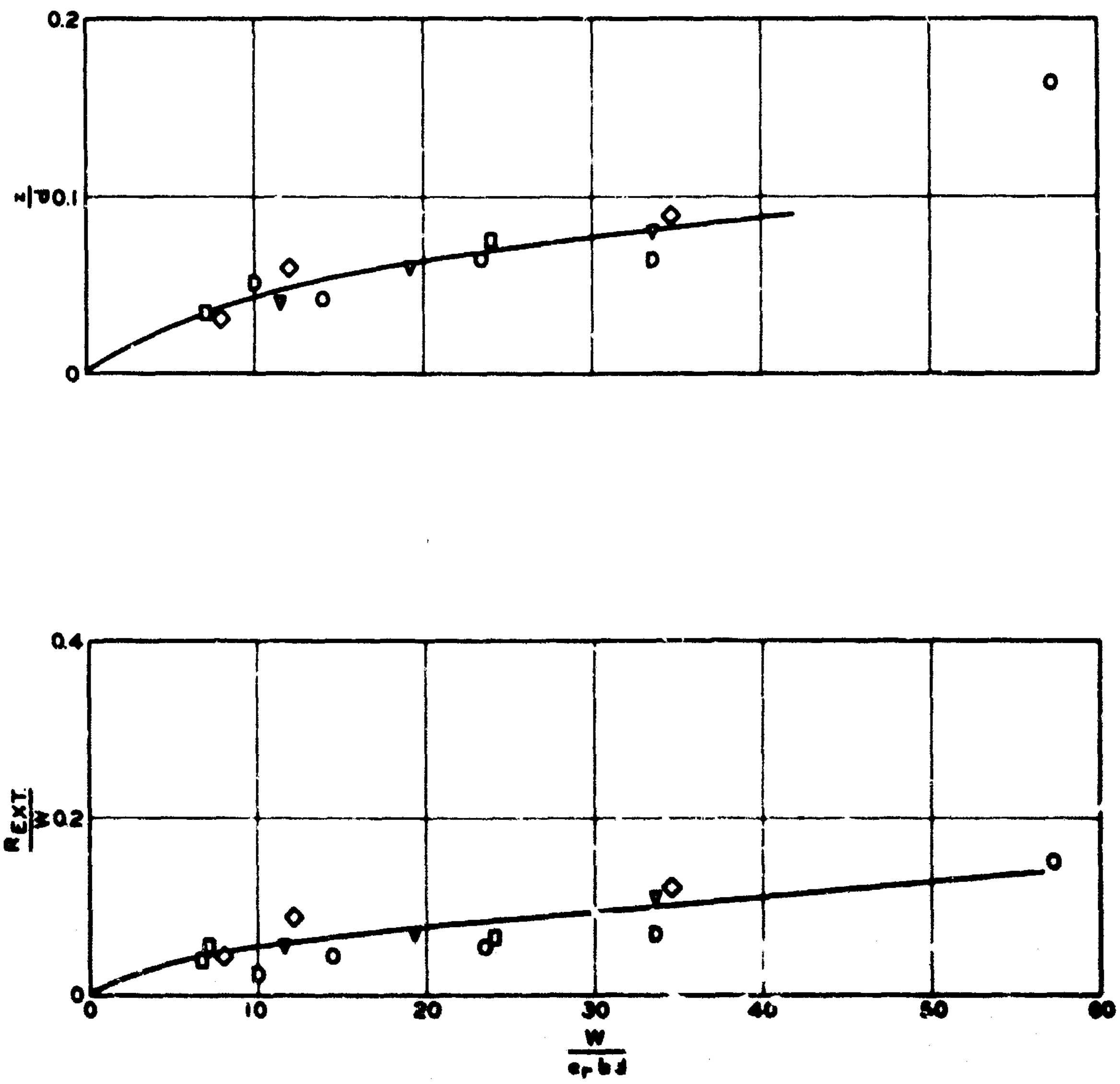


LEGEND

- ○ 15% DEFLECTION
- ▲ 25% DEFLECTION
- □ 35% DEFLECTION

$\frac{z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{c_r bd}$

4.50-18, 4-PR TIRE
TOWED POINT
YUMA SAND



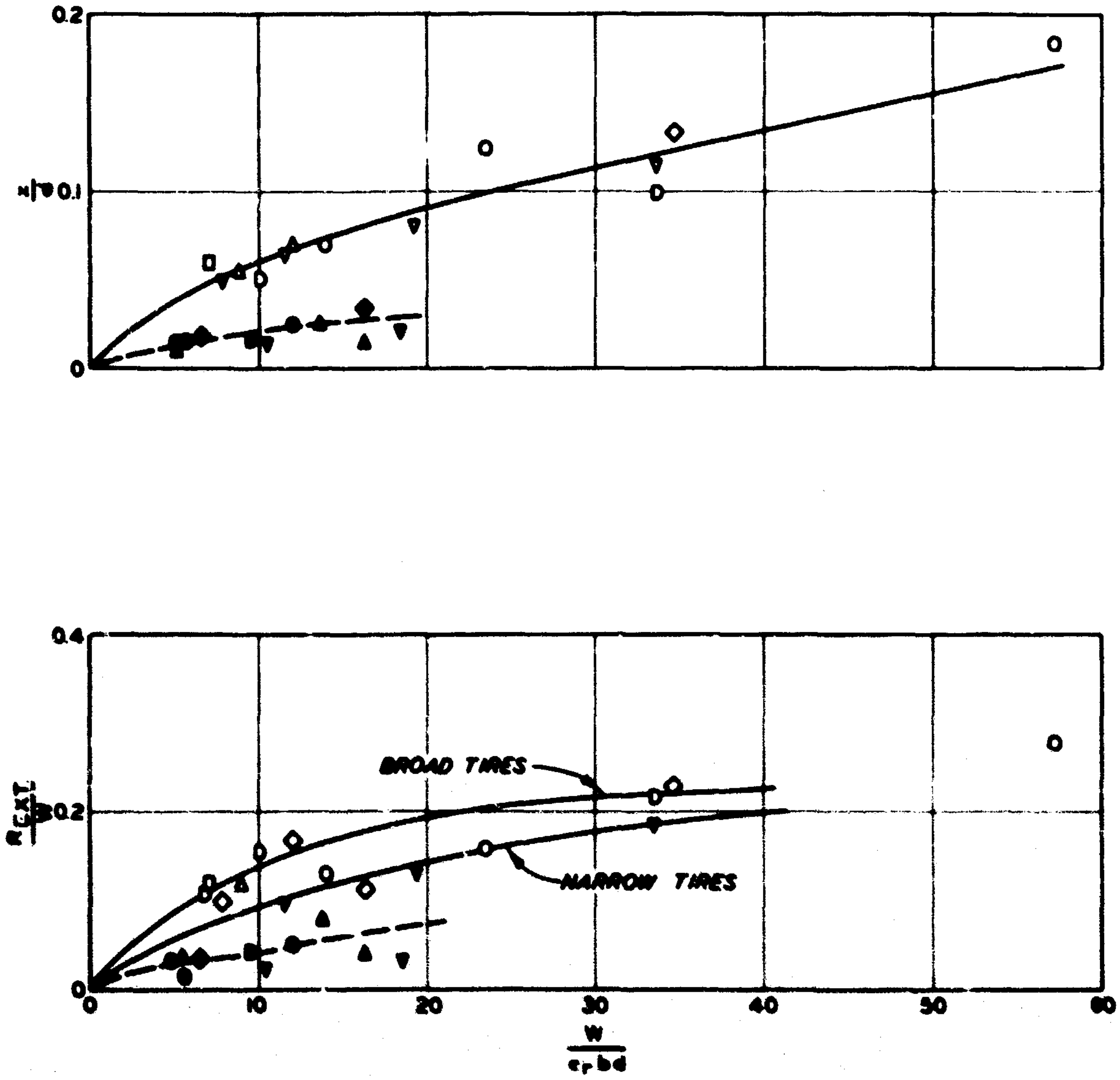
LEGEND

TILLED SAND	DEFLECT * %
○ — 600-16, S	5.8
▼ — MB	5.9
□ — TORUS	7.8
◇ — 600-16, D	9.8
D — 24 X 24 BAG	10.5

NOTE: ASSUMPTION: ($R_{EXT} = R_{SAND} - R_{HARDSTAND}$)
R_{SAND} IS EQUIVALENT TO
AMRC TOWED FORCE

* BASED ON OUTSIDE
DIAMETER OF TIRE.

