DEFLECTION OF MOVING TIRES

TESTS WITH A 12.00-22.5 TUBELESS TIRE ON ASPHALTIC CONCRETE SAND, AND SILT, 1959-1960

TECHNICAL REPORT NO. 3-516

Report 2

August 1961

U. S. Army Engineer Waterways Experiment Station

CORPS OF ENGINEERS

Vicksburg, Mississippi

ARMY-MRC VICKSBURG, MISS.

PREFACE

This report presents results of a study of the influence of soil strength, tire-inflation pressure, and other factors on the deflection of moving tires. The study was conducted at the U. S. Army Engineer Waterways Experiment Station as part of Corps of Engineers Subproject 8S70-05-001-03, "Mobility Fundamentals and Model Studies" (formerly Subproject 8-70-05-400, "Trafficability of Soils as Related to the Mobility of Military Vehicles").

The tests were made by personnel of the Army Mobility Research Center, Soils Division, under the supervision of Messrs. W. J. Turnbull, S. J. Knight, and D. R. Freitag. Mr. G. C. Downing, of the Waterways Experiment Station Instrumentation Branch, assisted in the design and supervision of construction of the special test instruments and was in charge of the measurement of the deflection data. Mr. A. J. Green, Jr., had the primary responsibility for conduct of the tests and preparation of this report.

Director of the Waterways Experiment Station during the course of the investigation and the preparation of this report was Col. Edmund H. Lang, CE. Technical Director was Mr. J. B. Tiffany.

CONTENTS

	Page
PREFACE	iii
SUMMARY	vii
PART I: PURPOSE AND SCOPE OF STUDY	1
PART II: TEST AREAS AND EQUIPMENT	2
Test Areas	2
Equipment	3
PART III: TEST PROGRAM	8
Dynamic Tests	8
Static Tests	10
Additional Data	11
Presentation of Data	11
PART IV: DISCUSSION OF TEST RESULTS	13
Typical Deflection Patterns	13
Deflection on an Unyielding Surface	14
Deflection in Coarse-Grained Soil	16
Deflection in Fine-Grained Soils	17
Effect of Type of Surface on Tire Deflection	19
PART V: CONCLUSIONS AND RECOMMENDATIONS	21
Conclusions	21
Recommendations	21
LIST OF REFERENCES	23
TABLES 1-7	
PLATES 1-12	

SUMMARY

This study is the second in a series of studies conducted to determine the shape of tires in motion on soils and other surfaces, knowledge of which is expected to lead to a better understanding of the distribution of forces at the tire-soil interface.

Five deflection gages, each consisting of a circular and a linear potentiometer coupled together, were installed in a 12.00-22.5, 12-ply rating, tubeless tire mounted on a loaded 2-1/2-ton truck to measure both translational and rotational movement of points on the inside surface of the tire.

Tests were conducted on four different surfaces: an unyielding (asphalt) surface, a medium-firm coarse-grained soil (sand) surface, and soft and very soft fine-grained soil (silt) surfaces. Vehicle speed, wheel load, tire pressure, temperature of the air within the tire, and number of passes of the vehicle were varied.

Test results showed that the shape of a moving tire is determined primarily by the wheel load, the tire-inflation pressure, and the type of surface traversed. At constant inflation pressure, temperature variations of the air in the tire, within the range experienced during this test program, did not affect the tire-deflection patterns. The magnitude of the tire deflection decreased with repetitive traffic on the silt surface but not on the sand.

Deflection gages with two degrees of freedom are considered adequate for measuring tire deflection.

DEFLECTION OF MOVING TIRES

TESTS WITH A 12.00-22.5 TUBELESS TIRE ON ASPHALTIC CONCRETE, SAND, AND SILT 1959-1960

PART I: PURPOSE AND SCOPE OF STUDY

1. This report, the second in a series on the deflection of moving tires, describes a study of influence of the type of surface traversed on the shape of a moving tire under various conditions of vehicle speed, wheel load, tire temperature, tire-inflation pressure, and number of passes of the vehicle. The study of the induced deflections of the tire is expected to lead to a better understanding of the forces at the tire-soil interface. A knowledge of the magnitude and distribution of forces at the tire-soil interface should provide a better understanding of soil behavior under wheeled vehicles and perhaps lead to the development of wheeled vehicles with markedly greater ability to traverse soft soils.

2. Measurements were made of the inside dimensions of a 12.00-22.5, 12-ply rating, commercial tubeless tire, loaded to 2950 lb and inflated to various pressures, mounted on a 2-1/2-ton truck traveling at various speeds on four different types of surfaces ranging from unyielding to very soft. Continuous measurements of the shape of the cross section of the tire were made by means of five gages placed at selected points inside the tire. Deflection of the test tire also was determined for a range of wheel loadings in static tests on a firm surface only.

PART II: TEST AREAS AND EQUIPMENT

Test Areas

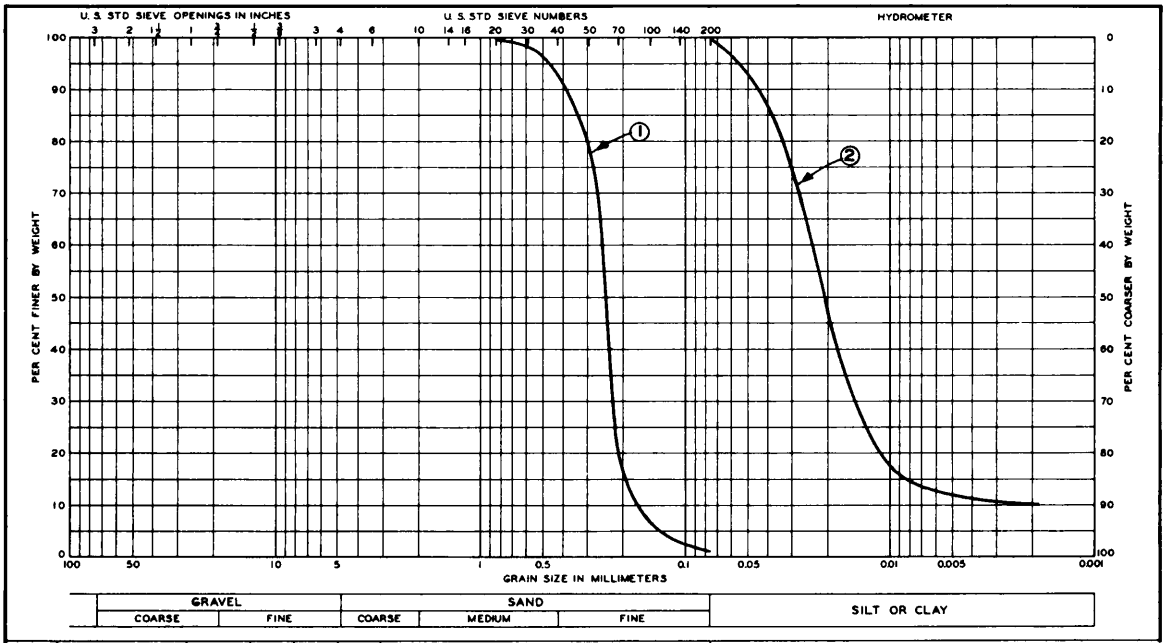
3. Test areas, located on the Waterways Experiment Station reservation, were selected to provide surfaces ranging from unyielding to very soft. Each area was reasonably level and uniform.

Unyielding surface

4. The unyielding surface selected was an asphaltic concrete road with a very low crown. A straight level section was used for the majority of the deflection tests, and a curved section was used for tests to determine the effects of cornering (i. e. turning) on tire deflection. The curve had no superelevation. All tests were run in the center of the road.

Medium-firm coarse-grained soil surface (sand)

5. A fine river sand comprising the bed of a large hydraulic model provided a medium-firm testing surface. A grain-size curve for this sand is shown in fig. 1. The surface of the sand was dry and loose, but at a



NUMBER	DEPTH	NATURAL MOISTURE	L.L.	P.L.	P.I.	CLASSIFICATION
1						SAND (SP)
2	0-12		31	26	5	SILT (ML)

031460-F

Fig. 1. Soil gradation and classification data

depth of 6 in. the sand was visibly damp and very firm. Moisture-content, density, and strength (cone index) data are recorded in table 1.

Soft and very soft fine-grained soil surfaces (silt sections 1 and 2)

6. An area of natural silt along Durden Creek provided soft (rating cone index about 70, section 1) and very soft (rating cone index about 40, silt section 2) surfaces for the deflection tests. Gradation and Atterberg limits data for this soil are shown in fig. 1 and other soil data in table 1. Two 170- by 35-ft sections were cleared of high grass before tests were begun.

Equipment

Truck

7. An M135, 2-1/2-ton, 6x6 military cargo truck normally equipped with six 11.00-20, 12-ply rating tires was used in the tests.

Test tire

8. A commercial 12.00-22.5, 12-ply rating, tubeless tire, designed to operate at approximately the same maximum load and inflation pressure as the 11.00-20 military tire, was used in the program. It was mounted on the left front wheel in all tests. Deflection gages were recessed into the rim so that the tire could be mounted normally.

Deflection gages

9. The deflection gages consisted of linear potentiometers coupled with circular potentiometers (fig. 2). With two degrees of freedom available, any gage could be adjusted to measure

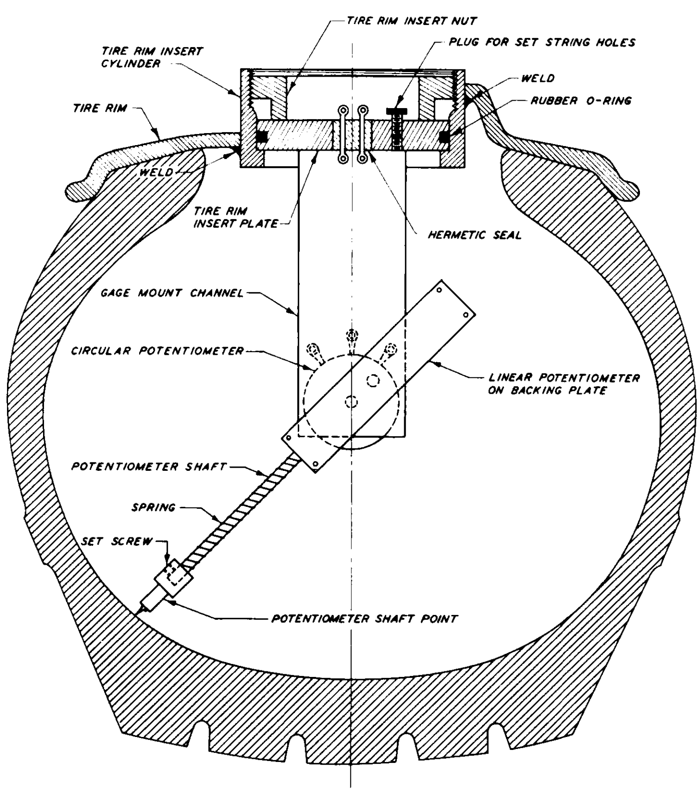


Fig. 2. Tire-deflection gage and mount

translational and rotational movements of any points on the tire cross section in the plane of the cross section. The linear potentiometers had a maximum travel of more than 2 in. and the circular potentiometers a maximum rotation of 270 degrees. According to the manufacturer, these potentiometers are accurate to 0.1 per cent throughout their full displacement.

Thermometers

10. For all tests, ambient temperatures were measured with a mercury thermometer. In addition, during the latter part of the test program, the temperature of the air within the tire was measured with an electrical-resistance thermometer and was recorded continuously on the test record.

Inflation pressure gages

11. In initial tests, tire-inflation pressures were measured with a laboratory-type Bourdon gage. In the late stages of the test program, however, a pressure transducer, bolted to the rim of the wheel and installed through a port near gage 1, was used to obtain a continuous record of the inflation pressure of the test tire during performance of a test. This transducer, Consolidated Electrodynamics Corporation Type 4-380, had an effective range of 0 to 100 psi.

Slip ring electrical system

12. A slip ring electrical system was provided to permit continuous operation of the test wheel without winding of the lead wires. The electrical signals from the deflection, pressure, and temperature gages were conducted into the 20-channel slip ring mounted at the hub on the test wheel. From this point, brush pickups transmitted the signal without amplification to the data recorder. A schematic drawing of the slip ring is shown in fig. 3.

Recorder

13. All electrically transmitted data were recorded by a Midwestern 18-channel, direct-writing oscillograph. Sensitive galvanometers were used with the recorder in the absence of amplification. The recorder and related instrumentation were carried in the truck bed as shown in fig. 4 (page 6).