EXTERNAL TOWING RESISTANCE
TILLED BEACH SAND



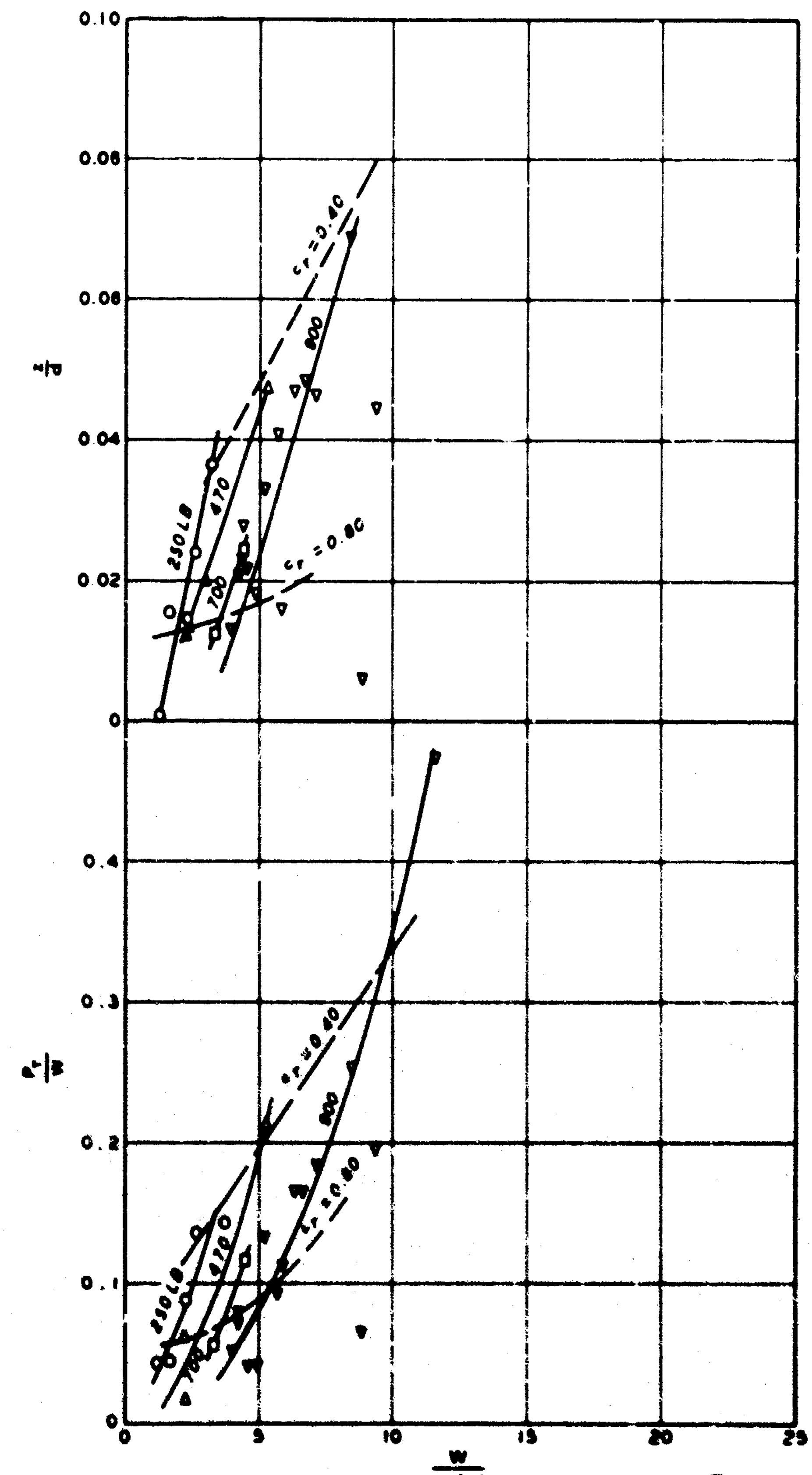
LEGEND

TILLED SAND	COMPACT SAND
O — 6.00-16, S	●
▽ — MR	▼
△ — LCC	▲
□ — TORUS	■
◇ — 6.00-16, D	◆
D — 24 X 24 BAG	D

NOTE: ASSUMPTION ($R_{EXT} = R_{SAND} - R_{HARDSTAND}$)
R_{SAND} IS EQUIVALENT TO
AMRC TOWED FORCE

* BASED ON OUTSIDE DIAMETER OF TIRE.