Power source

14. During the tests, power for the instrumentation was furnished by

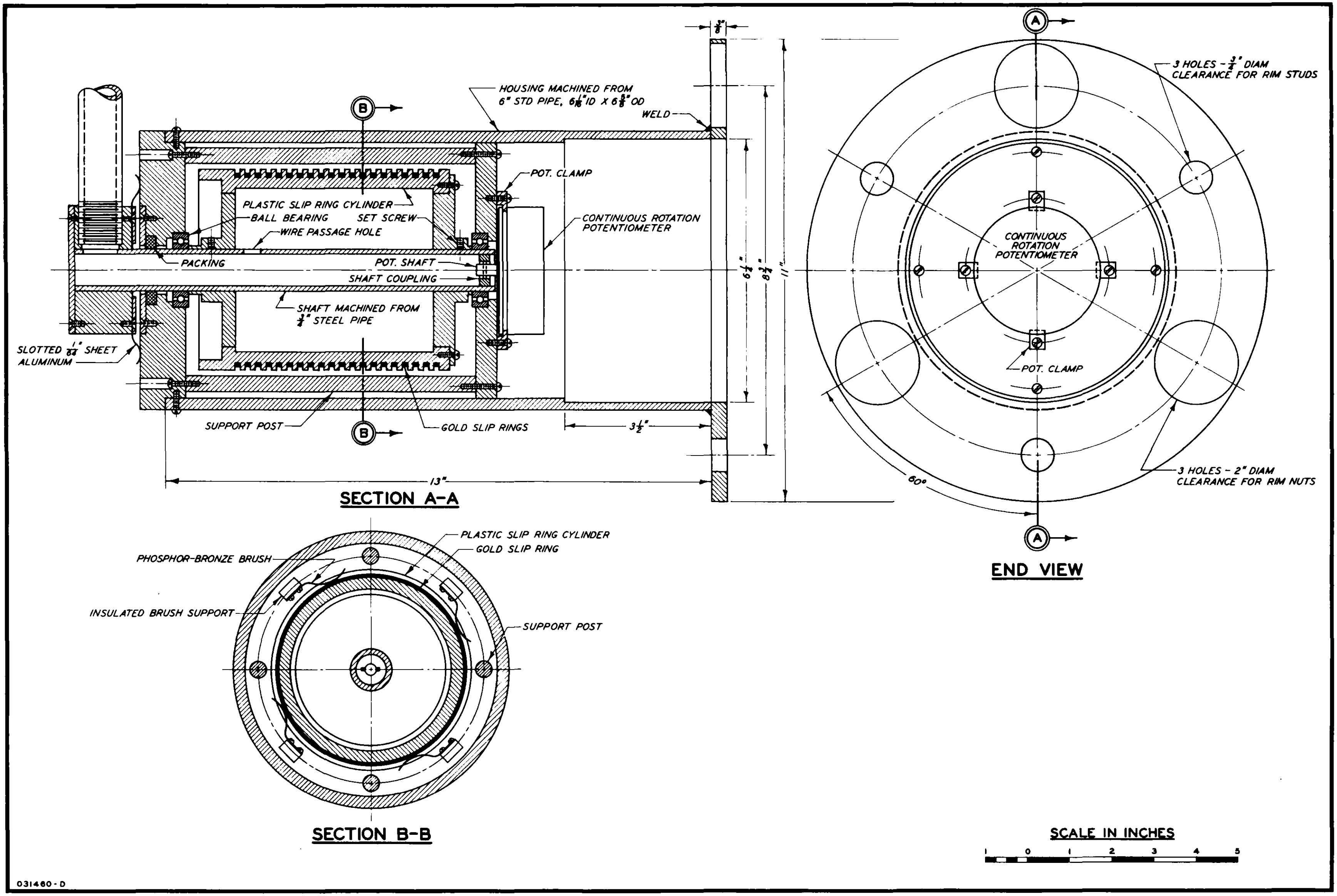


Fig. 3. Slip ring assembly used in tire-deflection study

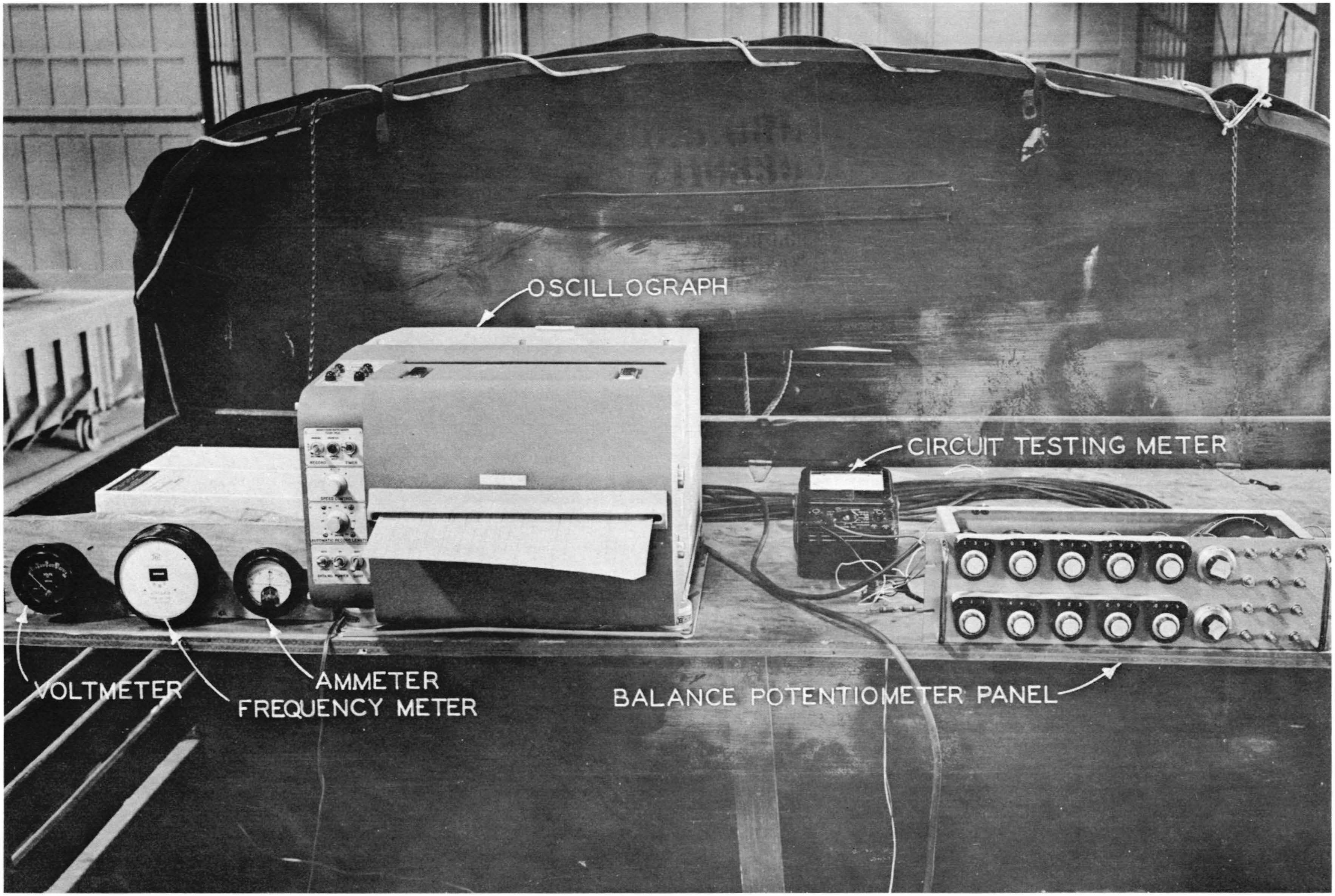


Fig. 4. Instrumentation for recording tire-deflection data

a 1-1/2-kva portable generator mounted on the bed of the M135 truck. Included in the circuitry were a voltage regulator and gages registering voltage, cycles, and amperage. This arrangement allowed operation independent of line power sources.

Continuous-rotation potentiometer

15. A rotating potentiometer was used to relate gage positions to wheel rotation. This instrument was installed in the slip ring and oriented in such a manner that it would mark the oscillograph chart each time deflection gage 1 became perpendicular to the ground surface in the plane of rotation. Further, as the wheel turned through 360 degrees, a line was drawn diagonally across the oscillograph chart as the resistance of the potentiometer increased from the minimum to the maximum. The vertical displacement of this trace was directly proportional to the rotation of the wheel in degrees (see plate 1).

PART III: TEST PROGRAM

Dynamic Tests

Procedure

16. Tests were conducted at tire-inflation pressures of 15, 30, and 60 psi on all test sections. The majority of the testing was done with the vehicle traveling forward at speeds of 3 to 4 mph; however, a few tests were run on the asphalt surface with the vehicle operating at speeds up to about 20 mph. The vehicle was steered in a straight-line path in all tests except the cornering test. The same load on the tire, 2950 lb, was used in all dynamic tests.

17. Deflection measurements were made during repetitive traffic tests on the sand and silt sections. On the sand section, three passes were made in the same tracks at a given tire-inflation pressure with deflection data being recorded on each pass. Soil data and samples were collected before and after each pass. On the two silt sections the number of passes made varied with soil strength and inflation pressure. When the soil strength permitted, 10 passes were made; when it did not, the test terminated when the vehicle became immobilized. Deflection data were taken on the first and last passes for each set of test conditions with one exception. On silt section 2 during the 60-psi test, the vehicle was immobilized on the third pass. Since this immobilization was not anticipated, deflection data recorded on the second pass were used. Soil data were taken before traffic and each time deflection data were recorded.

Data obtained

18. Data obtained in the dynamic tests consisted of continuous records of the movement of several points on the inside surface of the tire, i. e. the deflection of the tire at those points, while the tire traversed a given surface. The reference or datum for a given point was the position of that point when no load was applied to the tire. The shape and dimensions of the tire for a no-load condition were unchanged throughout the range of inflation pressures used in the study.

19. Five points on the inside of the tire were selected for location of deflection gages. Fig. 5 shows the gage locations in the cross section of the tire, and fig. 6 shows the gage locations in the plane of tire

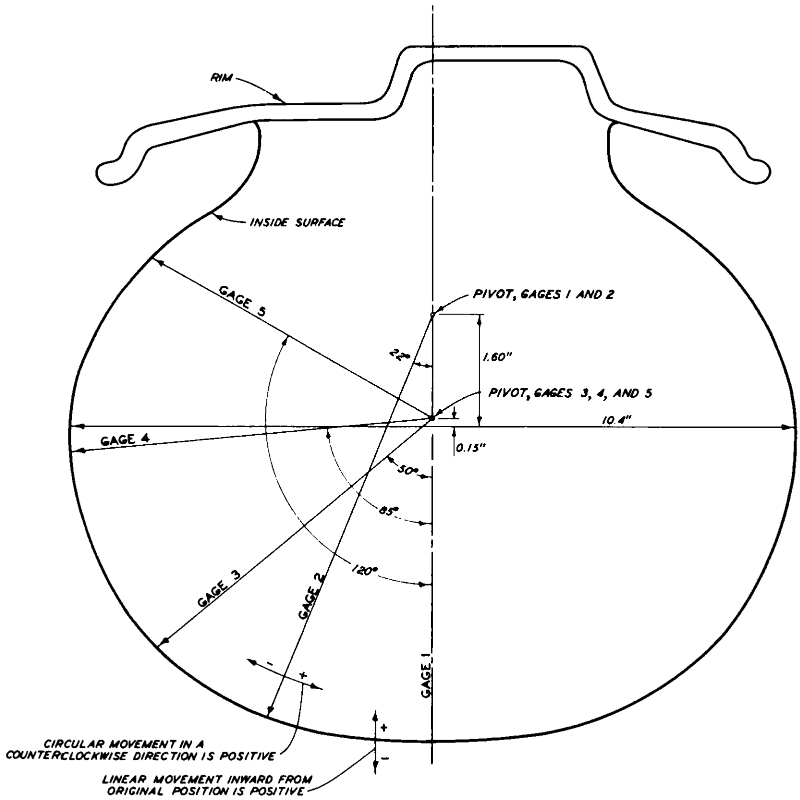


Fig. 5. Gage locations in cross section of tire (view from front of truck)

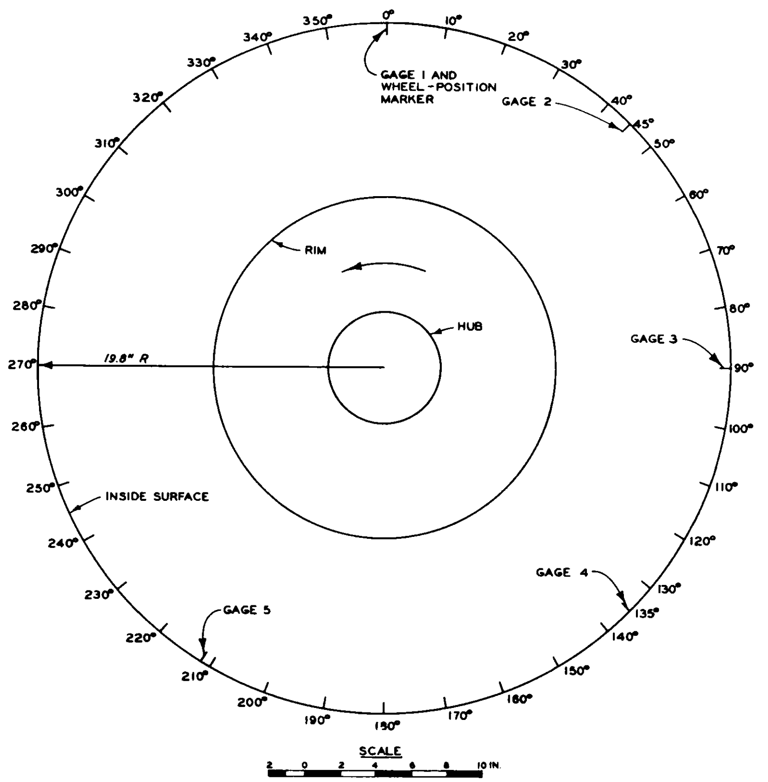


Fig. 6. Gage locations in plane of tire rotation

rotation. The locations described in the following subparagraphs are the original gage positions. Each gage returned to its original position, or very nearly so, during each wheel revolution.

- a. Gage 1. This gage was placed on the vertical center line through the cross section of the tire. It was pivoted 1.60 in. above the centroid of the cross section. Under usual conditions it measured movement of the inner surface of the tire in a direction perpendicular to the rim.
- b. Gage 2. This gage was placed at an angle of 22 degrees from the vertical center line through the cross section of the tire and was pivoted 1.60 in. above the centroid of the cross section.
- c. Gage 3. This gage was pivoted 0.15 in. above the centroid of the cross section of the tire at an angle of 50 degrees from the vertical.
- d. Gage 4. This gage was placed 85 degrees from the vertical. It was pivoted 0.15 in. above the centroid of the cross section of the tire. This gage measured the flexing of the tire at a point near the center of the sidewall.
- e. Gage 5. This gage was placed 120 degrees from the vertical center line through the cross section of the tire and was pivoted 0.15 in. above the centroid of the cross section.

20. For all dynamic tests except the cornering tests, the deflection gages were placed so that they measured the deflection of one side of the cross section of the tire. Gages 2, 3, 4, and 5 measured the deflection of that sidewall of the tire toward the interior of the vehicle, and gage 1 lay on the vertical center line through the cross section of the tire. In the cornering tests, the gages were arranged as follows: gage 1 remained in the vertical position; gages 2 and 5 were placed in a horizontal position near the center of the sidewall, one gage being placed on one side of the tire and the other on the opposite side; gages 3 and 4 were positioned 50 degrees from the vertical center line through the cross section, and the gages again were placed on opposite sides of the tire.

Static Tests

21. Deflection of the test tire was determined for a range of wheel loadings in static tests conducted on a concrete floor. In these tests, the load on the tire was varied from 0 to 3400 lb by lifting the wheel

incrementally by a jack or loading it with dead weights, as required. Load was measured with a beam-balance platform scale. The same inflation pressures used in the dynamic tests (15, 30, and 60 psi) were used.

22. In the static tests, load-tire deflection relations were developed. The vertical deflection of the tire was determined at only one point, at the center of the cross section at the vertical plane through the axle center line.

Additional Data

23. Additional data collected included soil, temperature, and inflation pressure data. The soil data consisted of strength (cone index) and rut depth before, during, and after traffic; moisture content and density before traffic; and remolding index of the silt before traffic. The tire temperature was recorded during each individual test run but it did not vary more than 5 degrees (Fahrenheit) for any specific run. The change in inflation pressure during any individual test did not exceed 1 psi. Therefore, since the variations were small and did not influence the results, temperature and inflation-pressure-change data are not tabulated in this report.

Presentation of Data

24. For the most part, the data collected in this program are presented as drawings of the cross section of the tire (plate 3 and plates 6-10). Due to the arrangement of the gages in the test tire, deflections of only one-half of the bottom of the tire and one sidewall (that toward the interior of the test vehicle) were actually measured. The deflected tire was assumed to be symmetrical, and the other half of the tire is drawn similar to the instrumented half. This explains why the left half of the tire cross section in the "deflection characteristics" plots is drawn with a solid line (actual average measured deflection) and the right half with a dashed line (assumed deflection). The cross sections represent the average of all deflections measured for each test condition, and most tests consisted of nine complete revolutions of the wheel. Each point

plotted on the cross section indicates the average deflection recorded by a particular gage when its position coincided with the desired reference plane (e.g. directly under the axle center line, 10 degrees before, 30 degrees after, etc.). The vertical plane through the axle center line will hereafter be referred to as the vertical reference plane. Those reference planes through the axle center line that are not vertical will be designated by their angle, in degrees, from the vertical. Planes forward of the axle are indicated by a plus sign and those after by a minus sign. In plots intended to show variations in the deflection of the tire with respect to speed, load, inflation pressure, position of the reference plane, or surface strength, the readings from selected gages are utilized. The data on which the graphical presentations are based are recorded in tabular form (tables 2-7) to provide greater detail.

PART IV: DISCUSSION OF TEST RESULTS

Typical Deflection Patterns

25. A typical oscillograph produced by the deflection gages is shown in plate 1. It can be seen that the vertical center-line gage (No. 1) began to register significant deflection approximately 60 degrees before the gage reached the vertical reference plane. Deflection of the linear potentiometer increased slightly from 60 to 20 degrees from the vertical reference plane, then increased rapidly to a maximum at the vertical reference plane, and returned to zero nearly symmetrically. The linear potentiometer in gage 2 produced a similar pattern. Circular potentiometers in gages 1 and 2, which measured rotational movement in the reference plane, registered a maximum deflection concurrently with that measured by the linear potentiometers in gages 1 and 2. Gages 3, 4, and 5 were placed on the lower, center, and upper portions of the sidewall, respectively. The linear potentiometers in these gages often recorded a double-peaked or saddle-shaped curve with the peaks spaced 30 to 40 degrees apart in the plane of tire rotation. Normally, the vertical reference plane was reached at a point equidistant between the two peaks of the linear potentiometer trace. Maximum deflection of the circular potentiometers in these three gages generally occurred at the position of the vertical reference plane. The deflection pattern illustrated is typical of that produced at 30- and 60-psi inflation pressures; at 15 psi, gages 3 and 4 produced a single peak on all surfaces, and on asphalt, gage 5 also produced a single peak.

26. The general pattern of behavior of the deflection gages described in the previous paragraph prevailed in a majority of the tests. However, certain distinct variations were observed that could be associated with the specific test conditions. These variations are noted in subsequent paragraphs. Within the sequence of tire revolutions for a particular test there were some deviations from the norm, such as shifting of the peaks, or changes in the magnitude of the deflection. These inconsistencies were most frequent on the rough surfaces or in tests where it seemed likely that the torque on the test wheel was somewhat variable.

Deflection on an Unyielding Surface

Deflection versus static load and inflation pressure

27. Results of the static load tests are presented in plate 2. The load-deflection curves show that the deflection of the tire at the center line of the vertical reference plane is directly proportional to load and inversely proportional to inflation pressure. These data for the 12.00-22.5 tubeless tire agree qualitatively with tire data recorded by Von Bomhard[1]* which show that for both static and dynamic loading conditions the vertical and transverse (sidewall bulge) deflections of a tire at the vertical reference plane are directly proportional to wheel load and inversely proportional to inflation pressure.

Deflection versus dynamic load and inflation pressure

28. The cross sections of the moving tire at the vertical reference plane on a firm surface at three inflation pressures are plotted in plate 3 from the data in table 2. At most gage positions, the difference between 60- and 30-psi deflections was much less than the difference between 30- and 15-psi deflections. At the 15-psi inflation pressure, gages 3, 4, and 5 produced single-peaked curves, with the maximum deflections occurring at the vertical reference plane. Double-peaked curves were observed with these gages at both 30- and 60-psi inflation pressures, and the deflections at the vertical reference plane were less than the maxima. Also, the general shape of the bottom portion of the cross section changed as a result of reducing the inflation pressure. At 60 psi, the perimeter of the tire cross section was a relatively smooth curve, whereas at 15 psi, it was convoluted. It is worthy of note that the 15-psi cross section probably was influenced by the thick exterior tread in contact with the firm surface (see fig. 2).

29. The appearance of the deflected cross sections shown in plate 3 is somewhat different from that of the sections representing the same conditions presented in Report 1 of this series.[3] The difference represents

---

* Raised numerals refer to similarly numbered items in List of References.

increased accuracy of testing and is believed to have resulted from two factors: (a) the improved gages used in the present study, which incorporated measurements of both linear and rotational movements of the gage point, and (b) the placement of two gages in a critical portion of the tire cross section where only one had been placed previously (gage positions 2 and 3 in this report, gage position 5 in Report 1). Deflections measured at gage positions 1 and 4 in both test programs were in close agreement.

Deflection versus speed

30. The results of tests run on the asphaltic concrete pavement to determine the effect of vehicle speed on tire deflection at two inflation pressures (15 and 30 psi) are tabulated in table 6. The listed tire deflections are those registered on a single revolution of the wheel; the corresponding vehicle speeds are averages calculated for the same revolution from the oscillograph time record. Only the linear deflections at gage position 1 are shown. The statistical correlations between vehicle speed and tire deflection, derived from the data in table 6, are shown in plate 4. A few data points at approximate vehicle-speed intervals of 1 mph are included in this graph to illustrate the extent of data scatter.

31. From plate 4 it can be seen that at both inflation pressures, tire deflection generally decreased slightly as vehicle speed increased. This trend is in accord with published data on other tires.[2] At 15-psi inflation pressure, the effect is almost three times as great as that experienced at 30 psi. However, even at 15 psi, the deflection at 20 mph is only about 10 per cent less than at 2 mph. Thus, variations in deflection due to changes in vehicle speed were of lesser magnitude than variations from other causes, such as surface irregularities and dynamic oscillations of the vehicle's suspension system.

Deflection versus air temperature in tire

32. Two special tests were conducted to determine the effects of tire temperature on deflection. Testing was conducted at speeds up to 10 mph on the asphaltic concrete pavement with the tire-inflation pressure at 30 psi. All conditions were identical in both tests except for tire temperature. One test was conducted when the temperature of the air in the tire was 66 F and the other when it was 104 F. These temperatures

are representative of the range experienced during this test program. Neither the magnitude of the peak deflections nor the general deflection patterns were noticeably different at the two test temperatures. Although these tests indicated that tire-deflection measurements are not influenced by temperature if inflation pressure is held constant, it is possible that some effect may be noted under more extreme temperature conditions.

Effect of cornering force on deflection

33. Tire-deflection measurements were made as the truck executed a 38-ft-radius turn on the asphaltic concrete road at a speed of approximately 15 mph. Unfortunately, it was found that some of the gages did not return to their original position after each run. The data recorded on the oscillograph trace indicated that the tire deflected enough to free the point of the deflection gages from the tire sidewall. Although gage difficulties prevented the drawing of accurate tire cross sections, some general observations could be made concerning the cornering-test data. The maximum deflection of the vertical gage (No. 1) was smaller when the vehicle was turning left than when it was steered in a straight-line path. During a right-hand turn, the deflection was greater than in straight-line travel. These deflections are shown in plate 5. The observed changes in deflection during turns probably were caused by the transfer of load from the inner to the outer wheels due to centrifugal force (note: test tire was on left front wheel). In both left and right turns, the tire was laterally distorted toward the inside of the turn; the distortion was detected by visual observation as well as by the fact that all gages rotated toward the inside of the curve.

Deflection in Coarse-Grained Soil

34. Tire-deflection tests in sand were conducted at three tire-inflation pressures--15, 30, and 60 psi; three passes were run in a single path at each inflation pressure. Deflection data are shown in table 3 and the related soils data in table 1.

Deflection versus inflation pressure

35. Cross sections of the tire on the first pass at each of the three inflation pressures are plotted in plate 6 from data in table 3;

soil data were taken from table 1. A progressive increase in over-all deflection occurred with decrease in tire pressure, but the deflection trace of gages 3 and 4 changed from a double- to a single-peak curve. As on the asphaltic concrete surface, a greater change in deflection occurred as a result of reducing the inflation pressure from 30 to 15 psi than from 60 to 30 psi. At 15-psi inflation pressure, the bottom portion of the cross section became slightly convex upward (see plate 6). This effect was not as pronounced as in the earlier studies described in Report 1.[3] The reason for this difference has not been established but it probably reflects the difference in the firmness of the sand (cone index about 80 in former tests and about 120 in present tests) or, as mentioned in paragraph 29, the more strategic gage location in this study.

Deflection with repetitive traffic

36. Cross sections of the tire on three successive passes are shown in plate 7 for inflation pressures of 15, 30, and 60 psi. It can be noted that very little change in the shape of the cross section resulted from the repetitive traffic. The consistent tire shape is of some interest since in each case approximately two-thirds of the final rut depth was formed on the first pass of the vehicle, and the firmness of the surface decreased slightly during traffic. Cone index in the top 6 in. before each pass and rut depth after each pass are noted in plate 7.

Deflection in Fine-Grained Soils

37. Tests were conducted on soft, natural silt soil at inflation pressures of 15, 30, and 60 psi. Two sets of test data were obtained. The test conditions for each set were identical except for the firmness of the soil in the test areas. Data were recorded on the first and last passes (usually the tenth pass except when an immobilization was anticipated).

38. The deflection data obtained in tests on the two silt sections are shown in tables 4 and 5, and the soils data in table 1. Unfortunately the data obtained on these sections do not appear wholly reliable. Obvious difficulties were experienced with the instrumentation during the testing, and in some instances questionable results were revealed when the raw data were reduced. Some of the data obtained at the 15-psi inflation pressure

(in both silt sections) are particularly strange. For example, the linear potentiometer of gage 2 indicated essentially the same unusually large deflection for the first and tenth passes on section 1 and on the first pass on section 2. Similarly, the circular potentiometer of gage 3 registered an extraordinary amount of rotational movement on the first pass in section 1.

39. Some of the gages were checked by comparing the readings of two different gages placed at the same relative position on the cross section of the tire. These check tests provided reliable data for the deflection of the tire at gage points 1 and 4 for several soil strength conditions. No readings were made at other gage points during these check tests, however. The pertinent data from these tests are listed in tables 4 and 5 as check tests 1 and 2, respectively. The corresponding soil data are incorporated in table 1 under the same headings.

40. Before the gage problems could be completely resolved, seasonal changes in the strength of the soil prevented reruns of the soft-soil tests. However, at least some of the unusual results are believed to have been due to factors other than the instrumentation; e.g. irregular soil conditions, torque on the tire, the sides of the ruts, etc. Therefore, it is considered desirable that further studies be made on prepared lanes of soft soils so that better control over some of the variables can be obtained.

Deflection versus inflation pressure

41. The shape of the tire cross section on the first pass over silt sections 1 and 2 is shown in plates 8 and 9, respectively, for the 30- and 60-psi inflation pressures. The cross sections for the 15-psi data are not shown because of their doubtful validity. Although the data are inadequate to support definite conclusions, it does appear that the effect of a change in inflation pressure on the shape of the cross section is generally similar to that observed in the tests on the asphalt and sand test sections.

Deflection versus repetitive traffic

42. The variation in deflection of the cross section of the test tire with repetitive traffic for the 30-psi inflation pressure on silt sections 1 and 2 is shown in plate 10. It can be seen from this plate that the deflection of the tire decreases as a result of the repeated passes in

the same path. Measurements taken in the wheel path during traffic (table 1) show that the repeated passes of the test vehicle also caused the soil to become softer and the ruts to become deeper. It seems probable that these phenomena are related. The recorded data show similar effects at the 15- and 60-psi inflation pressures.

43. It should be noted that the left rut in most tests tended to be deeper than the right, and this may have influenced the test results. Deeper rutting on one side causes an increase in the wheel load on that side, which would affect the magnitude of the tire deflections. The tilt of the vehicle could also tend to apply a lateral force to the tire or to press the tire against the side of the rut. In this event, the tire would probably have been distorted to one side and would no longer have been symmetrical. Since all the gage points were on one side of the tire, lateral distortion (if there were any) could not be detected by the gages.

Effect of Type of Surface on Tire Deflection

44. The deflections registered at the 1 to 5 mph speed range with the 2950-lb wheel load by gages 1 and 4 over a total of 80 degrees of wheel rotation are shown in plate 11. The rotational movement of the gages has not been considered in the graphical presentation. All surface types and tire pressures tested are represented. These data are recorded also in table 7. The check test data for the 15-psi inflation pressure on the silt sections were used in plotting plate 11 rather than the results of the initial tests at this pressure.

45. In general, the vertical tire-deflection patterns (gage 1) are similar in shape for all surfaces, and there is a trend for the greatest deflection to occur on the strongest surfaces at any one inflation pressure. Results of the initial tests at 15 psi on the silt sections are exceptions to this trend, but the validity of these data is uncertain as was noted previously. The horizontal deflection patterns are similar for all surfaces. At 15-psi inflation pressure the horizontal deflection gages indicate a broad single-peaked deflection pattern, but at 30- and 60-psi inflation pressures shallow, double-peaked curves occur. On the asphalt section and the relatively firm silt section, only small differences in

the magnitude of 30- and 60-psi horizontal deflections were noted. In the sand and the comparatively soft silt section, larger differences were found to exist between the 30- and 60-psi horizontal deflections.

46. A direct comparison of the sidewall bulge with the vertical deflection of the tire for the three general types of surfaces studied is shown in plate 12. Data from tables 2-5 of this report and from tables 1, 2, and 6 of Report 1 are shown in this plate. The vertical deflection is that recorded at the gage 1 position and the sidewall bulge is the deflection measured by gage 4, this report, or gage 3, Report 1. All deflections plotted are at the vertical reference plane. Tests conducted at tire-inflation pressures ranging from 10 to 70 psi are included in the plot.

47. The test data indicate that for each type of surface a definite relation exists between the vertical deflection of the bottom of the tire and the accompanying sidewall bulge. The relations are similar for the asphaltic concrete and sand surfaces, but the trend is quite different for the soft, fine-grained soil surfaces. At the high tire pressures (low vertical deflections) the sidewall bulge is greater, for a given vertical deflection, on the soft silt or clay surfaces than on either the sand or the asphalt surface. At low tire pressures, the sidewall bulge on soft clay or silt is about the same as or slightly less than on the other two surfaces.

PART V: CONCLUSIONS AND RECOMMENDATIONS

Conclusions

48. The data collected during this study are considered an adequate basis for the following conclusions concerning the deflection of the 12.00-22.5, 12-ply rating, tubeless tire on the surfaces tested.

- a. Under static loading on an unyielding surface, tire deflection increases consistently and systematically with increases in wheel load or with decreases in tire-inflation pressure.
- b. The shape of a moving tire is determined primarily by the wheel load, the tire-inflation pressure, and the nature of the surface on which it is traveling. In turns, lateral inertial forces also influence tire deflection.
- c. The maximum deflection on an unyielding surface at the center line of the cross section of the tire decreases only slightly as vehicle speed increases through the range from 0 to 20 mph. Increased speed also causes a greater dispersion of the data, probably as a result of oscillations of the vehicle's suspension system.
- d. Within the temperature range experienced in these tests (66 to 104 F), tire deflection is not affected by temperature of the air within the tire if inflation pressure is held constant.
- e. In general, the largest tire deflections occur on the firmest surfaces, and the smallest deflections on the softest surfaces.
- f. The magnitude of the tire deflection decreases with repetitive traffic on a natural, wet, fine-grained soil (probably, at least in part, due to the decreasing soil strength) but remains about the same on sand.
- g. Deflection gages with two degrees of freedom are considered adequate for measuring tire deflection.

Recommendations

49. It is recommended that:

- a. Tests be conducted to explore more completely the effect of the strength of both sand and wet clay on the deflection of a tire traveling thereon.
- b. Additional tests be conducted on natural fine-grained soils to study the effect on tire-deflection patterns of the

progressive loss in soil strength caused by repetitive traffic.

c. Tests be conducted with a variety of tires to relate size and stiffness to the observed tire-deflection patterns.

d. When possible, tire deflection be studied with a single-wheel test rig to eliminate the influence of a vehicle's suspension system.

e. Further tests be conducted in prepared lanes of soft soils so that better control over some of the variables can be obtained.

LIST OF REFERENCES

1. Bomhard, Franz Josef von, Method of Measuring the Dynamic Wheel Load of Motor Vehicles. R. Oldenburg Verlag, Munich, 1956.

2. Bonse, R. P. H., and Kuhn, S. H., A Study of the Dynamic Forces Exerted by Moving Vehicles on a Road Surface. National Institute for Road Research, South African Council for Scientific and Industrial Research, Pretoria.

3. U. S. Army Engineer Waterways Experiment Station, CE, Deflection of Moving Tires; A Pilot Study on a 12X22.5 Tubeless Tire. Technical Report No. 3-516, Report 1, Vicksburg, Miss., July 1959.

Table 1

Soil Data, Sand and Silt Test Sections

Track	15-psi Tire-Inflation Pressure: Pass No.	CI	RCI	Rut Depth in.*	Moisture Content %	Dry Density lb/cu ft	30-psi Tire-Inflation Pressure: Pass No.	CI	RCI	Rut Depth in.	Moisture Content %	Dry Density lb/cu ft	60-psi Tire-Inflation Pressure: Pass No.	CI	RCI	Rut Depth in.	Moisture Content %	Dry Density lb/cu ft
Sand Section																		
	0	123		0.00	4.4	93.7	0	130		0.00	4.4	93.7	0	100		0.00	8.5	95.5
	1	119		0.50	---	--	1	92		0.79	---	--	1	88		1.96	---	--
	2	117		0.77	---	--	2	79		0.83	---	--	2	74		2.33	---	--
	3	114		1.07	---	--	3	108		1.17	---	--	3	91		2.40	---	--
Silt Section 1, First Run																		
Left	0	116	77		30.8	87.9	0	127	79	0.00	30.7	89.6	0	125	78	0.00	30.9	89.4
Right	0	129	--		---	--	0	108	65	0.00	--	--	0	104	65	0.00	--	--
Left	1	123	--	0.55	---	--	1	123	--	0.66	--	--	1	112	--	1.36	--	--
Right	1	140	--	0.50	---	--	1	102	--	0.61	--	--	1	114	--	1.18	--	--
Left	10	107	--	1.78	---	--	10	104	--	2.39	--	--	10	80	--	4.25	--	--
Right	10	133	--	1.55	---	--	10	94	--	2.06	--	--	10	83	--	3.17	--	--
Silt Section 2, First Run																		
Left	0	100	46		33.2	85.1	0	66	28	0.00	34.9	84.9	0	65	27	0.00	34.9	84.9
Right	0	105	--		---	--	0	86	35	0.00	--	--	0	57	34	0.00	--	--
Left	1	82	--	1.10	---	--	1	65	--	2.24	--	--	2	41	--	6.30	--	--
Right	1	99	--	1.04	---	--	1	77	--	1.04	--	--	2	50	--	4.19	--	--
Left	9	54	--	7.82	---	--	5	45	--	8.86	--	--	3**	†	--	11.01	--	--
Right	9	67	--	4.72	---	--	5	65	--	2.59	--	--	3	†	--	7.59	--	--
Check Tests at 15-psi Tire-Inflation Pressure																		
	Check Test 1, Silt Section 1						**Check Test 2, Silt Section 2**											
Left	0	95	66	0.00	36.6	81.3	0	78	41	0.00	38.4	79.2						
Right	0	98	68	0.00	--	--	0	76	40	0.00	--	--						
Left	1	91	--	0.66	--	--	1	72	--	1.07	--	--						
Right	1	95	--	0.60	--	--	1	71	--	1.15	--	--						
Left	10	65	--	3.48	--	--	10	47	--	8.28	--	--						
Right	10	65	--	3.45	--	--	10	45	--	8.39	--	--						

Note: Test wheel in left track.
Cone index 0- to 6-in. layer, all sections.
Cone index on sand after each pass; cone index on silt before and after first pass and before last pass.

* Rut depth in sand in left track (level section, even rutting).

** Only 20 ft of travel.

† Cone index 54-59 measured before second pass.