EXTERNAL TOWING RESISTANCE
TILLED AND COMPACT
BEACH SAND
1.5% DEFLECTION*

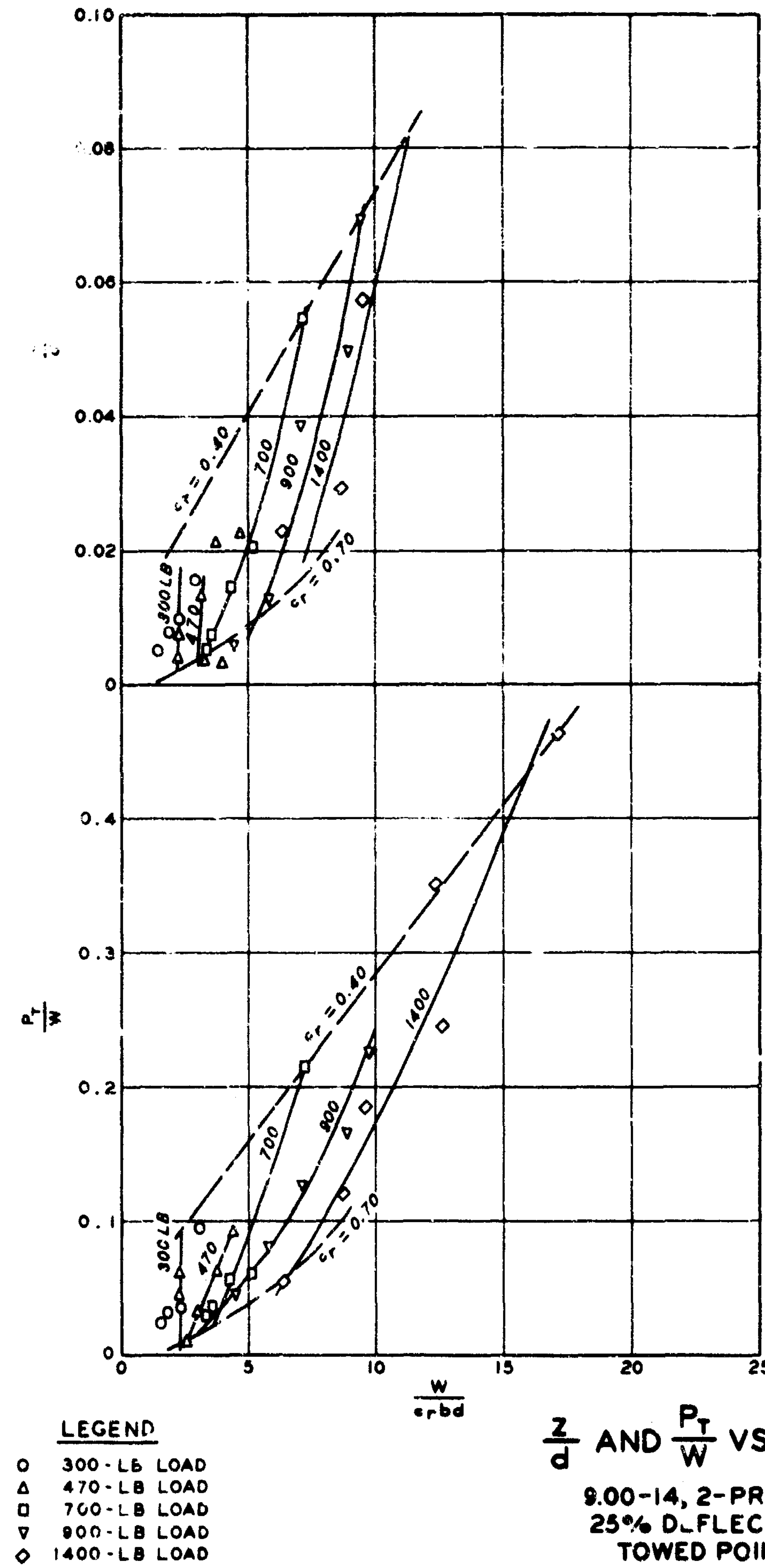


LEGEND

- O 250 - LB LOAD
- Δ 470 - LB LOAD
- □ 700 - LB LOAD
- ▽ 800 - LB LOAD

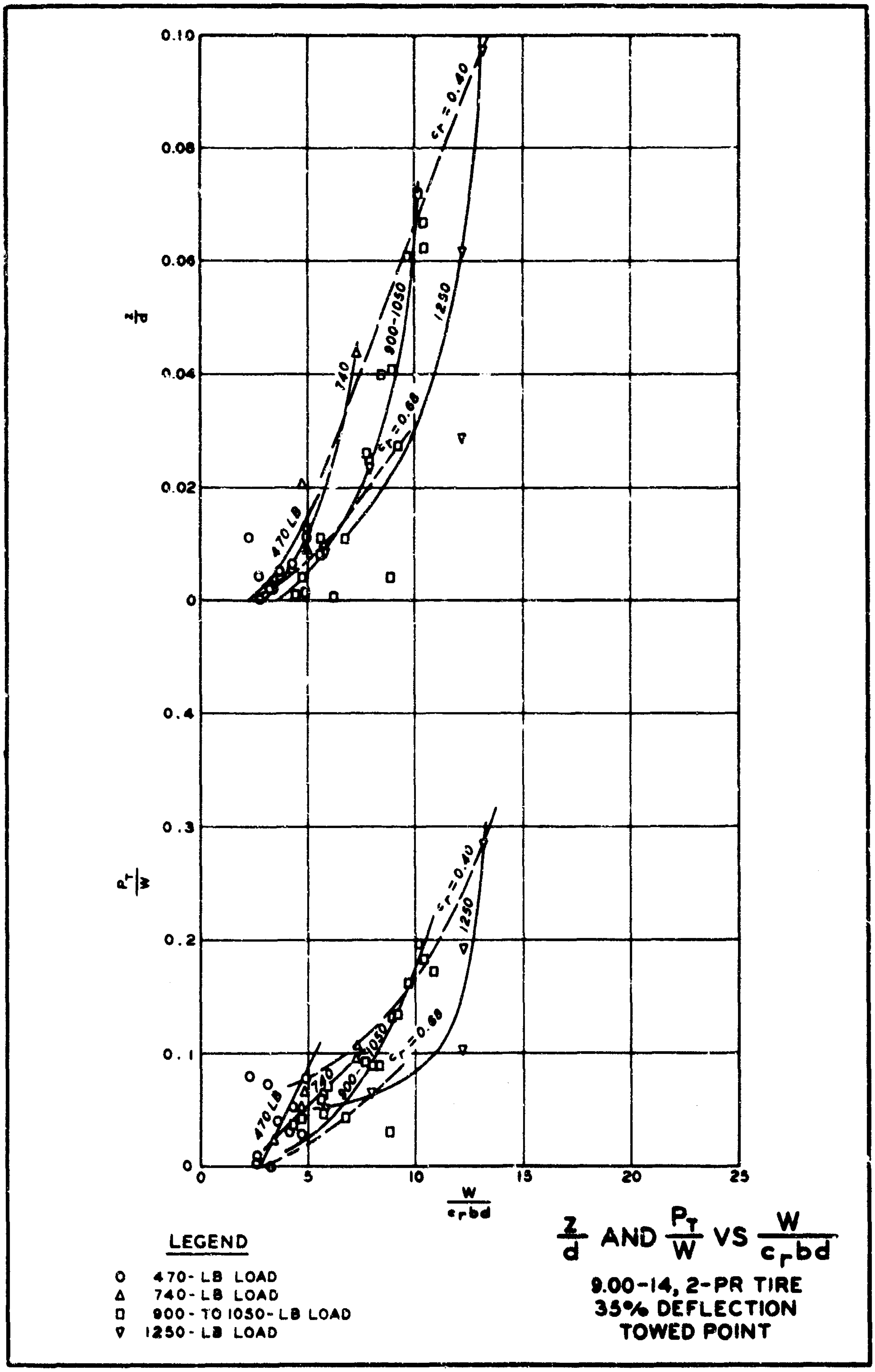
$\frac{z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{c_r bd}$

9.00-14, 2-PR TIRE
15% DEFLECTION
TOWED POINT



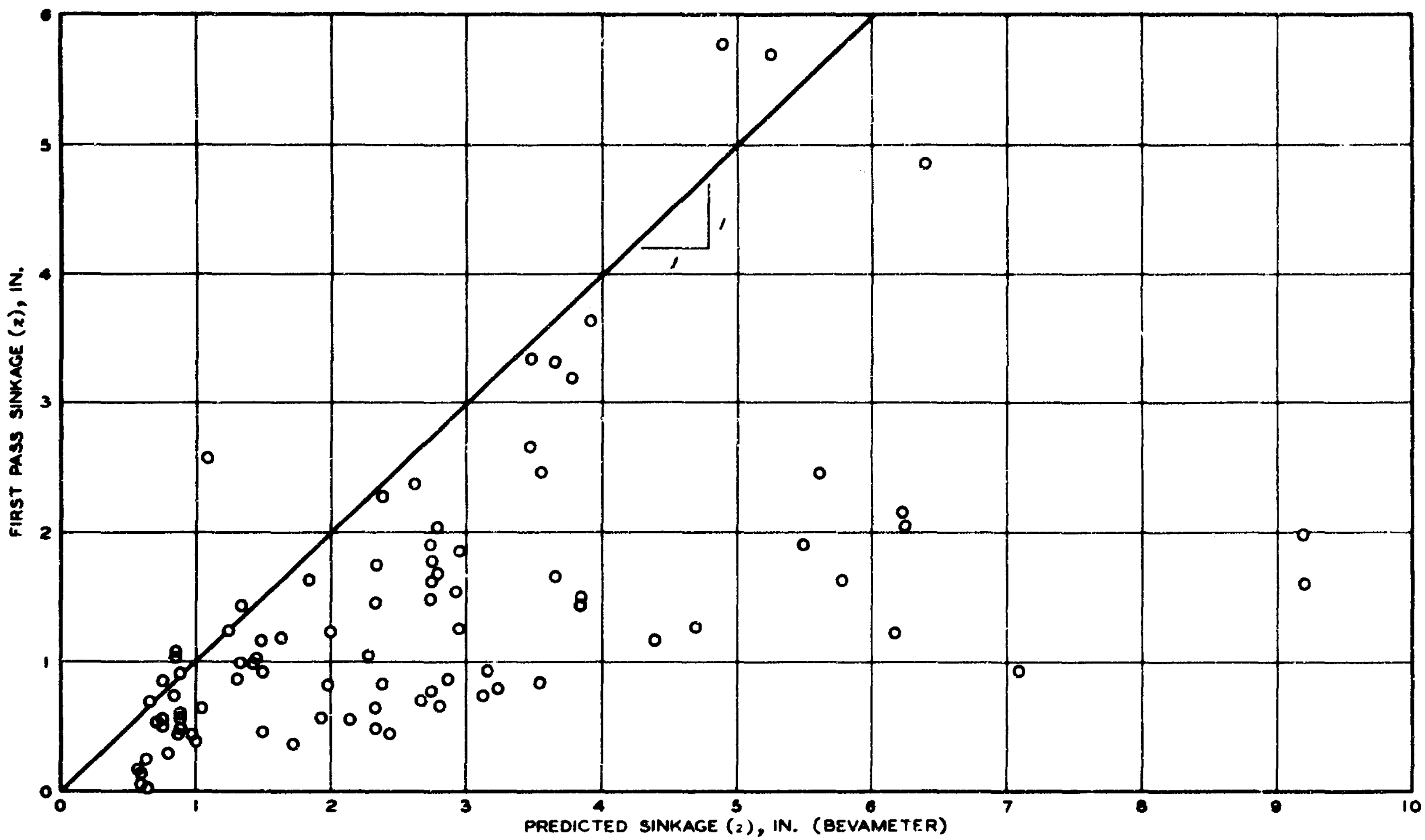
$\frac{Z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{c_r bd}$