Table 2

Deflection of All Gages at Vertical Reference Plane, Asphalt Test Section

12.00-22.5, 12-PR, Tubeless Tire
Wheel Load 2950 lb, Speed Range 2-5 mph

	Deflection of Indicated Gage									
Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
				15-psi Inflation Pressure						
1	1.66	-2.8	1.22	-9.4	-0.45	-6.6	-0.49	-2.7	-0.07	0.6
2	1.72	-1.7	1.27	-10.3	-0.50	-7.8	-0.48	-2.7	-0.08	-0.1
3	1.74	-1.5	1.31	-9.2	-0.48	-7.5	-0.48	-2.7	-0.08	0.4
4	1.75	-0.5	1.29	-9.7	-0.49	-7.7	-0.47	-2.7	-0.08	0.3
5	1.65	-1.4	1.29	-9.4	-0.47	-6.8	-0.44	-2.7	-0.08	0.8
6	1.59	-1.1	1.36	-9.4	-0.46	-6.8	-0.45	-2.7	-0.07	0.6
7	1.63	-1.9	1.26	-8.8	-0.47	-6.9	-0.46	-2.7	-0.07	0.2
8	1.64	-0.7	1.26	-9.2	-0.48	-7.2	-0.43	-2.7	-0.08	0.6
9	1.71	-0.2	1.26	-9.4	-0.49	-8.9	-0.45	-3.5	-0.08	0.5
Avg	1.68	-1.3	1.28	-9.4	-0.48	-7.4	-0.46	-2.8	-0.08	0.4
				30-psi Inflation Pressure						
1	0.99	-0.7	0.67	-5.2	0.28	-3.9	-0.18	-0.6	-0.03	0.0
2	0.93	-0.7	0.67	-5.1	-0.25	-3.7	-0.20	-0.8	-0.02	0.0
3	0.94	-0.4	0.68	-5.9	-0.23	-3.2	-0.18	-1.1	-0.02	0.0
4	1.02	-0.7	0.63	-5.6	-0.23	-3.9	-0.19	1.3	-0.03	0.0
5	0.99	-1.5	0.72	-5.9	-0.27	-3.5	-0.21	-1.3	-0.04	0.0
6	1.09	-1.5	0.67	-5.6	-0.30	-3.9	-0.18	-1.2	-0.05	0.0
7	0.94	-0.6	0.78	-5.5	-0.30	-4.1	-0.19	-1.5	-0.04	0.0
8	0.96	-0.6	0.75	-5.6	-0.26	-3.9	-0.20	-1.3	-0.03	0.0
9	1.02	-0.9	0.76	-5.3	-0.25	-3.7	-0.20	-1.3	-0.03	0.0
Avg	0.99	-0.5	0.70	-5.5	-0.26	-3.8	-0.19	-1.2	-0.03	0.0
				60-psi Inflation Pressure						
1	0.64	-0.5	0.60	-2.5	-0.16	-1.5	-0.12	-0.2	0.00	0.9
2	0.72	-0.5	0.48	-2.2	-0.16	-1.4	-0.14	-0.3	0.00	0.9
3	0.73	-0.4	0.56	-1.7	-0.13	-0.7	-0.12	-0.2	0.00	0.9
4	0.68	-0.5	0.51	-1.5	-0.15	-1.3	-0.12	-6.2	0.00	0.8
5	0.79	-0.6	0.49	-0.5	-0.16	-1.2	-0.14	-0.5	0.00	0.9
6	0.74	-0.3	0.55	-0.5	-0.12	-0.9	-0.13	-0.3	-0.00	0.9
7	0.77	-0.5	0.55	-2.2	-0.13	-1.4	-0.12	-0.4	-0.00	0.6
8	0.70	-0.3	0.53	-2.3	-0.15	-1.2	-1.12	-0.3	-0.01	0.7
9	0.80	-0.3	0.55	-1.2	-0.14	-0.9	-0.12	-0.5	-0.00	0.7
Avg	0.73	-0.4	0.54	-1.6	-0.15	-1.2	-0.12	-0.3	-0.00	0.8

Notations:

LP_1, LP_2, etc., denotes linear potentiometer in correspondingly numbered gage.

CP_1, CP_2, etc., denotes circular potentiometer in correspondingly numbered gage.

Sign Convention:

Minus sign on LP values denotes outward movement with respect to original gage position.

Minus sign on CP values denotes clockwise movement with respect to original gage position.

Table 3

Deflection of All Gages at Vertical Reference Plane, Sand Test Section

12.00-22.5, 12-PR, Tubeless Tire
Wheel Load 2950 lb, Speed Range 2-5 mph

15-psi Inflation Pressure, Pass 1

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	1.77	-0.4	1.05	-7.2	-0.38	-6.7	-0.48	-3.9	-0.47	-5.8
2	1.55	-1.9	1.15	-5.8	-0.35	-7.4	-0.56	-4.3	-0.36	-7.7
3	1.39	-2.7	1.14	-4.7	-0.36	-6.9	-0.50	-3.5	-9.37	-4.2
4										
5	1.39	-4.9	1.14	-2.8	-0.35	-5.7	-0.39	-3.4	-0.31	-4.6
6	2.09	-5.8	1.62	-4.5	-0.35	-8.0	-0.44	-4.3	-0.13	-5.3
7	1.89	-1.1	1.18	-7.5	-0.32	-8.1	-0.62	-4.9	-0.27	-6.6
8	1.69	-0.9	1.09	-7.1	-0.28	-6.2	-0.67	-6.1	-0.48	-6.7
9										
Avg	1.68	-2.5	1.20	-5.7	-0.34	-6.9	-0.52	-4.3	-0.34	-5.8

15-psi Inflation Pressure, Pass 2

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	1.56	-1.6	1.07	-6.1	-0.33	-8.3	-0.55	-5.4	-0.54	-8.9
2	1.55	-1.6	1.13	-5.9	-0.36	-9.2	-0.56	-5.7	-0.52	-8.7
3	1.44	-0.9	1.02	-7.7	-0.36	-8.3	-0.52	-5.0	-0.71	-7.4
4	1.63	-3.3	1.25	-5.9	-0.26	-7.4	-0.52	-5.2	-0.43	-6.0
5	1.94	-3.4	1.42	-5.7	-0.30	-8.1	-0.49	-6.2	-0.37	-8.4
6	1.87	-2.9	1.24	-5.5	-0.35	-7.2	-0.48	-4.1	-0.47	-6.5
7	1.65	-1.6	1.17	-5.7	-0.38	-8.4	-0.57	-4.6	-0.68	-6.5
8	1.64	-1.6	1.17	-5.7	-0.38	-8.4	-0.56	-4.6	-0.69	-6.3
9	1.69	-1.9	1.25	-6.4	-0.45	-9.1	-0.66	-5.2	-0.53	-7.1
Avg	1.66	-2.1	1.19	-6.1	-0.35	-8.3	-0.56	-5.1	-0.60	-7.3

15-psi Inflation Pressure, Pass 3

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	1.73	-2.1	1.34	-6.1	-0.43	-7.7	-0.61	-5.6	-0.49	-7.6
2	1.54	-1.1	1.28	-6.2	-0.50	-5.0	-0.63	-5.8	-0.46	-6.2
3	1.48	-0.1	1.14	-5.0	-0.44	-7.6	-0.58	-4.0	-0.50	-6.8
4										
5	Recordings blurred by electrical static									
6										
7										
8										
9										
Avg	1.58	-1.4	1.25	-5.7	-0.46	-6.8	-0.61	-5.1	-0.48	-6.9

30-psi Inflation Pressure, Pass 1

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	0.83	-2.9	0.52	-2.9	-0.09	-3.7	-0.22	-1.9	-0.01	-0.2
2	0.85	-0.3	0.68	-2.4	-0.06	-4.0	-0.25	-0.8	-0.02	0.5
3	0.99	-0.2	0.68	-1.9	-0.06	-4.6	-0.26	-0.9	-0.01	0.6
4	1.11	-0.7	0.68	-3.3	-0.04	-3.9	-0.23	-1.2	-0.01	0.8
5	0.97	-0.2	0.66	-3.1	-0.09	-3.6	-0.24	-0.8	-0.00	0.5
6	0.96	-0.2	0.66	-2.0	-0.06	-3.6	-0.20	-0.6	-0.01	0.7
7	0.86	-0.1	0.56	-3.5	-0.09	-3.3	-0.24	-1.2	-0.01	0.5
8	1.03	-1.2	0.69	-3.9	-0.14	-3.5	-0.18	-0.4	-0.01	0.1
9	1.08	-0.1	0.65	-2.4	-0.11	-4.5	-0.23	-1.4	-0.01	0.5
Avg	0.97	-0.7	0.64	-2.7	-0.08	-3.8	-0.23	-1.0	-0.01	0.5

30-psi Inflation Pressure, Pass 2

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	1.07	-0.5	0.64	-3.6	-0.14	-4.1	-0.14	-1.4	-0.00	-1.9
2	1.03	-0.1	0.54	-4.8	-0.13	-3.5	-0.18	-1.7	-0.00	-1.4
3	1.00	-0.6	0.57	-4.4	-0.14	-3.9	-0.18	-0.9	-0.00	-1.4
4	1.11	-0.2	0.64	-4.1	-0.10	-3.9	-0.20	-1.9	-0.01	-1.6
5	1.16	-0.4	0.70	-4.3	-0.12	-5.1	-0.21	-1.2	-0.01	-1.6
6	1.04	-0.0	0.61	-4.6	-0.15	-4.8	-0.21	-0.9	-0.01	-2.3
7	0.91	-0.7	0.58	-4.8	-0.10	-3.9	-0.19	-0.9	-0.02	-2.3
8	1.05	-0.2	0.60	-4.3	-0.13	-4.8	-0.19	-1.9	-0.01	-2.3
9										
Avg	1.04	-0.3	0.61	-4.4	-0.13	-4.2	-0.19	-1.4	-0.01	-1.8

30-psi Inflation Pressure, Pass 3

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	0.94	-0.5	0.65	-4.2	-0.15	-5.1	-0.28	-1.4	-0.02	0.6
2	0.99	-0.5	0.50	-3.4	-0.12	-2.9	-0.17	-0.6	-0.01	0.3
3	0.92	-0.4	0.63	-3.1	-0.06	-4.4	-0.27	-1.2	-0.02	0.1
4	1.03	-1.6	0.72	-3.6	-0.04	-5.3	-0.28	-1.7	-0.02	0.2
5	1.07	-1.8	0.76	-4.4	-0.03	-5.6	-0.26	-2.3	-0.02	0.5
6	1.01	-1.9	0.68	-3.8	-0.01	-4.7	-0.24	-1.3	-0.02	0.1
7	0.98	-1.6	0.64	-3.4	-0.01	-4.0	-0.25	-1.5	-0.02	0.1
8	0.98	-1.5	0.63	-3.1	-0.01	-4.3	-0.25	-1.1	-0.02	0.1
9	0.96	-1.6	0.70	-3.1	-0.09	-5.4	-0.26	-1.5	-0.02	0.1
Avg	0.99	-1.0	0.66	-3.6	-0.06	-4.6	-0.25	-1.4	-0.02	0.2

60-psi Inflation Pressure, Pass 1

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	0.55	-1.2	0.33	-0.3	-0.07	-2.0	-0.11	-0.8	0.01	-0.9
2	0.52	-0.3	0.38	-1.6	-0.02	-2.5	-0.13	-0.4	0.01	-0.2
3	0.51	-0.2	0.32	-0.5	-0.02	-1.9	-0.09	-0.4	0.01	-0.7
4	0.50	-0.5	0.40	-1.5	-0.01	-2.1	-0.09	-0.8	0.00	-0.2
5	0.41	-0.5	0.28	-1.1	0.01	-1.5	-0.07	-0.2	0.01	0.5
6	0.55	-0.3	0.36	-1.3	-0.04	-1.8	-0.11	-0.6	0.00	-0.7
7	0.57	-0.3	0.41	-0.9	-0.01	-2.3	-0.09	-0.3	0.01	-0.5
8	0.54	-0.3	0.38	-1.3	-0.03	-1.9	-0.10	-0.6	0.00	-0.4
9	0.51	-0.6	0.33	-1.4	-0.08	-2.3	-0.11	-1.5	0.00	0.6
Avg	0.52	-0.6	0.36	-1.1	-0.03	-2.1	-0.10	-0.7	0.01	-0.4

60-psi Inflation Pressure, Pass 2

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	0.56	-1.2	0.32	-2.3	-0.06	-1.8	-0.09	-0.5	-0.00	1.3
2	0.61	-0.4	0.35	-1.8	-0.06	-1.5	-0.11	-0.3	-0.01	0.4
3	0.59	-1.2	0.32	-2.3	-0.06	-1.9	-0.10	-0.0	-0.01	0.4
4	0.59	-1.2	0.31	-1.9	-0.05	-1.9	-0.10	-0.6	-0.01	1.1
5	0.55	-0.5	0.33	-1.6	-0.03	-1.8	-0.09	-0.3	-0.00	1.3
6	0.61	-0.9	0.46	-0.4	-0.05	-2.3	-0.21	-1.2	-0.01	1.4
7	0.56	-1.0	0.35	-1.3	-0.02	-1.7	-0.10	-1.2	-0.01	1.2
8	0.58	-0.4	0.36	-1.3	-0.05	-1.8	-0.12	-1.1	-0.02	0.7
9										
Avg	0.58	-0.8	0.35	-1.6	-0.05	-1.8	-0.11	-0.8	-0.01	1.0

60-psi Inflation Pressure, Pass 3

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
1	0.58	-1.2	0.31	-1.5	-0.06	-2.1	-0.09	-0.4	-0.01	-0.5
2	0.50	-1.7	0.30	-0.1	-0.05	-1.5	-0.08	-0.8	-0.00	-0.5
3	0.50	-0.5	0.31	-1.4	-0.01	-2.4	-0.07	-0.5	-0.00	-0.5
4	0.52	-0.5	0.29	-1.3	-0.03	-1.2	-0.06	-0.5	-0.01	-0.6
5	0.46	-1.2	0.37	-0.9	-0.07	-1.9	-0.09	-0.9	-0.00	-0.7
6	0.56	-0.9	0.40	-1.9	-0.01	-2.0	-0.10	-0.9	-0.00	-0.5
7	0.53	-0.2	0.36	-0.9	-0.02	-1.3	-0.08	-0.8	-0.00	-0.5
8	0.56	-0.3	0.37	-1.4	-0.02	-1.4	-0.10	-1.1	-0.00	-0.4
9	0.55	-0.0	0.39	-1.0	-0.03	-0.8	-0.08	-0.6	-0.01	-0.5
Avg	0.53	-0.8	0.34	-1.1	-0.03	-1.6	-0.09	-0.7	-0.01	-0.5

Notations:

LP_1 , LP_2 , etc., denotes linear potentiometer in correspondingly numbered gage.

CP_1 , CP_2 , etc., denotes circular potentiometer in correspondingly numbered gage.

Sign Convention:

Minus sign on LP values denotes outward movement with respect to original gage position.
Minus sign on CP values denotes clockwise movement with respect to original gage position.

Table 4

Deflection of All Gages at Vertical Reference Plane, Silt Section 1

12.00-22.5, 12-PR, Tubeless Tire
Wheel Load 2950 lb, Speed Range 2-5 mph

	Deflection of Indicated Gage									
Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
						Pass 1				
						15-psi Inflation Pressure				
1	2.06	-7.9	1.88	-1.2	-0.35	-9.8	-0.32	-2.5	-0.17	-6.9
2	1.39	-5.6	1.66	-0.8	-0.39	-10.9	-0.47	-2.5	-0.09	-9.6
3	2.05	-6.1	1.39	-1.9	-0.39	-9.8	-0.43	-2.3	-0.10	-9.0
4										
5										
6										
7			Recordings blurred by electrical static							
8										
9										
Avg	1.85	-6.5	1.64	-1.3	-0.38	-10.2	-0.41	-2.4	-0.12	-8.5
						30-psi Inflation Pressure				
1	0.56	-0.5	0.84	-0.3	-0.07	-5.6	-0.18	-0.9	-0.16	0.3
2	0.95	-0.3	0.84	-1.3	-0.05	-6.7	-0.21	-0.9	-0.12	0.3
3	0.90	-0.3	0.73	-1.2	-0.00	-3.9	-0.18	-0.6	-0.09	0.7
4	1.07	-1.7	0.60	-0.7	-0.03	-4.5	-0.12	-0.7	-0.10	0.9
5	0.95	-1.7	0.46	-0.8	-0.06	-3.4	-0.17	-0.2	-0.09	1.1
6	0.76	-1.2	0.88	-2.1	-0.01	-4.5	-0.19	-0.6	-0.06	0.7
7	0.95	-1.2	0.87	-0.5	-0.09	-5.0	-0.18	-0.4	-0.15	0.2
8	0.76	-1.2	0.69	-2.2	-0.06	-4.6	-0.18	-0.7	-0.09	0.9
9	0.82	-1.2	0.90	-5.0	-0.01	-6.2	-0.20	-0.9	-0.14	0.9
Avg	0.86	-1.0	0.76	-1.6	-0.04	-4.9	-0.18	-0.5	-0.11	0.7
						60-psi Inflation Pressure				
1	0.46	-0.7	0.25	-4.5	-0.02	-4.9	-0.11	-1.4	-0.07	-0.9
2	0.59	-0.9	0.69	-4.3	0.03	-5.5	-0.11	-3.4	-0.07	-0.8
3	0.57	-1.9	0.56	-2.3	-0.10	-4.8	-0.09	-1.1	-0.10	0.0
4	0.52	-0.6	0.55	-3.5	0.02	-2.5	-0.10	-0.9	-0.06	-0.7
5	0.53	-0.6	0.42	-2.5	0.02	-5.1	-0.10	-2.9	-0.06	-1.0
6	0.35	-1.2	0.37	-3.7	-0.04	-5.3	-0.11	-1.9	-0.04	0.0
7	0.54	-1.2	0.47	-3.7	0.08	-3.7	-0.10	-0.6	-0.07	0.4
8	0.46	-0.3	0.41	-2.0	-0.02	-4.5	-0.11	-0.7	-0.06	0.4
9	0.41	-0.3	0.41	-2.2	0.02	-3.5	-0.09	0.0	-0.06	0.4
Avg	0.49	-0.9	0.46	-3.2	0.04	-4.4	-0.10	-1.4	-0.07	-0.2

Data Obtained from Check Test 1

	Deflection of Indicated Gage					
Rev. No.	LP_{1a} in.	CP_{1a} deg	LP_{1b} in.	CP_{1b} deg	LP_4 in.	CP_4 deg
1	1.68	-0.7	1.71	-0.9	-0.30	-1.3
2	1.63	-0.6	1.50	-0.6	-0.35	-1.6
3	1.57	-0.6	1.48	-0.5	-0.31	-1.4
4	1.47	-0.7	1.40	-0.8	-0.33	-1.5
5	1.42	-0.6			-0.31	-1.6
Avg	1.55	-0.7	1.52	-0.7	-0.32	-1.5

(Continued)

Notations:

LP_1 , LP_2 , etc., denotes linear potentiometer in correspondingly numbered gage.

CP_1 , CP_2 , etc., denotes circular potentiometer in correspondingly numbered gage.

Sign Convention:

Minus sign on LP values denotes outward movement with respect to original gage position.
Minus sign on CP values denotes clockwise movement with respect to original gage position.

Table 4 (Concluded)

Pass 10

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
					Deflection of Indicated Gage					
							15-psi Inflation Pressure			
1	0.59	-10.5	1.46	-0.5	-0.43	-6.6	-0.47	-2.9	-0.30	-6.9
2	0.60	-10.9	--	---	-0.50	-9.2	-0.44	-2.9	-0.33	-5.5
3	0.72	-9.8	--	---	-0.48	-9.2	-0.54	-3.4	-0.51	-9.5
4	0.46	-9.5	2.21	-1.6	-0.45	-7.8	-0.48	-2.9	-0.38	-9.2
5	0.52	-9.3	1.72	-2.6	-0.47	-6.6	-0.53	-3.2	-0.41	-7.3
6	0.36	-8.4	1.64	-2.8	-0.49	-6.2	-0.51	-2.9	-0.37	-9.5
7	0.31	-8.4	1.54	-3.3	-0.49	-6.4	-0.43	-2.9	-0.41	-8.9
8	0.40	-8.4	1.62	-2.8	-0.48	-7.6	-0.52	-3.8	-0.59	-7.8
9	0.25	-8.2	1.23	-2.6	-0.49	-6.3	-0.42	-2.7	-0.47	-5.6
Avg	0.47	-9.3	1.63	-2.4	-0.47	-7.3	-0.48	-3.1	-0.42	-7.8
							30-psi Inflation Pressure			
1	0.59	-0.8	0.50	-4.2	-0.11	-5.1	-0.25	-1.9	-0.12	-0.6
2	0.65	-1.1	0.52	-3.8	-0.06	-4.9	-0.21	-1.9	-0.09	-0.6
3	0.52	-2.2	0.42	-4.4	-0.11	-4.9	-0.22	-1.5	-0.11	-0.7
4	0.50	-1.0	0.38	-3.4	-0.13	-5.1	-0.27	-12.9	-0.14	-0.9
5	0.48	-0.7	0.40	-3.9	-0.14	-4.7	-0.19	-1.5	-0.09	-0.3
6	0.54	-0.6	0.44	-3.5	-0.10	-4.9	-0.20	-1.3	-0.10	-0.7
7	0.66	-0.4	0.54	-2.8	-0.07	-4.7	-0.22	-1.3	-0.12	-0.8
8	0.70	-2.1	0.52	-3.9	-0.12	-6.1	-0.25	-1.5	-0.14	-0.3
9	0.64	-2.9	0.48	-4.7	-0.14	-6.1	-0.27	-2.4	-0.15	-0.2
Avg	0.59	-1.3	0.47	-3.8	-0.11	-5.2	-0.23	-2.9	-0.12	-0.6
							60-psi Inflation Pressure			
1	0.30	-0.6	0.28	-2.7	-0.06	-3.3	-0.10	-1.5	-0.05	-1.2
2	0.30	-0.4	0.21	-2.8	-0.09	-3.5	-0.07	-0.8	-0.04	-0.9
3	0.24	-0.8	0.20	-2.6	-0.07	-2.9	-0.09	-0.8	-0.03	-1.2
4	0.24	-0.1	0.17	-2.9	-0.08	-2.6	-0.10	-0.5	-0.04	-0.3
5	0.26	-0.3	0.19	-2.5	-0.05	-1.9	-0.09	-0.9	-0.04	0.0
6	0.30	-0.6	0.24	-2.1	-0.04	-1.9	-0.08	-0.7	-0.04	-0.3
7	0.24	-1.6	0.19	-2.5	-0.07	-1.7	-0.09	-0.7	-0.04	-0.7
8	0.28	-0.8	0.20	-2.6	-0.07	-2.4	-0.09	-1.9	-0.04	-1.9
9	0.34	-2.9	0.24	-1.2	-0.06	-0.9	-0.07	-0.9	-0.03	-0.1
Avg	0.28	-0.9	0.21	-2.5	-0.07	-2.3	-0.09	-0.9	-0.04	-0.7

Data Obtained from Check Test 1

Rev. No.	LP_{1a} in.	CP_{1a} deg	LP_{1b} in.	CP_{1b} deg	LP_4 in.	CP_4 deg
	Deflection of Indicated Gage					
1	0.84	-0.6	0.95	-0.5	-0.31	-0.9
2	0.80	-0.4	0.87	-0.4	-0.29	-1.1
3	0.73	-0.3	0.83	-0.5	-0.28	-1.1
4	0.71	-0.3	0.79	-0.3	-0.25	-1.0
5	0.72	-0.6			-0.26	-0.8
Avg	0.76	-0.4	0.86	-0.4	-0.28	-1.0

Table 5

Deflection of All Gages at Vertical Reference Plane, Silt Section 2

12.00-22.5, 12-PR, Tubeless Tire
Wheel Load 2950 lb, Speed Range 2-5 mph

Deflection of Indicated Gage — Pass 1

Rev. No.	LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
										15-psi Inflation Pressure
1	1.84	-1.4	1.67	-5.7	-0.06	-17.5	-0.52	-2.9	-0.53	-1.7
2	1.79	-1.1	1.82	-6.4	-0.15	-15.7	-0.53	-3.5	-0.53	-4.1
3	1.59	-2.1	1.72	-7.1	-0.03	-16.4	-0.40	-2.7	-0.23	-6.8
4	1.49	-0.3	1.54	-7.5	-0.19	-19.3	-0.61	-4.6	-0.17	-7.3
5	1.81	-0.8	1.64	-5.6	-0.13	-20.4	-0.43	-3.1	-0.38	-9.3
6	1.39	-0.4	1.48	-5.5	-0.24	-19.8	-0.40	-3.1	-0.30	-9.6
7	1.85	-2.8	1.76	-5.8	-0.37	-19.7	-0.43	-3.3	-0.51	-8.4
8	1.36	-2.8	1.69	-6.5	-0.32	-22.1	-0.58	-4.3	-0.50	-7.6
9	1.86	-2.9	1.85	-5.5	-0.32	-19.4	-0.56	-3.7	-0.45	-7.3
Avg	1.66	-1.6	1.69	-6.2	-0.20	-18.9	-0.50	-3.5	-0.40	-6.9
										30-psi Inflation Pressure
1	0.83	-0.7	0.80	-3.7	-0.08	-6.9	-0.21	-0.8	-0.40	-2.3
2	0.74	-1.3	0.74	-4.0	-0.09	-6.9	-0.23	-0.9	-0.43	-2.9
3	0.87	-1.7	0.83	-3.9	-0.05	-5.5	-0.26	-1.5	-0.45	-2.2
4	0.70	-0.8	0.81	-3.0	0.01	-7.2	-0.20	-0.9	-0.33	-2.0
5	0.78	-1.5	0.70	-2.3	-0.03	-6.9	-0.20	-1.4	-0.38	-2.5
6	0.87	-1.7	0.90	-2.9	-0.08	-6.4	-0.22	-0.5	-0.37	-2.1
7	0.69	-0.8	0.70	-3.2	-0.01	-5.9	-0.21	-0.5	-0.34	-2.7
8	0.84	-0.3	0.72	-2.8	-0.01	-7.9	-0.25	-1.4	-0.49	-3.0
9	0.65	-0.6	0.73	-1.9	-0.01	-5.7	-0.20	-1.2	-0.39	-2.7
Avg	0.77	-1.0	0.77	-3.1	-0.04	-6.6	-0.22	-1.0	-0.40	-2.5
										60-psi Inflation Pressure
*	0.40	-2.1	0.44	-2.6	-0.06	-4.4	-0.09	-0.6	-0.11	2.1

Data Obtained from Check Test 2 — Deflection of Indicated Gage (15-psi Inflation Pressure)

Rev. No.	LP_{1a} in.	CP_{1a} deg	LP_{1b} in.	CP_{1b} deg	LP_4 in.	CP_4 deg
1	1.60	-0.8	1.51	-0.6	-0.31	-1.1
2	1.55	-0.5	1.40	-0.5	-0.31	-1.0
3	1.43	-0.7	1.39	-0.6	-0.33	-1.2
4	1.35	-0.6	1.44	-0.7	-0.34	-1.2
5	1.47	-0.6			-0.28	-0.7
Avg	1.48	-0.6	1.44	-0.6	-0.32	-1.0

* Chart jammed in the recorder; only one revolution readable

(Continued)

Notations:

LP_1 , LP_2 , etc., denotes linear potentiometer in correspondingly numbered gage.

CP_1 , CP_2 , etc., denotes circular potentiometer in correspondingly numbered gage.

Sign Convention:

Minus sign on LP values denotes outward movement with respect to original gage position.
Minus sign on CP values denotes clockwise movement with respect to original gage position.

Table 5 (Concluded)

Rev. No.	Deflection of Indicated Gage LP_1 in.	CP_1 deg	LP_2 in.	CP_2 deg	LP_3 in.	CP_3 deg	LP_4 in.	CP_4 deg	LP_5 in.	CP_5 deg
15-psi Inflation Pressure, Pass 10										
1	0.47	-4.9	0.74	-6.2	-0.30	-7.2	-0.09	-2.2	-0.18	-5.4
2	0.77	-5.0	0.93	-7.3	-0.31	-4.1	-0.06	-1.9	-0.16	-5.1
3	0.60	-5.1	1.02	5.5	-0.47	-6.0	-0.41	-0.2	-0.22	-6.6
4	0.44	-5.8	0.52	-5.8	-0.32	-8.3	-0.05	-3.0	-0.09	-5.5
5	0.58	-5.3	0.69	-5.9	-0.35	-7.6	-0.11	-2.6	-0.14	0.0
6	0.26	-4.8	0.40	-5.1	-0.31	-5.9	-0.17	-2.1	-0.18	-2.5
7	0.34	-5.1	0.54	-6.7	-0.41	-6.3	-0.39	-2.4	-0.40	-2.4
8	0.39	-7.9	0.50	-8.6	-0.43	-8.5	-0.28	-3.0	-0.30	-0.6
9	0.44	-6.6	0.53	-7.1	-0.42	-7.6	-0.29	-2.6	-0.20	1.1
Avg	0.48	-5.6	0.65	-6.5	-0.37	-6.8	-0.40	-2.2	-0.21	-3.0
30-psi Inflation Pressure, Pass 5										
1	0.22	-2.1	0.23	-1.4	-0.14	-3.7	-0.16	-0.8	-0.22	-1.6
2	0.20	-2.3	0.21	-1.0	-0.10	-3.5	-0.18	-0.9	-0.29	-1.2
3	0.36	-2.7	0.38	-0.9	-0.20	-4.6	-0.25	-1.3	-0.34	-1.8
4	0.26	-1.8	0.28	-0.9	-0.10	-3.9	-0.19	-0.9	-0.24	-0.9
5	0.24	-2.1	0.37	-0.9	-0.12	-3.7	-0.20	-0.9	-0.29	-1.3
6	0.33	-2.2	0.30	-0.7	-0.08	-3.7	-0.22	-0.9	-0.30	-0.4
7	0.18	-1.8	0.25	-1.9	-0.17	-3.6	-0.17	-1.1	-0.08	-0.6
8	0.22	-2.1	0.32	-1.1	-0.13	-2.9	-0.13	-0.8	-0.17	-0.2
9	0.13	-2.2	0.21	-3.0	-0.15	-3.1	-0.15	-0.7	-0.19	0.7
Avg	0.24	-2.1	0.27	-1.3	-0.13	-3.6	-0.17	-0.9	-0.34	-0.9
60-psi Inflation Pressure, Pass 2										
1	0.24	-2.4	0.30	-3.7	-0.05	-3.7	-0.12	-0.9	-0.08	4.5
2	0.23	-1.3	0.25	-2.3	-0.04	-2.9	-0.12	-1.7	-0.08	4.1
3	0.15	-2.6	0.16	-1.9	-0.07	-2.6	-0.11	-0.8	-0.07	3.6
4	0.22	-2.2	0.23	-2.5	-0.04	-2.8	-0.09	-0.8	-0.04	3.6
5	0.21	-2.1	0.27	-1.2	-0.03	-2.9	-0.09	-0.8	-0.04	3.2
6	0.10	-1.9	0.09	-1.2	-0.06	-2.6	-0.10	-0.8	-0.07	2.7
7	0.10	-1.7	0.09	-2.1	-0.08	-2.2	-0.11	-1.3	-0.09	1.5
8	0.09	-1.9	0.09	-2.8	-0.07	-2.6	-0.12	-0.6	-0.05	1.5
9	0.14	-1.9	0.12	-2.1	-0.06	-2.8	-0.10	-0.8	-0.03	0.1
Avg	0.17	-2.0	0.18	-2.2	-0.06	-2.8	-0.11	-0.9	-0.06	2.8

Rev. No.	Data Obtained from Check Test 2 — Deflection of Indicated Gage LP_{1a} in.	CP_{1a} deg	LP_{1b} in.	CP_{1b} deg	LP_4 in.	CP_4 deg
15-psi Inflation Pressure, Pass 10						
1	0.70	-0.5	0.75	-0.6	-0.30	-1.0
2	0.65	-0.3	0.59	-0.5	-0.31	-1.0
3	0.60	-0.4	0.61	-0.4	-0.28	-0.8
4	0.59	-0.5	0.60	-0.3	-0.25	-0.9
5	0.61	-0.6			-0.27	-1.2
Avg	0.63	-0.5	0.63	-0.5	-0.28	-1.0

Table 6

Effect of Vehicle Speed on Tire Deflection on Asphaltic Concrete

12.00-22.5, 12-PR, Tubeless Tire
Wheel Load 2950 lb
Inflation Pressures 15 and 30 psi

Vehicle Speed mph	Tire Deflection in.	Vehicle Speed mph	Tire Deflection in.	Vehicle Speed mph	Tire Deflection in.
		15 psi			
3.65	1.74	9.65	2.00	14.08	1.45
3.61	1.75	9.69	1.78	14.22	1.49
3.59	1.78	9.63	1.86	14.25	1.55
3.65	1.66	9.52	2.01	14.30	1.60
3.99	1.61	9.39	2.07	14.58	1.40
4.29	1.64	9.29	1.66	14.58	1.46
4.49	1.65	9.71	2.38	14.67	1.41
4.60	1.72	9.35	2.34	14.82	1.45
4.64	1.70	10.43	1.65	14.85	1.35
4.77	1.76	8.99	1.47	15.05	1.60
4.78	1.70	8.98	1.63	15.14	1.81
4.83	1.66	8.99	1.94	15.23	1.69
4.89	1.63	8.98	2.16	15.50	1.41
4.91	1.70	9.21	2.04	15.50	1.55
5.40	1.84	9.34	1.89	15.54	1.49
5.51	1.72	9.49	1.78	15.71	1.46
6.10	1.67	9.55	1.79	16.40	1.61
5.95	1.70	9.55	1.47	15.71	2.32
6.16	1.78	9.74	1.55	15.54	2.25
6.80	1.94	9.95	1.82	15.92	1.86
6.93	1.55	10.22	1.80	15.96	1.96
7.07	1.39	10.46	1.78	15.71	2.18
7.29	1.53	10.63	1.72	15.37	2.18
7.85	1.44	10.84	1.86	15.05	2.16
7.77	1.61	11.11	1.69	14.43	2.12
7.77	1.80	11.48	1.62	14.49	1.66
7.69	2.00	11.40	1.91	14.11	1.64
7.77	1.98	11.74	1.51	13.51	1.39
7.26	1.80	11.88	1.64	13.34	1.65
6.54	1.69	12.34	1.80	12.49	2.04
6.73	1.73	12.36	1.35	11.93	1.66
6.99	1.89	12.63	2.04	10.97	1.72
7.47	1.41	12.63	1.65	9.96	1.95
7.86	1.73	12.90	1.42	9.10	2.00
7.85	1.68	12.97	1.46	8.42	1.65
7.92	1.70	13.24	1.46	7.77	1.64
7.97	1.78	13.60	1.47	6.23	2.27
8.15	1.65	13.54	1.96	5.00	2.16
8.55	1.47	13.34	1.87	3.90	1.84
8.61	1.56	13.47	1.64		
8.77	1.83	13.51	1.50		
9.00	1.97	13.65	1.31		
9.07	2.04	13.79	1.51		
9.23	1.90	13.79	1.47		
8.42	1.98	14.00	1.30		

(Continued)

Note: All deflections were read from linear potentiometer in gage 1.
All values shown were recorded at the vertical reference plane.