9.00-14, 2-PR TIRE
25% DEFLECTION
TOWED POINT



$\frac{Z}{d}$ AND $\frac{P_T}{W}$ VS $\frac{W}{c_r bd}$

9.00-14, 2-PR TIRE
35% DEFLECTION
TOWED POINT



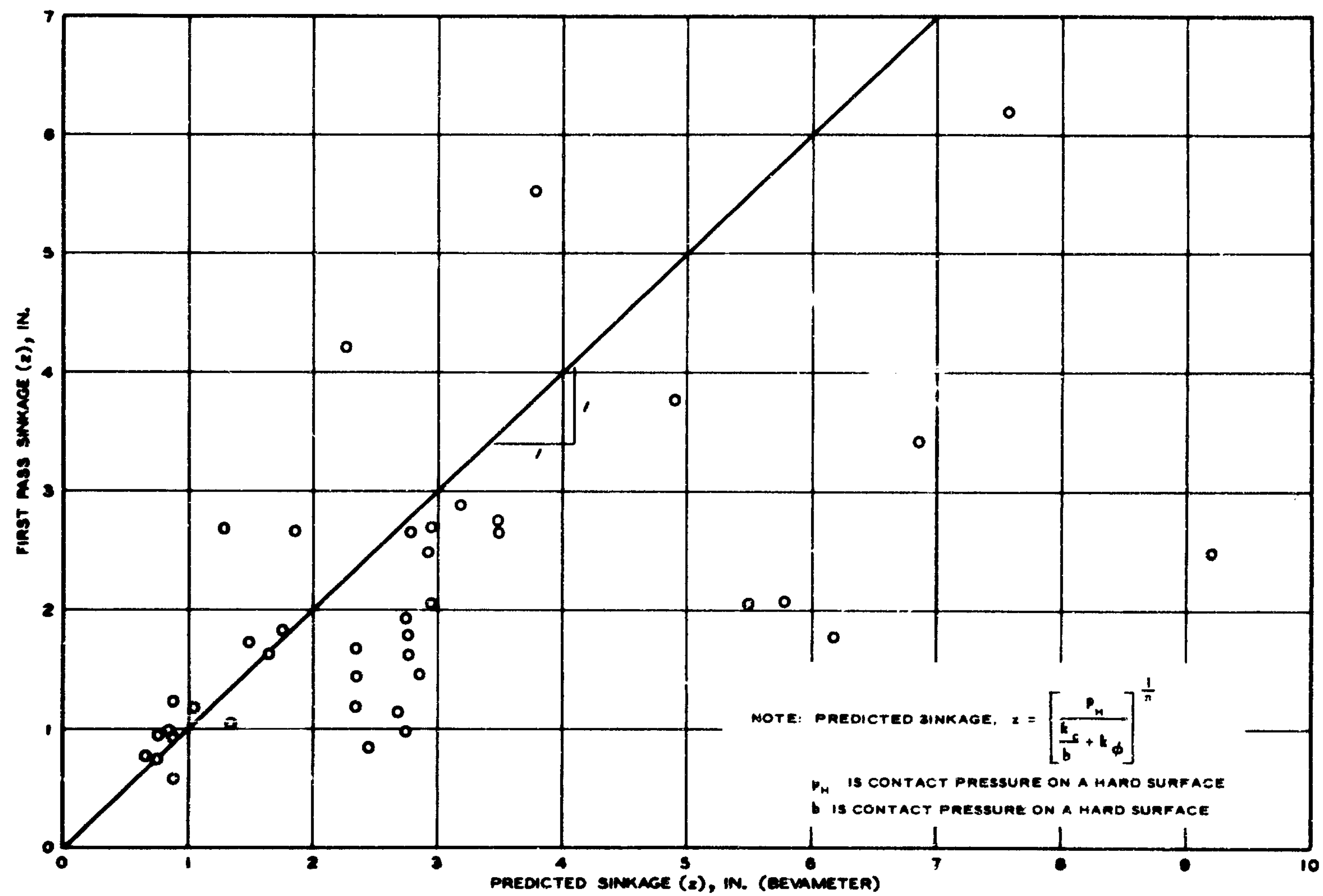
NOTE: PREDICTED SINKAGE, $z = \left[\frac{p_H}{\frac{k_c}{b} + k_\phi} \right]^{\frac{1}{n}}$

p_H IS CONTACT PRESSURE ON A HARD SURFACE

b IS CONTACT WIDTH ON A HARD SURFACE

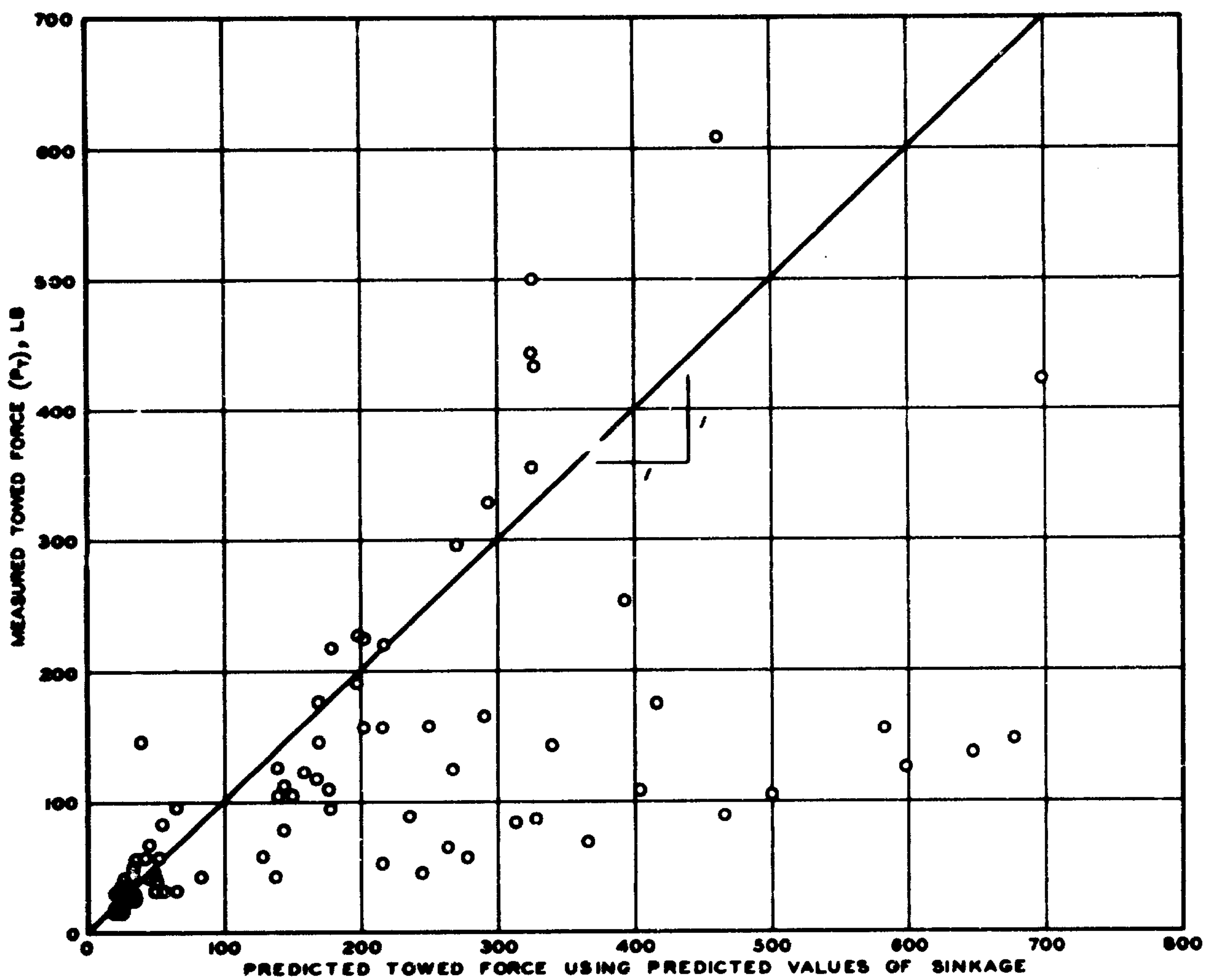
MEASURED SINKAGE VS PREDICTED SINKAGE (BEVAMETER)

4.50-18, 4-PR TIRE
TOWED POINT
FIRST PASS



MEASURED SINKAGE VS PREDICTED SINKAGE (BEVAMETER)