Table 6 (Concluded)

Vehicle Speed mph	Tire Deflection in.	Vehicle Speed mph	Tire Deflection in.	Vehicle Speed mph	Tire Deflection in.	Vehicle Speed mph	Tire Deflection in.
30 psi							
4.83	1.00	16.46	0.92	6.60	0.96	11.85	1.01
5.43	0.94	16.97	1.11	6.93	0.93	11.66	1.07
5.87	0.96	17.19	1.11	7.37	1.11	11.85	1.09
6.09	1.03	17.59	0.97	7.53	1.06	11.66	1.07
6.33	1.00	17.63	1.09	7.61	1.09	12.05	1.01
6.58	1.09	17.93	1.07	7.61	1.17	10.33	0.87
6.66	0.94	18.07	1.06	7.37	0.97	13.64	1.08
6.86	0.98	18.21	1.11	7.45	1.04	11.66	1.23
7.12	1.03	18.44	1.25	6.89	0.89	11.30	1.17
7.40	1.10	17.93	1.32	6.69	1.13	11.85	1.03
7.55	1.08	17.81	1.22	6.63	1.13	11.48	0.90
7.74	1.04	17.26	1.27	6.69	1.43	11.66	1.22
7.94	1.01	16.81	1.19	6.63	1.03	11.30	1.19
7.96	1.07	16.43	1.15	6.82	1.13	11.66	1.00
8.11	1.07	16.21	1.03	6.82	1.13	11.30	1.17
8.43	1.11	15.72	1.05	6.95	1.01	11.30	1.04
8.91	1.12	15.22	1.04	7.16	1.06		
9.21	1.09	14.88	1.02	7.23	1.01		
9.51	1.10	14.40	1.16	7.23	1.05	10.79	1.01
9.87	1.15	14.01	1.04	7.53	1.12	10.95	1.25
10.29	1.00	13.31	1.23	7.09	1.08	10.63	1.16
10.47	0.97	13.03	0.99	7.16	1.08	10.32	1.13
10.63	1.00	12.62	1.20	7.16	1.00	10.32	1.04
10.82	1.13	11.85	1.11	7.09	0.89	10.32	1.12
11.04	1.07	11.53	1.11	7.53	1.15	9.77	1.04
11.17	1.11	11.38	0.97	7.16	1.25	9.64	0.99
11.22	1.04	11.24	1.06	7.53	1.25	9.51	1.06
11.64	0.98	11.13	1.03	7.37	0.97	9.15	1.11
11.74	1.03	11.15	0.90	7.77	1.01	9.27	1.13
11.93	1.08	11.21	1.13	7.95	0.94		
12.15	0.93	10.75	1.31	8.21	1.03		
12.25	1.01	10.23	1.13	8.31	1.05		
12.51	1.12	9.64	1.18	8.71	0.89		
12.82	1.01	9.03	1.13	9.27	1.26		
13.22	1.05	8.51	1.16	9.51	1.27		
13.64	0.95	7.59	1.32	9.90	1.06		
13.88	0.93	6.56	1.10	10.18	1.10		
14.17	1.04	5.78	1.00	10.18	1.06		
14.63	1.04	5.17	1.14	10.48	1.12		
14.91	0.95	4.87	1.06	10.63	1.00		
15.13	0.98	4.91	1.03	11.13	1.07		
15.58	1.05	4.94	0.97	11.30	1.08		
15.85	1.04	5.24	1.05	11.30	1.04		
15.92	1.01	5.69	1.03	11.30	1.09		
16.14	0.93	6.20	1.08	11.66	1.01		

Table 7

Deflection with Respect to Reference Plane Position on Four Surfaces*

Asphalt Section

Gage Position deg	Deflection (in.) at Gage LP1	CP1	LP2	CP2	LP3	CP3	LP4	CP4	LP5	CP5
60-psi Inflation Pressure										
40	0.11	-0.3	0.05	-0.3	-0.04	-0.3	-0.10	-0.4	-0.02	-1.0
Before 30	0.11	-0.5	0.05	-1.0	-0.11	-0.4	-0.14	-0.5	-0.02	-0.8
maximum 20	0.17	-0.5	0.06	-1.8	-0.18	-0.7	-0.17	-0.9	-0.03	-0.7
10	0.54	-0.4	0.38	-2.3	-0.20	-0.8	-0.15	-0.7	-0.02	-0.6
Center line	0.73	-0.4	0.54	-1.6	-0.15	-1.2	-0.12	-0.3	-0.00	-0.8
10	0.39	-0.8	0.29	-2.5	-0.21	-1.6	-0.15	-0.1	-0.02	-0.7
After 20	0.17	-0.8	0.05	-1.4	-0.23	-1.2	-0.18	-0.5	-0.04	-1.0
maximum 30	0.13	-0.7	0.05	-1.2	-0.15	-1.2	-0.16	-0.9	-0.04	-0.3
40	0.13	-0.5	0.07	-0.9	-0.07	-0.7	-0.12	-1.3	-0.04	-0.0
30-psi Inflation Pressure										
40	0.14	-0.0	0.01	-1.3	-0.07	-1.3	-0.04	-0.6	-0.12	-0.0
Before 30	0.24	-0.3	0.03	-2.5	-0.14	-2.2	-0.10	-0.8	-0.02	-0.0
maximum 20	0.42	-0.6	0.08	-3.2	-0.21	-2.6	-0.21	-1.4	-0.04	-0.0
10	0.77	-0.7	0.47	-4.4	-0.22	-2.9	-0.20	-0.9	-0.05	-0.0
Center line	0.99	-0.5	0.70	-5.5	-0.26	-3.8	-0.19	-1.2	-0.03	-0.0
10	0.66	-0.7	0.50	-4.2	-0.25	-4.1	-0.20	-1.5	-0.04	-0.6
After 20	0.41	-0.4	0.12	-3.4	-0.24	-3.5	-0.14	-1.8	-0.05	-0.0
maximum 30	0.23	-0.4	0.04	-3.2	-0.18	-2.7	-0.07	-1.4	-0.06	-0.6
40	0.15	-0.6	0.02	-2.1	-0.08	-2.1	-0.01	-1.2	-0.04	-0.6
15-psi Inflation Pressure										
40	0.34	-0.0	0.08	-1.9	-0.16	-1.7	-0.13	-0.8	-0.00	-0.0
Before 30	0.37	-0.3	0.12	-3.5	-0.24	-3.2	-0.17	-1.3	-0.01	-0.0
maximum 20	0.64	-0.7	0.42	-5.6	-0.31	-4.6	-0.23	-1.9	-0.01	-0.1
10	1.27	-1.0	1.10	-8.1	-0.40	-6.5	-0.37	-2.3	-0.04	-0.2
Center line	1.68	-1.3	1.28	-9.4	-0.48	-7.4	-0.46	-2.8	-0.08	-0.4
10	1.19	-0.9	0.87	-7.8	-0.41	-6.5	-0.37	-2.1	-0.05	-0.3
After 20	0.81	-0.7	0.30	-5.5	-0.33	-4.5	-0.28	-1.6	-0.03	-0.2
maximum 30	0.54	-0.5	0.14	-3.4	-0.25	-3.0	-0.21	-1.3	-0.02	-0.1
40	0.44	-0.4	0.10	-2.1	-0.16	-1.4	-0.15	-1.1	-0.01	-0.0

Sand Section

Gage Position deg	Deflection (in.) at Gage LP1	CP1	LP2	CP2	LP3	CP3	LP4	CP4	LP5	CP5
60-psi Inflation Pressure										
40	0.07	-0.2	0.05	-0.1	-0.00	-0.1	-0.06	-0.9	-0.01	-0.4
Before 30	0.07	-0.9	0.05	-0.1	-0.03	-0.5	-0.09	-0.6	-0.04	-0.3
maximum 20	0.13	-0.8	0.08	-0.2	-0.08	-1.1	-0.11	-1.2	-0.04	-0.3
10	0.38	-0.7	0.27	-0.8	-0.05	-1.2	-0.11	-1.2	-0.03	-0.3
Center line	0.52	-0.6	0.36	-1.1	-0.03	-2.1	-0.10	-0.7	-0.01	-0.4
10	0.36	-0.7	0.22	-0.7	-0.05	-1.7	-0.12	-0.8	-0.00	-0.3
After 20	0.14	-0.4	0.09	-0.3	-0.07	-0.9	-0.12	-1.2	-0.05	-0.4
maximum 30	0.09	-0.5	0.07	-0.1	-0.03	-0.6	-0.07	-1.3	-0.04	-0.5
40	0.08	-0.3	0.06	-0.0	-0.00	-0.1	-0.04	-2.1	-0.02	-0.5
30-psi Inflation Pressure										
40	0.19	-0.4	0.09	-0.0	-0.08	-1.5	-0.20	-1.3	-0.00	-0.8
Before 30	0.24	-0.4	0.10	-0.4	-0.16	-1.7	-0.25	-1.3	-0.01	-0.7
maximum 20	0.52	-0.5	0.24	-0.5	-0.18	-2.3	-0.27	-1.4	-0.01	-0.5
10	0.86	-0.6	0.56	-2.1	-0.11	-2.8	-0.27	-1.5	-0.01	-0.4
Center line	0.97	-0.7	0.64	-2.7	-0.08	-3.8	-0.23	-1.0	-0.01	-0.5
10	0.91	-0.5	0.46	-2.6	-0.16	-2.6	-0.24	-1.2	-0.01	-1.0
After 20	0.38	-0.3	0.16	-0.9	-0.16	-2.4	-0.29	-1.2	-0.01	-1.2
maximum 30	0.26	-0.1	0.12	-1.0	-0.09	-1.7	-0.19	-1.4	-0.01	-0.8
40	0.21	-0.1	0.11	-0.0	-0.02	-1.5	-0.12	-1.2	-0.01	-0.6
15-psi Inflation Pressure										
40	0.34	-0.8	0.16	-0.8	-0.15	-0.3	-0.19	-0.9	-0.13	-2.0
Before 30	0.43	-1.3	0.21	-1.8	-0.24	-1.4	-0.29	-2.0	-0.20	-3.1
maximum 20	0.82	-1.5	0.44	-3.0	-0.29	-2.9	-0.36	-2.5	-0.26	-4.3
10	1.43	-1.6	0.94	-4.7	-0.33	-4.8	-0.50	-4.0	-0.35	-5.0
Center line	1.68	-2.5	1.20	-5.7	-0.34	-6.9	-0.52	-4.3	-0.34	-5.8
10	1.27	-2.4	0.99	-5.5	-0.34	-4.6	-0.44	-3.5	-0.35	-4.8
After 20	0.52	-1.4	0.48	-3.1	-0.33	-2.9	-0.33	-2.5	-0.23	-4.0
maximum 30	0.31	-1.3	0.35	-2.5	-0.20	-1.6	-0.23	-1.5	-0.11	-2.0
40	0.23	-0.6	0.18	-1.1	-0.11	-0.9	-0.16	-1.0	-0.03	-1.2

(Continued)

Notations:

LP_1 , LP_2 , etc., denotes linear potentiometer in correspondingly numbered gage.
CP_1 , CP_2 , etc., denotes circular potentiometer in correspondingly numbered gage.
Center line denotes vertical reference plane.
Before and after 40°, 30°, 20°, 10° denotes position of gages relative to vertical reference plane.

Sign Convention:

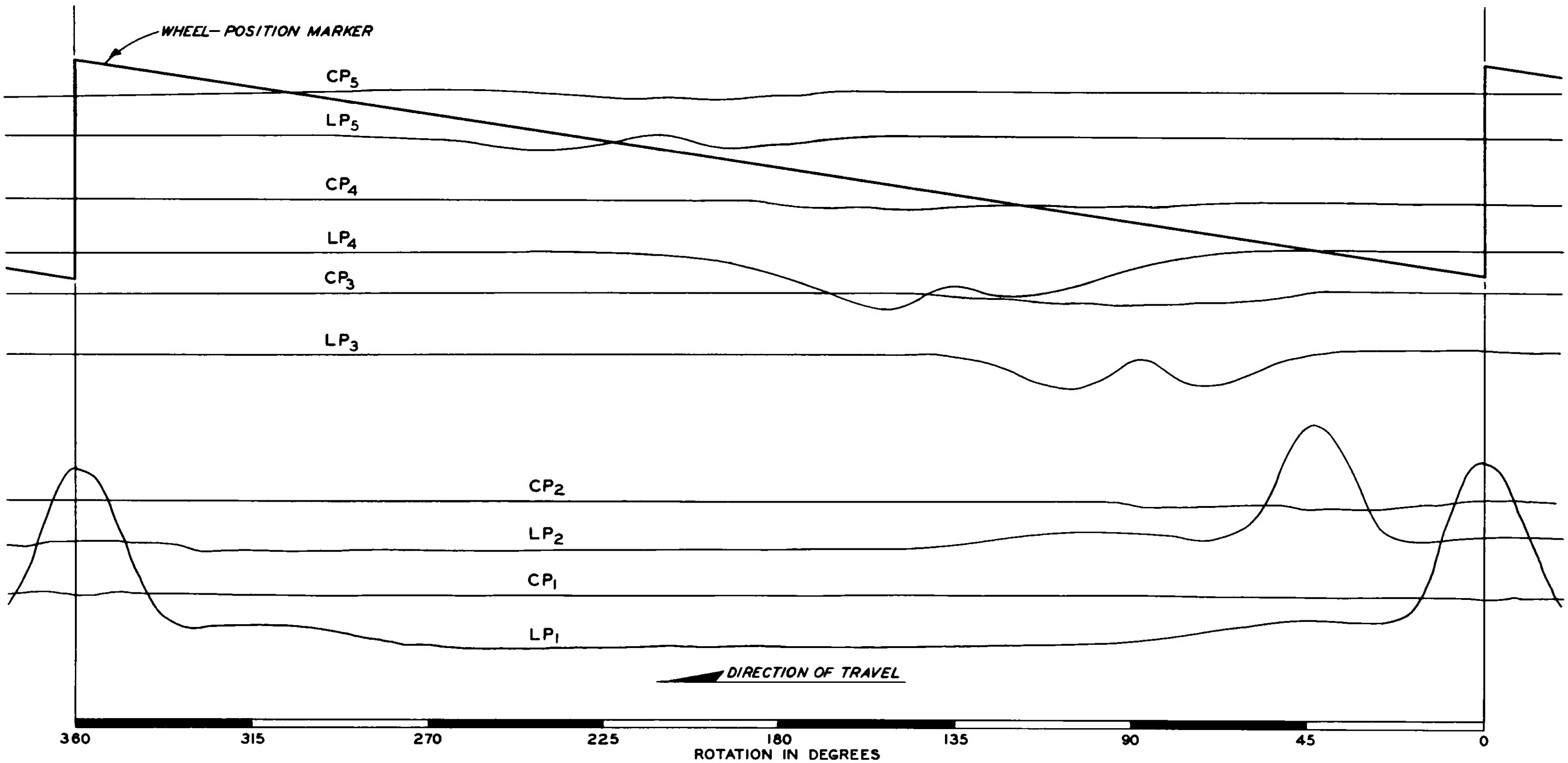
Minus sign on LP values denotes outward movement with respect to original gage position.
Minus sign on CP values denotes clockwise movement with respect to original gage position.