4.50-18, 4-PR TIRE
MAXIMUM PULL POINT
FIRST PASS

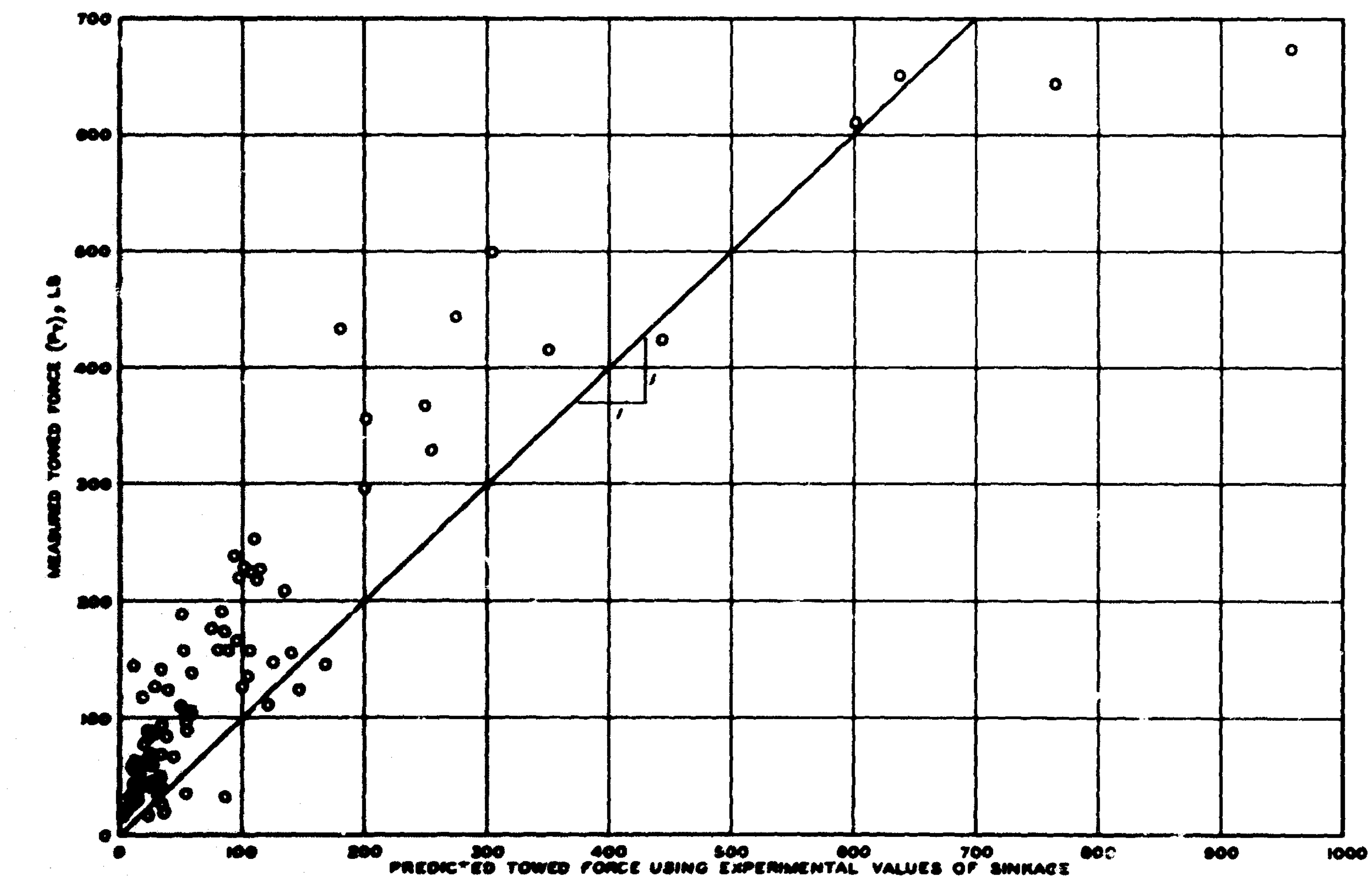


NOTE: PREDICTED TOWED FORCE = $\frac{(k_c + bk_\phi) z^{n+1}}{n+1}$

MEASURED TOWED FORCE VS PREDICTED TOWED FORCE

PREDICTED VALUES OF SINKAGE

4.50-18, 4-PR TIRE
TOWED POINT



NOTE: PREDICTED TOWED FORCE = $\frac{(k_c + bk_\phi)\, z^{n+1}}{n+1}$

MEASURED TOWED FORCE VS PREDICTED TOWED FORCE

EXPERIMENTAL VALUES OF SINKAGE

4.50-18, 4-PR TIRE

TOWED POINT

APPENDIX A: SINKAGE STUDY

1. When the mobility studies were begun, it was recognized that the mere measurement of the depth of rut left by a tire was not a sufficiently accurate measure of the sinkage it underwent. A study of the action of a rigid wheel in a clay soil had revealed definite and significant rebounding of a rut surface.* The flow of dry sand back into the rut after a wheel has passed is obvious to the most casual observer. Therefore, in an attempt to measure sinkage more accurately at the beginning of the tests in Yuma sand, two measurements were used, one of the vertical movement of the hub of the wheel, and the other of the deflection of the tire as measured by a single gage inside the tire. This measurement technique was probably more accurate than any yet tried. However, it depended upon the assumption that the maximum deflection of the tire was occurring directly under the hub. It was later found that this was not necessarily true; and as a consequence, intensive studies were initiated of tire configuration, giving due regard to movement of the hub, position of the soil surface, and continuous deflection of the tire. These studies were begun by studying detailed plots of the instantaneous profile of a smooth tire in the sand on the first pass.

2. The deflected tire surface shown in plate A1 was obtained by plotting the measured deflection onto the undeflected tire surface. It is evident that the maximum deflection does not occur directly under the hub as was once assumed. The effect of this assumption on wheel sinkage can be seen by rotating the deflected tire surface until the maximum deflection is under the hub (refer to plate A1). The wheel sinkage obtained from the deflected tire surface is 4.70 in., whereas that obtained from the rotated deflected tire surface (called "old" sinkage) is 3.72 in. For an idea of the difference between the old sinkage and the "drawing" sinkage determined by the present direct methods (drawing the deflected shape and scaling the total sinkage), refer to plates A1 and A2 and table A1. (Note that these data represent all of the test tires under various test conditions.)

3. Preparation of drawings for every point in every test for which

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* WES Technical Report No. 3-565, Tests with Rigid Wheels, Report 1, Tests in Fat Clay, 1958, May 1961.

sinkage was required would be a tremendous task. Therefore, a means of estimating the correct sinkage, which would require less time and effort, was investigated. The investigation, performed only for the tires tested on Yuma sand, resulted in the development of two equations. Plates A3 and A4 show the relation between the sinkage obtained from a study of the tire profiles and the sinkage computed according to the two respective equations. The data represent the entire range of tire sizes, loads, inflation pressures, and deflections as well as the full range of soil strengths tested (refer to table A1). The equations obviously accomplish their purpose; however, it is stressed that they are considered to apply only to the condition attendant to their development. Other conditions may require different techniques. This point will be investigated carefully in future studies.

4. The first equation

$$z = H + R \sin \beta \sin \cos^{-1} \frac{(R - \delta_{MH}) \cos \beta}{R} - (R - \delta_{MH}) \sin^2 \beta \quad \text{(A1)}$$

was based on the fact that the angle (β) formed by the vertical radius and a radius through the point of maximum deflection was related to the sinkage developed by the wheel, i.e as β increased in a given test, the sinkage increased also (plate A3). The equation was derived from a geometric construction on the drawings of the deflected tire. The second equation

$$z = \frac{2H (\delta_{MH} + H)^2}{H^2 + (\delta_{MH} + H)^2} \quad \text{(A2)}$$

was based on the deflection (δ_{MH}) on the hard surface and the hub movement (H). After several drawings had been made, the fact that the sinkage was related to these two measurements became apparent. Again, when a geometric construction was made on the drawings of the deflected tire, the relation expressed in the second equation emerged. The fact that both these equations produce similar values of sinkage for a series of 12 pneumatic-tired wheels operating in a yielding soil lends credence to the relations developed. These 12 tires represent a range of diameters of

15 to 28 in., section widths of 4 to 9 in., section heights of 3 to 6 in., and ply ratings of 2 to 8. Loads ranged from 100 to 1420 lb, hard-surface tire deflections from 15 to 35 percent, and soil strength from 14 to 73 cone index in the 0- to 6-in. layer. The second sinkage equation (plate A4) was used to compute sinkages for the first-pass traffic in all the Yuma sand tests discussed in the main text of this report.

5. Finally, a more direct method for determining the maximum sinkage is illustrated in plate A5 and described below. After detailed deflection studies were accomplished, it was recognized that these principles could be applied in determining maximum sinkage. The method in plate A5 is recommended for any future study of sinkage, particularly if the instrumentation suggested can be realized. In the schematic drawing in plate A5, the linear gage (with a pivotal tip to prevent any bending of the gage) is shown measuring the tire deflection at the angle θ (any angular position of the radius along which the center line of the gage lies). As the gage measures the deflection, electrical instruments will subtract the measured deflection (δ) from the undeflected radius (R) and multiply the difference ($R - \delta$) by the cosine of θ. It is this quantity, $(R - \delta) \cos \theta$, that will appear as a continuous trace as the wheel rotates. An approximation of such a trace at a negative-slip condition is also shown in plate A5. The positive peak of the trace, $(R - \delta) \cos \theta_{max}$, will be reached as the wheel penetrates the soil to maximum depth. Then $(R - \delta) \cos \theta_{max}$ less $R - \delta_{MH} - H$ (the distance of the original soil surface from the center line of the axle which is continuously recorded during a test) is the sinkage.