* All tests performed on pass 1.

Table 7 (Concluded)

Gage Position deg	Silt Section 1 Deflection (in.) at Gage LP_1	CP_1	LP_2	CP_2	LP_3	CP_3	LP_4	CP_4	LP_5	CP_5	Silt Section 2 Deflection (in.) at Gage LP_1	CP_1	LP_2	CP_2	LP_3	CP_3	LP_4	CP_4	LP_5	CP_5
60-psi Inflation Pressure																				
40	0.07	-0.7	0.10	-0.9	-0.04	-1.2	-0.12	-0.5	-0.01	0.0	0.04	-1.2	0.02	-1.0	-0.07	-2.3	-0.08	-0.9	-0.08	-1.0
Before 30	0.07	-0.9	0.10	-1.0	-0.08	-2.4	-0.15	-1.0	-0.02	0.1	0.04	-1.4	0.02	-1.4	-0.08	-2.4	-0.10	-1.1	-0.10	-1.5
maximum 20	0.08	-0.9	0.13	-1.3	-0.10	-3.4	-0.19	-1.8	-0.04	0.4	0.07	-0.3	0.04	-1.9	-0.09	-3.9	-0.10	-1.1	-0.10	-2.5
10	0.35	-1.2	0.31	-1.2	-0.02	-3.6	-0.18	-1.6	-0.05	0.4	0.28	-2.1	0.26	-2.0	-0.06	-3.6	-0.10	-0.9	-0.10	-2.3
Center line	0.49	-0.9	0.46	-3.2	-0.04	-4.4	-0.10	-1.4	-0.07	0.2	0.40	-2.1	0.44	-2.6	-0.06	-4.4	-0.09	-0.6	-0.11	-2.1
10	0.37	-0.9	0.25	-2.3	-0.06	-4.0	-0.20	-1.5	-0.05	0.4	0.30	-1.4	0.28	-1.9	-0.09	-4.4	-0.08	-0.1	-0.14	-2.1
After 20	0.13	-0.9	0.14	-2.0	-0.08	-3.4	-0.21	-1.9	-0.03	0.4	0.09	-0.6	0.08	-1.8	-0.11	-4.2	-0.10	-0.6	-0.16	-2.3
maximum 30	0.08	-1.0	0.11	-1.8	-0.07	-2.6	-0.16	-1.1	-0.02	0.2	0.04	-1.2	0.04	-1.5	-0.10	-3.8	-0.10	-0.6	-0.16	-1.9
40	0.08	-0.4	0.09	-2.5	-0.05	-1.8	-0.10	-0.4	-0.01	0.1	0.04	-1.7	0.03	-1.0	-0.06	-3.0	-0.08	-0.9	-0.13	-0.9
30-psi Inflation Pressure																				
40	0.12	-0.3	0.13	-0.0	-0.00	-1.3	-0.12	-0.6	-0.11	-0.0	0.12	-0.8	0.12	-0.3	-0.06	-1.6	-0.11	0.3	-0.20	-0.0
Before 30	0.19	-0.5	0.15	-0.2	-0.03	-2.5	-0.15	-0.4	-0.13	-0.2	0.16	-1.0	0.15	-0.4	-0.12	-3.1	-0.16	-1.4	-0.24	-1.4
maximum 20	0.28	-0.8	0.32	-0.8	-0.08	-3.1	-0.18	-0.8	-0.15	-0.9	0.33	-1.5	0.28	-2.2	-0.13	-4.4	-0.21	-1.2	-0.30	-1.4
10	0.64	-0.5	0.68	-1.3	-0.03	-3.9	-0.19	-0.8	-0.14	-0.9	0.66	-1.3	0.62	-3.9	-0.09	-5.6	-0.25	-1.1	-0.31	-2.4
Center line	0.86	-1.0	0.76	-1.6	-0.04	-4.9	-0.18	-0.5	-0.11	-0.7	0.77	-1.0	0.77	-3.1	-0.04	-6.6	-0.22	-1.0	-0.40	-2.5
10	0.67	-0.6	0.59	-1.2	-0.02	-4.8	-0.20	-0.3	-0.17	-0.8	0.65	-1.3	0.62	-3.6	-0.05	-7.9	-0.26	-1.0	-0.38	-2.2
After 20	0.32	-0.8	0.25	-0.6	-0.07	-3.0	-0.22	-0.5	-0.19	-0.9	0.37	-1.3	0.29	-2.2	-0.11	-5.2	-0.31	-1.4	-0.34	-2.3
maximum 30	0.21	-0.8	0.14	-0.2	-0.07	-2.9	-0.19	-0.9	-0.17	-0.6	0.28	-0.6	0.15	-1.6	-0.13	-4.6	-0.31	-1.5	-0.29	-2.4
40	0.16	-0.2	0.13	-0.1	-0.03	-2.5	-0.16	-0.8	-0.15	-0.4	0.27	-0.6	0.13	-1.4	-0.08	-3.6	-0.30	-0.8	-0.22	-1.4
15-psi Inflation Pressure																				
40	0.18	-0.0			-0.17	-3.7	-0.06	-1.2	-0.15	-1.0	0.18	-0.5	0.21	-4.5	-0.14	-6.3	-0.18	-2.7	-0.13	-0.9
Before 30	0.32	-1.5			-0.24	-5.2	-0.12	-1.4	-0.22	-2.6	0.30	-0.8	0.32	-5.0	-0.19	-7.3	-0.22	-3.2	-0.27	-2.7
maximum 20	0.84	-2.8			-0.28	-8.0	-0.22	-1.9	-0.20	-5.2	0.71	-1.4	0.75	-5.5	-0.25	-17.7	-0.29	-3.2	-0.32	-5.6
10	1.51	-4.7			-0.35	-10.1	-0.38	-1.9	-0.11	-7.6	1.42	-2.8	1.39	-6.4	-0.22	-18.0	-0.39	-3.3	-0.34	-6.7
Center line	1.85	-6.5	1.64*	-1.3	-0.38	-10.2	-0.41	-2.4	-0.12	-8.5	1.66	-1.6	1.69	-6.2	-0.20	-18.9	-0.50	-3.5	-0.40	-6.9
10	1.32	-5.1			-0.35	-8.1	-0.26	-1.9	-0.24	-5.8	1.37	-2.4	1.31	-5.8	-0.35	-18.2	-0.42	-3.0	-0.40	-6.4
After 20	0.45	-2.0			-0.25	-4.4	-0.18	-2.5	-0.24	-3.5	0.65	-0.9	0.70	-4.5	-0.38	-14.5	-0.33	-3.4	-0.31	-4.6
maximum 30	0.28	-1.0			-0.17	-4.3	-0.10	-0.9	-0.28	-2.7	0.29	-0.7	0.37	-5.1	-0.41	-10.9	-0.26	-3.2	-0.17	-1.9
40	0.24	-0.8			-0.10	-3.5	-0.06	-0.9	-0.12	-2.0	0.20	-0.6	0.27	-4.5	-0.32	-9.8	-0.20	-3.0	-0.10	-0.5
Check Tests at 15-psi Tire-Inflation Pressure	Check Test 1, Silt Section 1										Check Test 2, Silt Section 2									
40	0.20	-0.0					-0.14	-0.5			0.15	-0.0					-0.12	-0.4		
Before 30	0.31	-0.2					-0.20	-0.9			0.28	-0.0					-0.19	-0.6		
maximum 20	0.68	-0.4					-0.26	-1.2			0.52	-0.2					-0.26	-0.7		
10	1.29	-0.5					-0.30	-1.3			1.05	-0.2					-0.28	-0.9		
Center line	1.54	-0.7	1.30**	-5.5**	-0.40**	-5.0**	-0.32	-1.5	-0.20**	0.10**	1.46	-0.4	1.25**	-5.0**	-0.37**	-5.7**	-0.32	-1.0	0.20**	0.10**
10	1.08	-0.6					-0.28	-1.4			0.85	-0.3					-0.29	-0.9		
After 20	0.55	-0.5					-0.26	-1.1			0.52	-0.2					-0.27	-0.8		
maximum 30	0.28	-0.3					-0.20	-0.9			0.35	-0.0					-0.22	-0.7		
40	0.20	-0.2					-0.15	-0.7			0.26	-0.0					-0.15	-0.6		

* LP_2 , CP_2 not readable except at peak
** Estimated from other data.



LEGEND

LP_1 LINEAR POTENTIOMETER
CP_1 CIRCULAR POTENTIOMETER
SUBSCRIPT INDICATES GAGE NUMBER

DEFLECTION SCALES

LINEAR POTENTIOMETER: 0.25 0 0.25 0.50 IN.
CIRCULAR POTENTIOMETER: 20 0 20 DEG

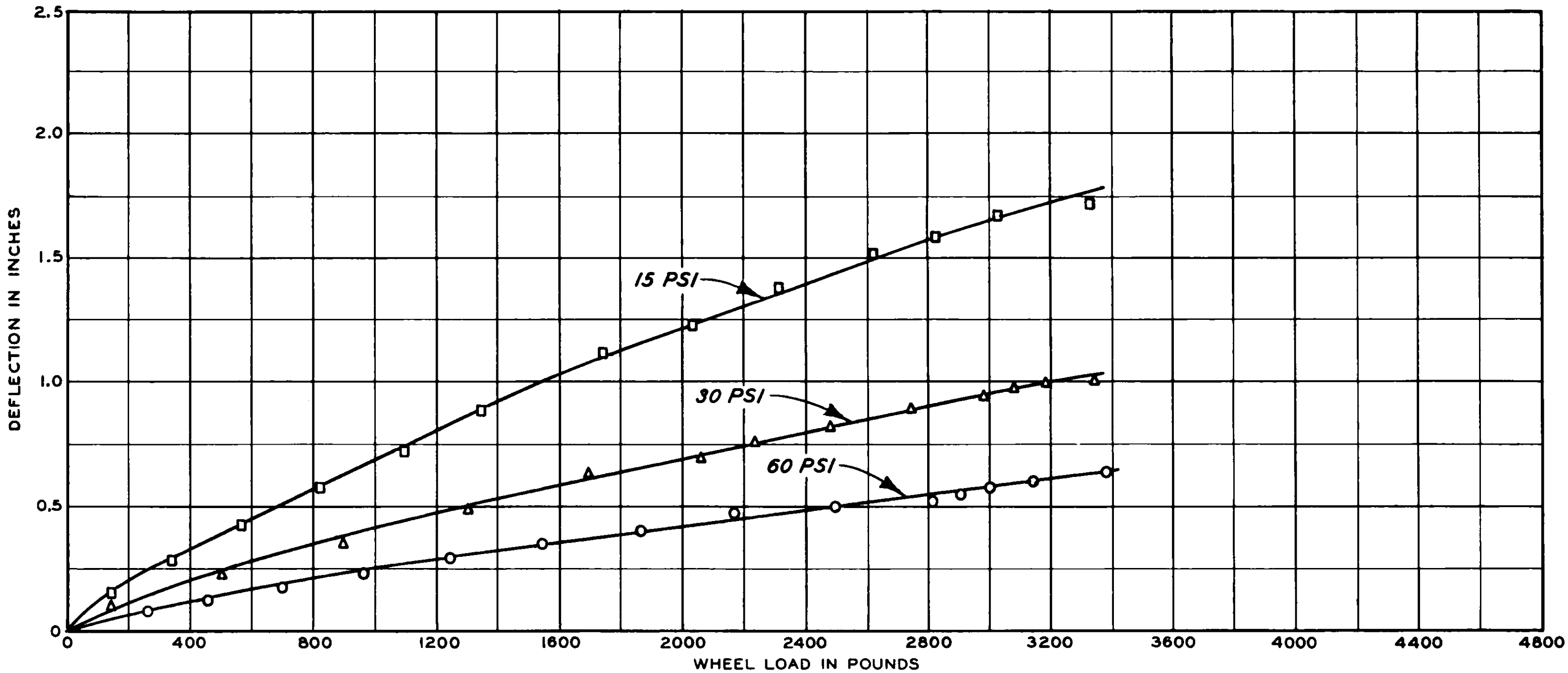
TYPICAL DEFLECTION RECORDING

12.00–22.5, 12–PR TUBELESS TIRE SAND SECTION, THIRD PASS

2950–LB LOAD INFLATION PRESSURE 60 PSI

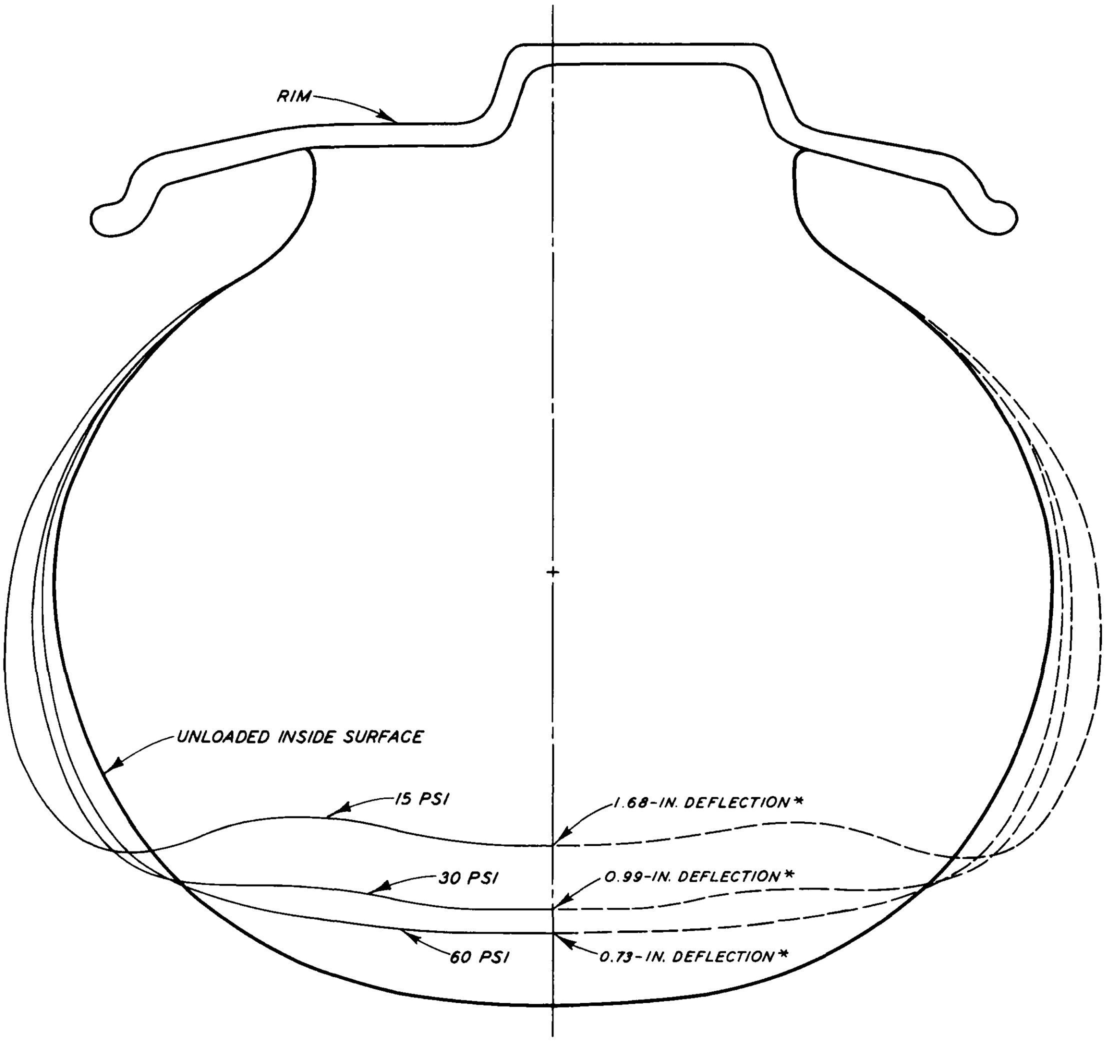
031460–C

PLATE 1



NOTE: DEFLECTION RECORDED BY GAGE 1.
12.00-22.5, 12-PR TUBELESS TIRE.

EFFECT OF STATIC WHEEL LOADS
ON TIRE DEFLECTION AT
VERTICAL REFERENCE PLANE
THREE INFLATION PRESSURES



NOTE: 12.00-22.5, 12-PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.
* DEFLECTIONS SHOWN ARE AVERAGES OF THE DEFLECTIONS MEASURED BY THE LINEAR POTENTIOMETER IN GAGE 1 ON ALL WHEEL REVOLUTIONS OF THE FIRST PASS.