Table A1

Test Me[illegible]ements and Sinkage Computations

Yuma Sand

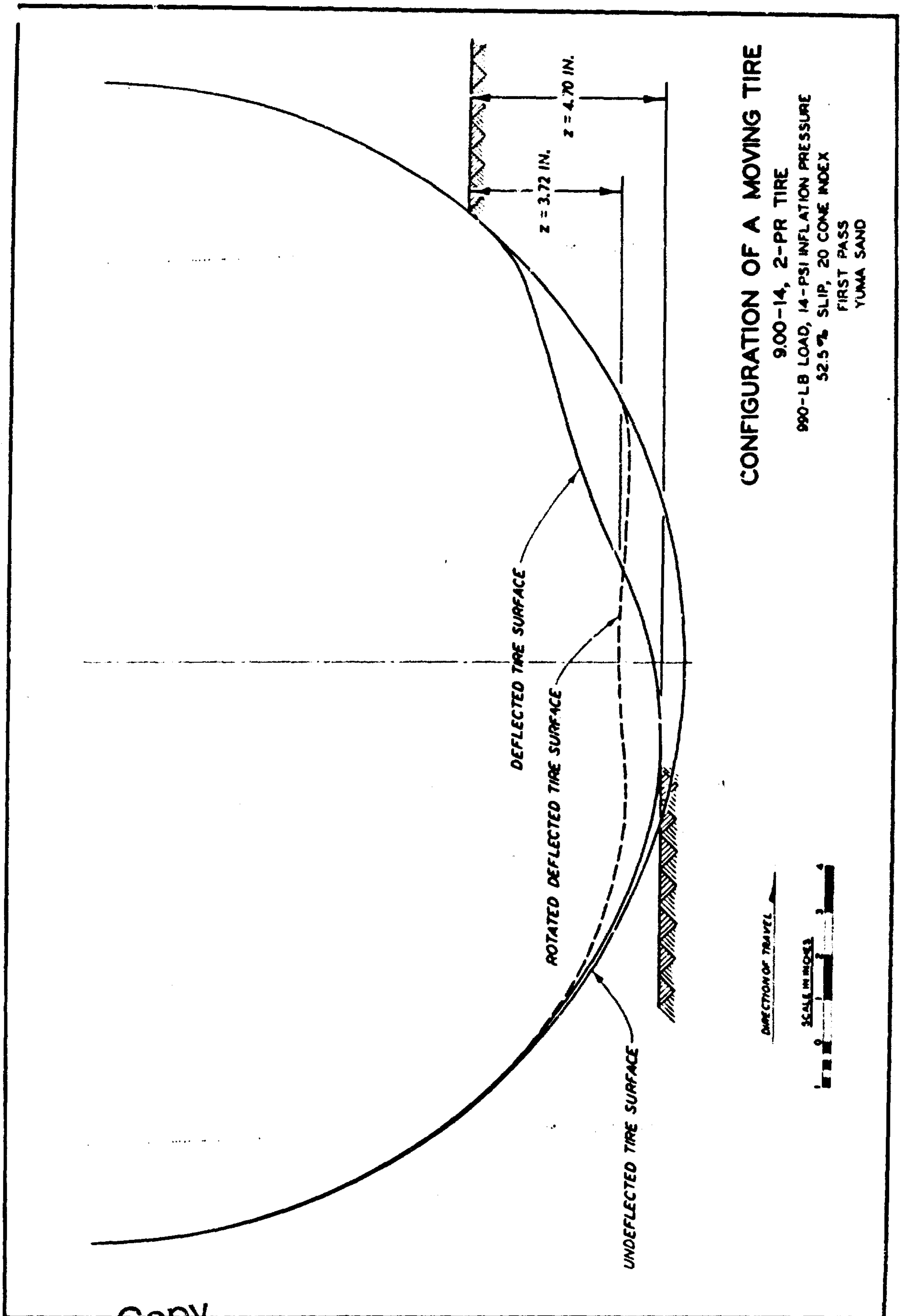
Tire	Test	Station	Cone Index	Inflation Pressure psi	Load lb	Torque ft-lb	Drawbar Pull lb	Slip %	Hard Surface Deflection in.	Undeflected Radius in.	Hub Movement in.	Sinkage, in. Drawing	Sinkage, in. Eq 1*	Sinkage, in. Eq 2**	"Old" Sinkage in.	Relative Position of Points†
							15% Deflection									
9.00-14 (2-PR)	S241	0+94 1+11.7	[illegible]	17.6	450 464	88 210	-32 67	3.4 30.1	0.93	13.575	0.93 1.30	1.45 1.95	1.45 1.90	1.49 1.94	1.24 1.62	2 8
9.00-14 (2-PR)	S233	0+93.9 1+10.4	44	17.6	470 464	89 188	43 130	0.5 10.7	0.92	13.575	0.16 0.24	0.29 0.45	0.34 0.48	0.31 0.46	0.27 0.35	4 6
9.00-14 (2-PR)	S559	0+93.7 1+00.2	68	17.6	452 458	100 238	78 202	3.4 12.3	0.95	13.575	0.09 0.20	0.24 0.38	0.20 0.41	0.18 0.38	0.20 0.25	4 5
9.00-14 (2-PR)	S301	0+94.3 1+01.0 1+07.5	26	40.2	884 872 860	160 276 360	-100 9 49	0.0 12.3 22.2	0.90	13.895	1.77 1.90 2.43	2.45 2.59 3.17	2.41 2.55 3.13	2.46 2.60 3.17	2.19 2.34 2.92	2 4 7
9.00-14 (2-PR)	S539	0+96.3 1+02.8	48	40.2	872 858	150 343	53 136	3.1 14.4	0.88	13.895	0.43 0.63	0.79 1.07	0.78 1.05	0.78 1.07	0.62 0.81	2 5
9.00-14 (2-PR)	S560	0+87.5 0+95.6 1+01.6	81	40.2	888 900 888	24 200 370	-4 130 296	-1.5 3.4 14.0	0.93	13.895	0.16 0.24 0.31	0.39 0.47 0.58	0.34 0.48 0.60	0.31 0.46 0.58	0.32 0.42 0.49	2 4 6
9.00-14 (8-PR)	S405	0+89 1+01.3	28	[illegible]	234 223	0 91	-28 70	-2.1 17.9	0.79	13.055	0.36 0.48	0.66 0.78	0.66 0.83	0.66 0.84	0.61 0.67	1 6
6.00-16 (2-PR)	S525	0+90.6 1+04.0	[illegible]	45.9	886 866	0 330	-70 185	0.2 17.5	0.79	13.87	0.40 0.60	0.75 1.03	0.74 0.99	0.72 1.01	0.59 0.79	1 7
4.50-7 (2-PR)	S470	0+96.5 1+22.3	28	24.3	229 219	29 112	-45 2	-7.6 36.5	0.53	7.43	0.96 1.74	1.36 2.21	1.33 2.17	1.36 2.19	1.25 2.08	2 8
							25% Deflection									
4.50-18 (4-PR)	S352	1+04.6 1+17.8	23	14.3	456 446	166 208	[illegible] 17	18.0 49.9	1.06	13.55	2.03 3.40	2.80 4.29	2.75 4.22	2.80 4.26	2.47 3.93	5 8
4.00-18 (2-PR)	S211 S212	0+94.2 1+15.2	26 46	15.9	340 351	Towed Test	-77 -26	-9.0 -1.5	0.79	13.07	0.97 0.18	1.52 0.37	1.45 0.37	1.49 0.35	1.28 0.33	1 1
							35% Deflection									
9.00-14 (2-PR)	S277	0+87.7 0+99.7	26	5.6	464 454	31 209	0 171	-0.4 15.5	1.86	13.385	0.15 0.32	0.35 0.62	0.34 0.68	0.30 0.63	0.35 0.53	3 6
9.00-14 (2-PR)	S561	0+96.1 1+01.8	47	5.6	454 460	190 242	182 224	7.8 19.4	1.94	13.385	0.12 0.24	0.28 0.49	0.28 0.53	0.24 0.47	0.25 0.34	4 7
9.00-14 (2-PR)	S564	0+94.[illegible] 1+00.2	56	5.6	456 460	76 245	66 238	2.2 10.4	1.96	13.385	-0.03 0.05	0.09 0.19	0.09 0.12	0.09 0.10	0.09 0.17	4 5
9.00-14 (2-PR)	S535	1+01.2 1+07.9 1+13.6 1+18.4 1+25.4	35	12.5	892 864 852 852 844	0 200 324 369 418	-138 45 112 123 66	-5.4 6.1 20.0 34.0 58.5	1.96	13.525	0.96 1.11 1.68 1.97 3.17	1.73 1.97 2.81 3.20 4.71	1.75 1.97 2.74 3.10 4.53	1.73 1.96 2.77 3.15 4.59	1.28 1.50 2.20 2.33 3.56	1 4 4 7 [illegible]
9.00-14 (2-PR)	S562	0+99.3 1+02.[illegible]	53	12.5	884 884	314 430	320 356	10.3 16.3	2.02	13.525	0.29 0.35	0.53 0.75	0.63 0.75	0.57 0.69	0.39 0.41	4 6
9.00-14 (2-PR)	S536	1+01.6 1+07.3	60	12.5	880 858	240 450	214 382	3.8 20.4	2.00	13.525	0.13 0.29	0.29 0.63	0.30 0.63	0.26 0.57	0.18 0.23	4 5
9.00-14 (2-PR)	S339	0+86.8 1+20.3	[illegible]	14.1	1020 996	0 466	-214 56	-11.6 52.5	1.96	13.545	1.16 3.26	2.03 4.70	2.04 4.63	2.04 4.69	1.57 3.72	1 8
9.00-14 (8-PR)	S427	0+95.4 1+30.[illegible]	23	12.9	1220 1104	128 530	-172 -42	-7.6 90.0+	1.95	13.155	1.41 5.65	2.41 7.31	2.38 7.24	2.40 7.28	1.77 6.10	2 8
6.00-16 (2-PR)	S512	1+02.8 1+08.9	24	14.5	908 868	120 284	-16 115	3.7 15.3	1.62	13.80	0.89 1.16	1.57 2.01	1.62 2.00	1.61 2.01	1.11 1.30	2 [illegible]
4.00-18 (2-PR)	S318	1+01.6 1+12.4	44	30.6	1044 990	128 350	-52 27	5.3 27.4	1.20	13.09	0.98 1.75	1.59 2.59	1.60 2.54	1.63 2.59	1.12 2.00	2 6

Note: All tires are tubeless [illegible].
Sinkage is the perpendicular distance between the original soil surface and the lowest point on the center line of the tire.

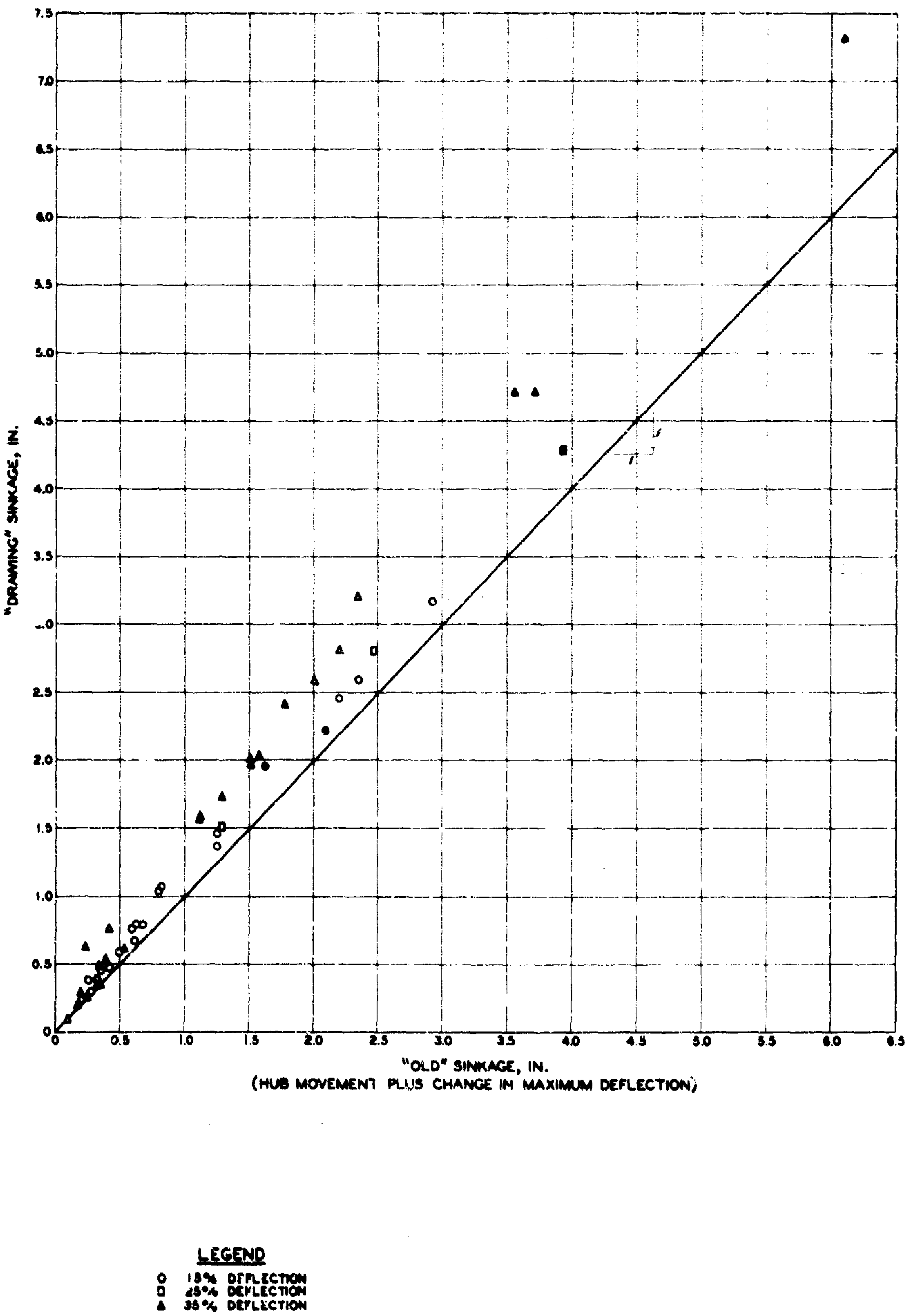
* [illegible] $= \frac{(R - \delta_{HD}) \cos \beta}{R} + (R - \delta_{HD}) \sin^2 \beta$ where $\beta = \tan^{-1} \frac{H}{(R - \delta_{HD}/2) \sin \cos^{-1} \frac{(R - \delta_{HD} - H)}{R - \delta_{HD}/2}}$ [illegible]

** [illegible]

† [illegible]

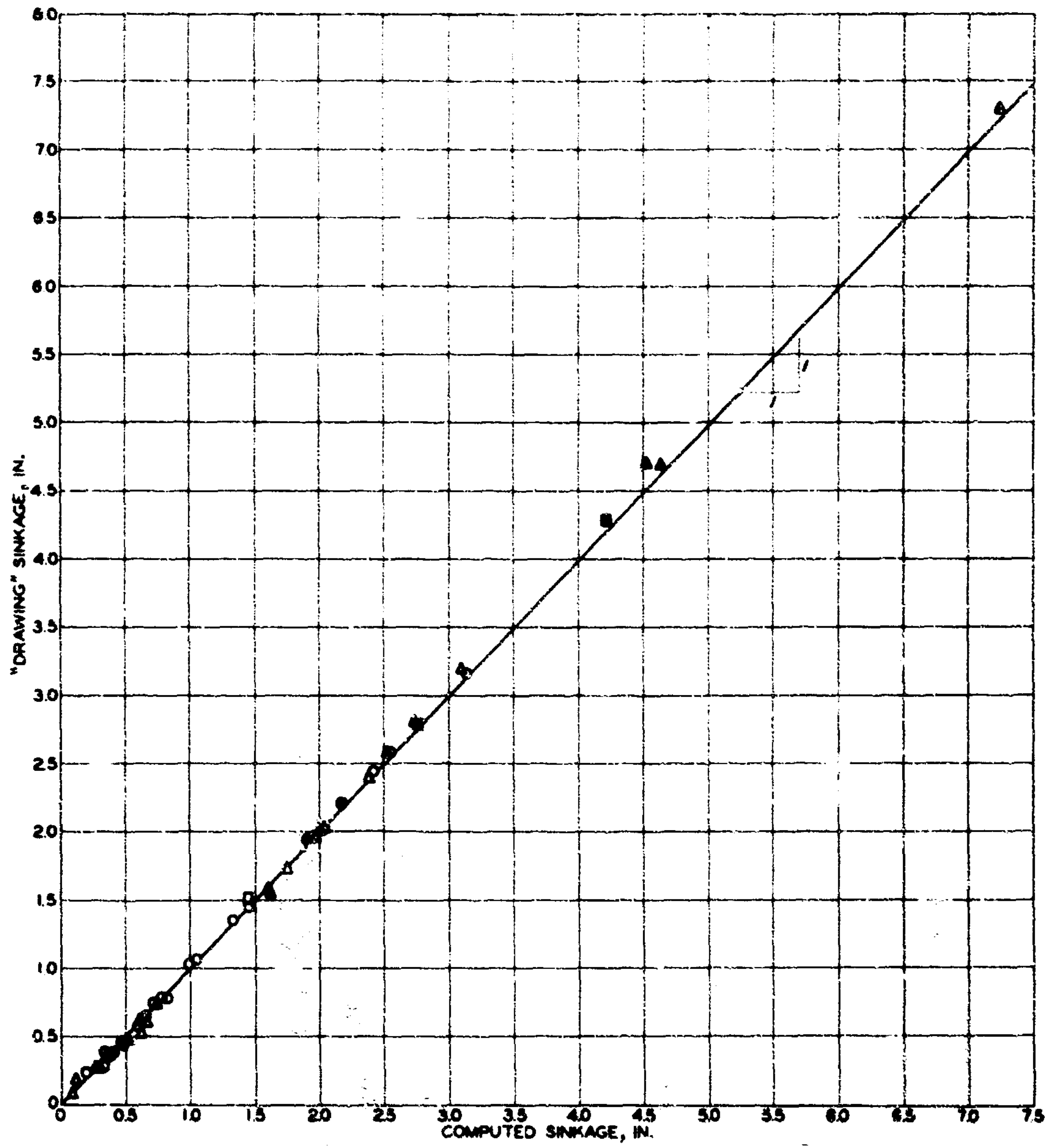


CONFIGURATION OF A MOVING TIRE
9.00-14, 2-PR TIRE
990-LB LOAD, 14-PSI INFLATION PRESSURE
52.5% SLIP, 20 CONE INDEX
FIRST PASS
YUMA SAND



DRAWING SINKAGE VS OLD SINKAGE

FIRST PASS
YUMA SAND



LEGEND

O 15% DEFLECTION
□ 25% DEFLECTION
Δ 35% DEFLECTION

NOTE: SOLID POINTS ARE BEYOND MAXIMUM PULL POINT ON PULL-SLIP CURVE.
VARIOUS TIRES, LOADS, AND SOIL STRENGTHS ARE REPRESENTED.

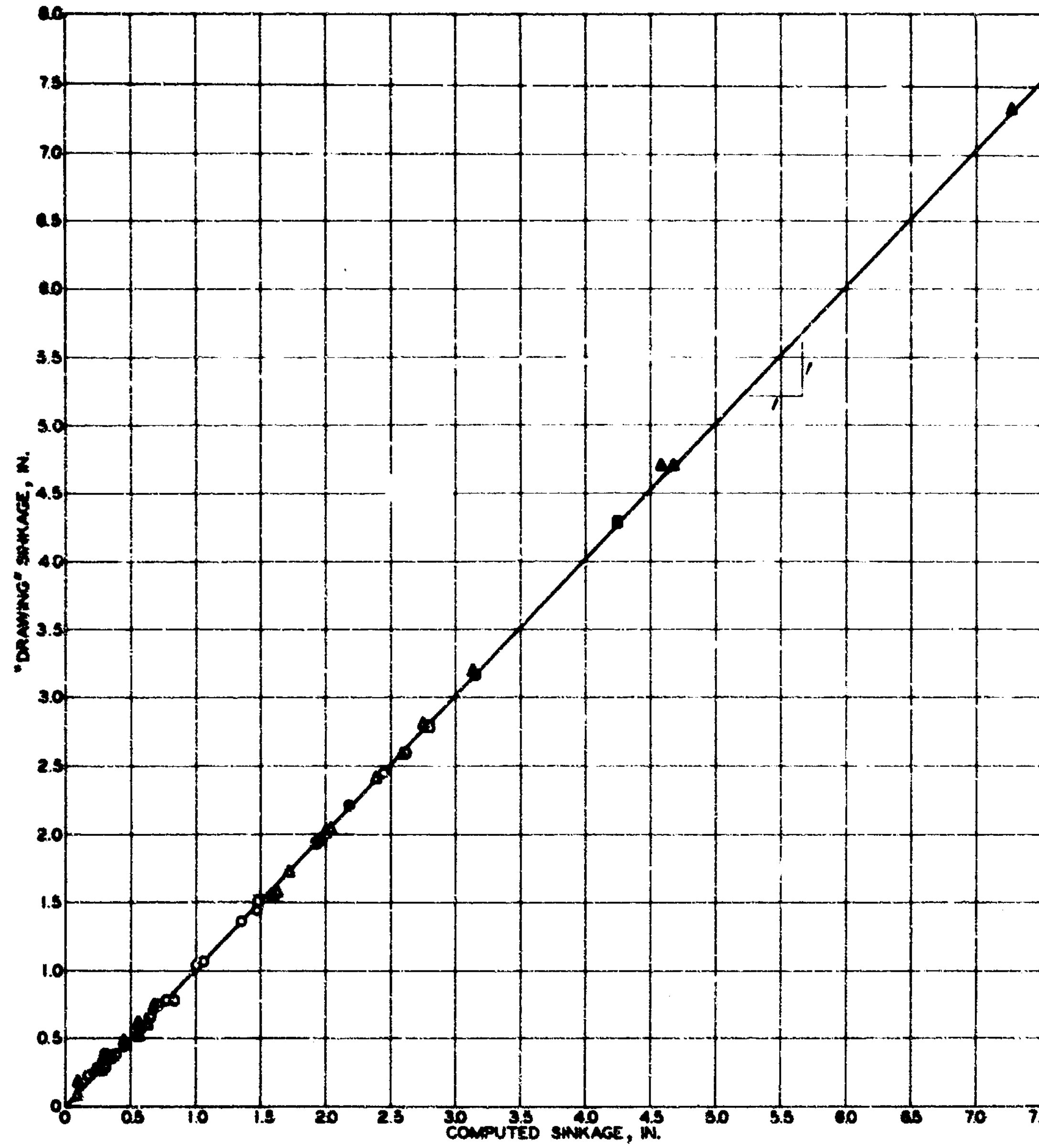
$$\beta = \tan^{-1} \frac{H}{(R - \delta_{MH}/2) \sin \cos^{-1} \frac{R - \delta_{MH} - H}{R - \delta_{MH}/2}}$$

H = HUB MOVEMENT
R = UNDEFLECTED RADIUS
δ_{MH} = DEFLECTION ON HARD SURFACE

$$^{*}Z = H + R \sin \beta \sin \cos^{-1} \frac{(R - \delta_{MH}) \cos \beta}{R} - (R - \delta_{MH}) \sin^{2} \beta$$

DRAWING SINKAGE VS COMPUTED SINKAGE EQUATION A1*

FIRST PASS YUMA SAND



LEGEND

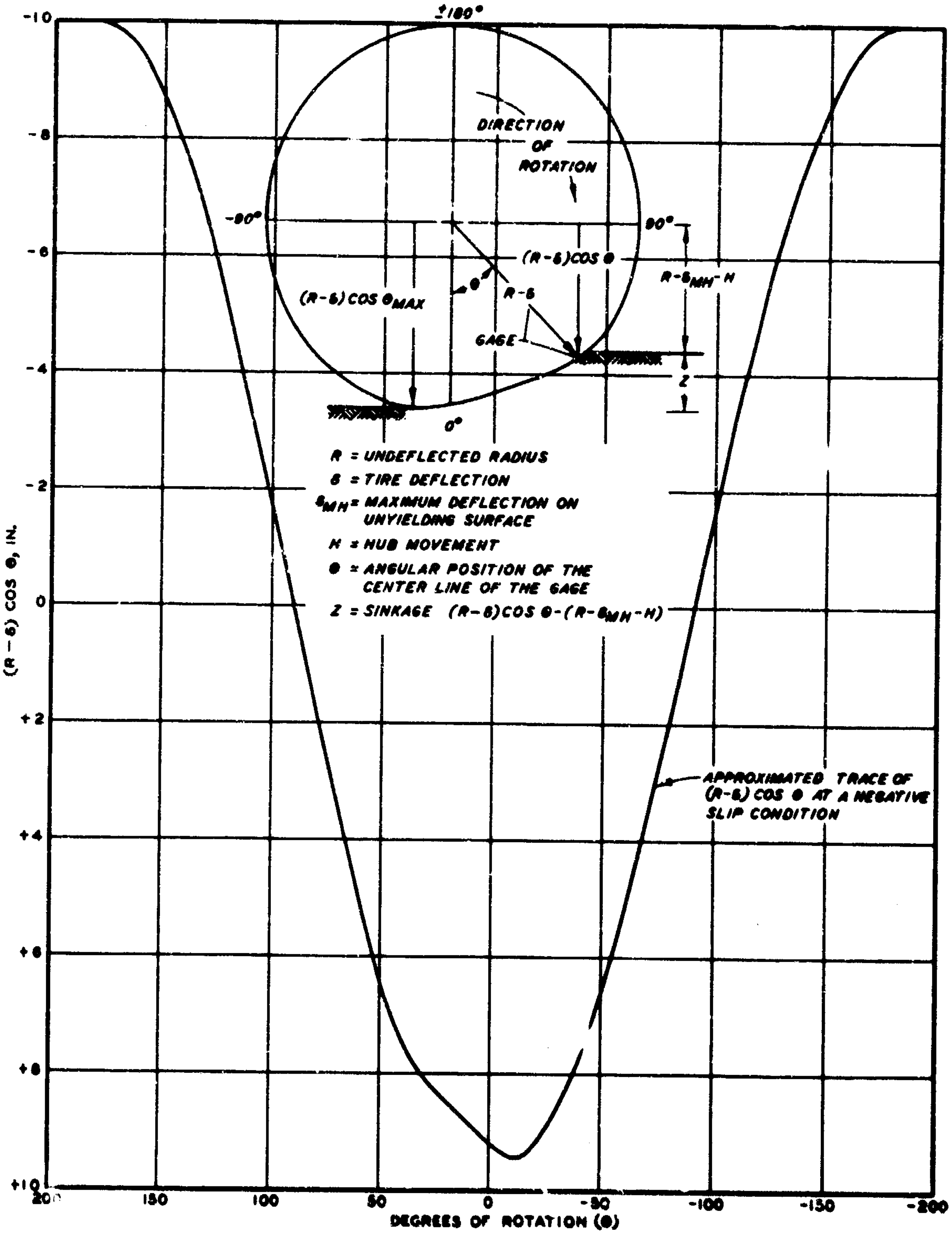
○ 15% DEFLECTION
□ 25% DEFLECTION
△ 35% DEFLECTION

NOTE: SOLID POINTS ARE BEYOND MAXIMUM PULL POINT ON PULL-SLIP CURVE.
VARIOUS TIRES, LOADS, AND SOIL STRENGTHS ARE REPRESENTED.
δ_{MH} = DEFLECTION ON HARD SURFACE
H = HUB MOVEMENT

$$* \; Z = \frac{2H(\delta_{MH}+H)^2}{H^2+(\delta_{MH}+H)^2}$$

DRAWING SINKAGE VS COMPUTED SINKAGE EQUATION A2*

FIRST PASS
YUMA SAND



DIRECT METHOD FOR DETERMINING MAXIMUM SINKAGE