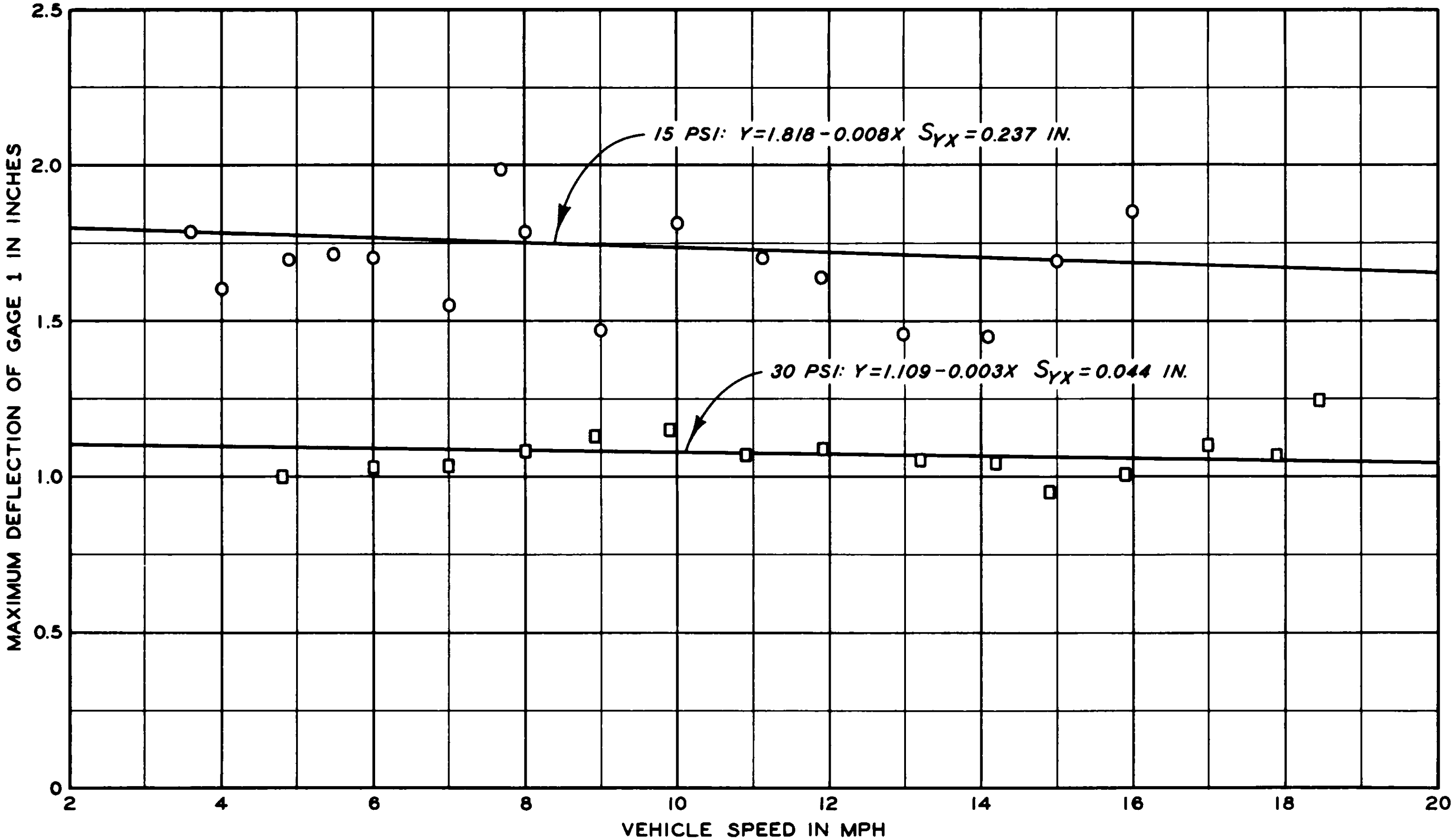
TIRE DEFLECTION ON ASPHALTIC CONCRETE VS THREE INFLATION PRESSURES

SPEED RANGE 2 TO 5 MPH

SCALE IN INCHES

1 0 1 2 3 4

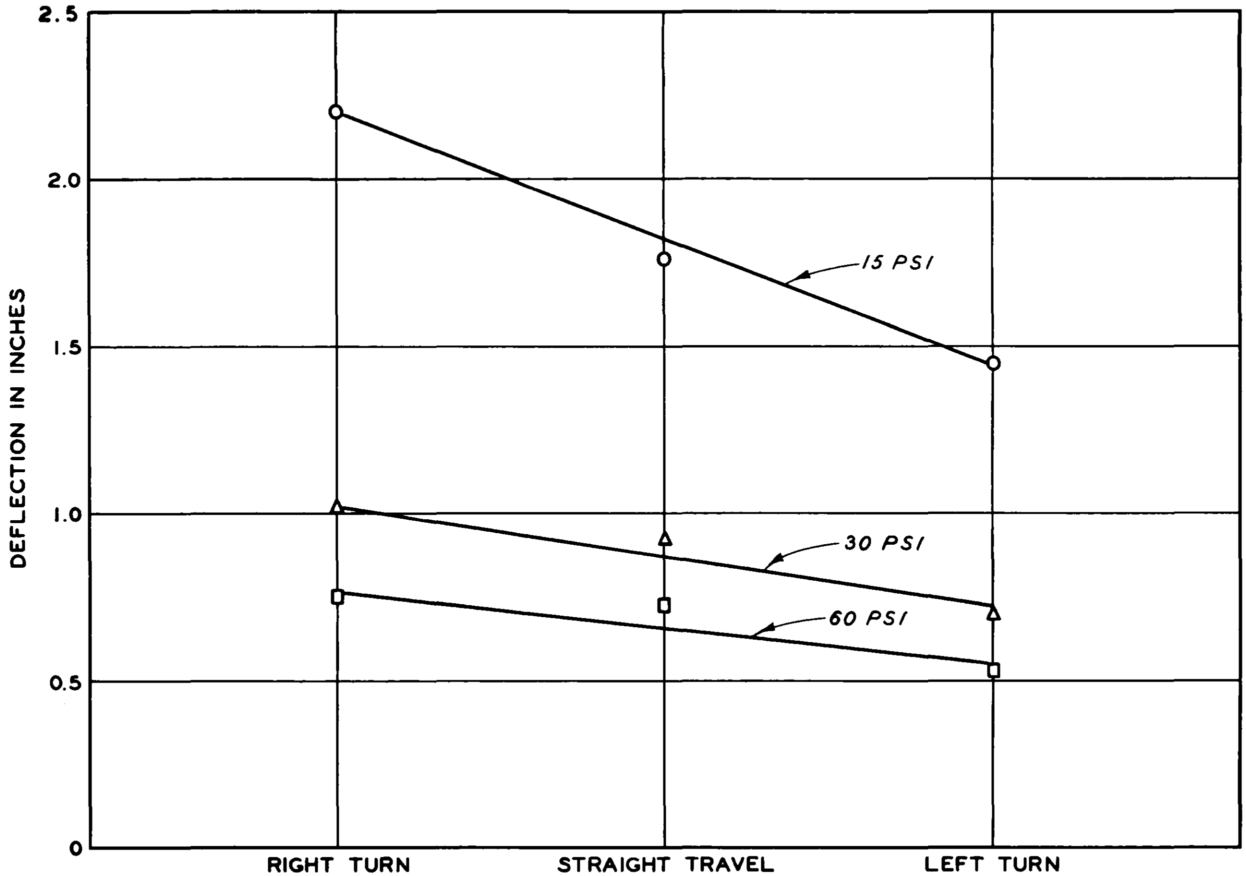
042860-1



NOTE: 15-PSI LINE REPRESENTS 129 DATA POINTS.
30-PSI LINE REPRESENTS 161 DATA POINTS.
12.00-22.5, 12-PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.

TIRE DEFLECTION ON ASPHALTIC CONCRETE VS VEHICLE SPEED

TWO INFLATION PRESSURES



NOTE: DEFLECTION GAGE ORIGINALLY PLACED AT CENTER LINE OF CROSS SECTION.

DEFLECTIONS SHOWN HERE WERE RECORDED AT THE VERTICAL REFERENCE PLANE.

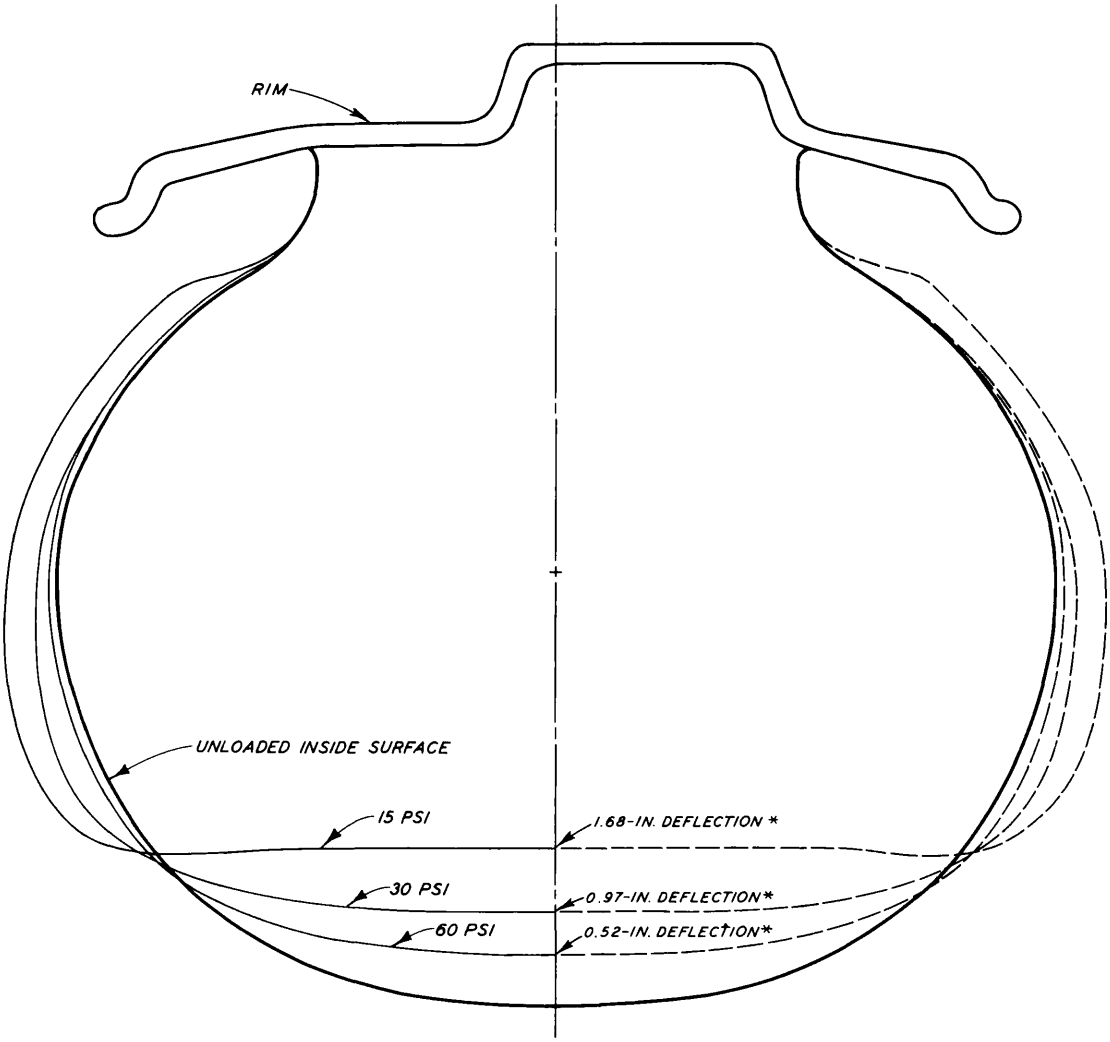
NO CORRECTION MADE FOR ROTATIONAL MOVEMENT OF GAGES.

12.00-22.5, 12-PR TUBELESS TIRE.

WHEEL LOAD 2950 LB.

EFFECT OF CORNERING ON TIRE DEFLECTION

RADIUS OF CURVE 38 FT
AVG SPEED 15 MPH
THREE TIRE PRESSURES



INFLATION PRESSURE PSI	BEFORE-TRAFFIC CONE INDEX 0" - 6" LAYER	RUT DEPTH AFTER FIRST PASS, IN.
15	123	0.50
30	130	0.79
60	100	1.96

NOTE: 12.00 - 22.5, 12 - PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.

* DEFLECTIONS SHOWN ARE AVERAGES OF THE DEFLECTIONS MEASURED BY THE LINEAR POTENTIOMETER IN GAGE 1 ON ALL WHEEL REVOLUTIONS OF THE FIRST PASS.

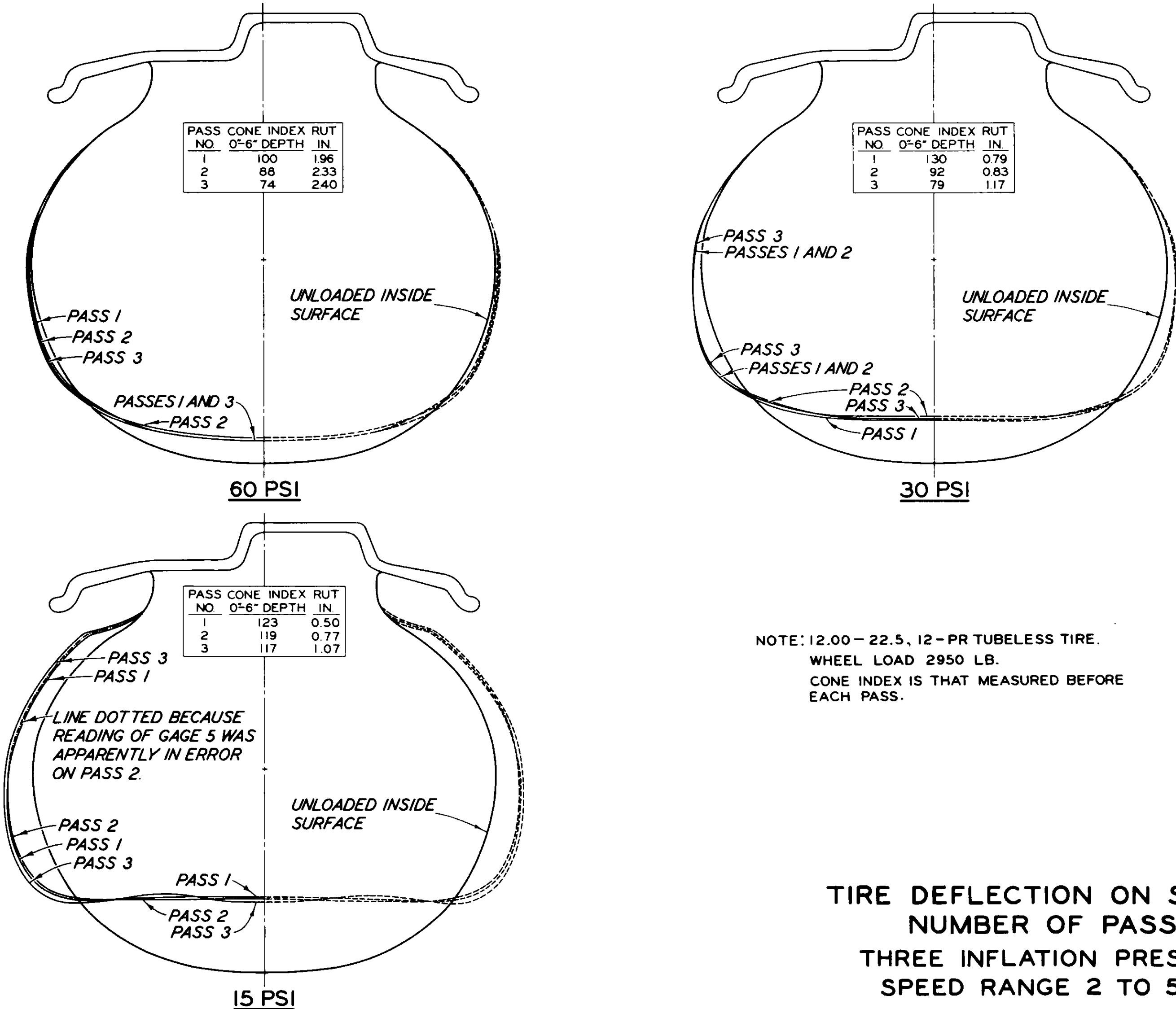
TIRE DEFLECTION ON SAND VS THREE INFLATION PRESSURES

SPEED RANGE 2 TO 5 MPH

SCALE IN INCHES

1 0 1 2 3 4

042860-J



60 PSI

PASS NO.	CONE INDEX 0"-6" DEPTH	RUT IN.
1	100	1.96
2	88	2.33
3	74	2.40

30 PSI

PASS NO.	CONE INDEX 0"-6" DEPTH	RUT IN.
1	130	0.79
2	92	0.83
3	79	1.17

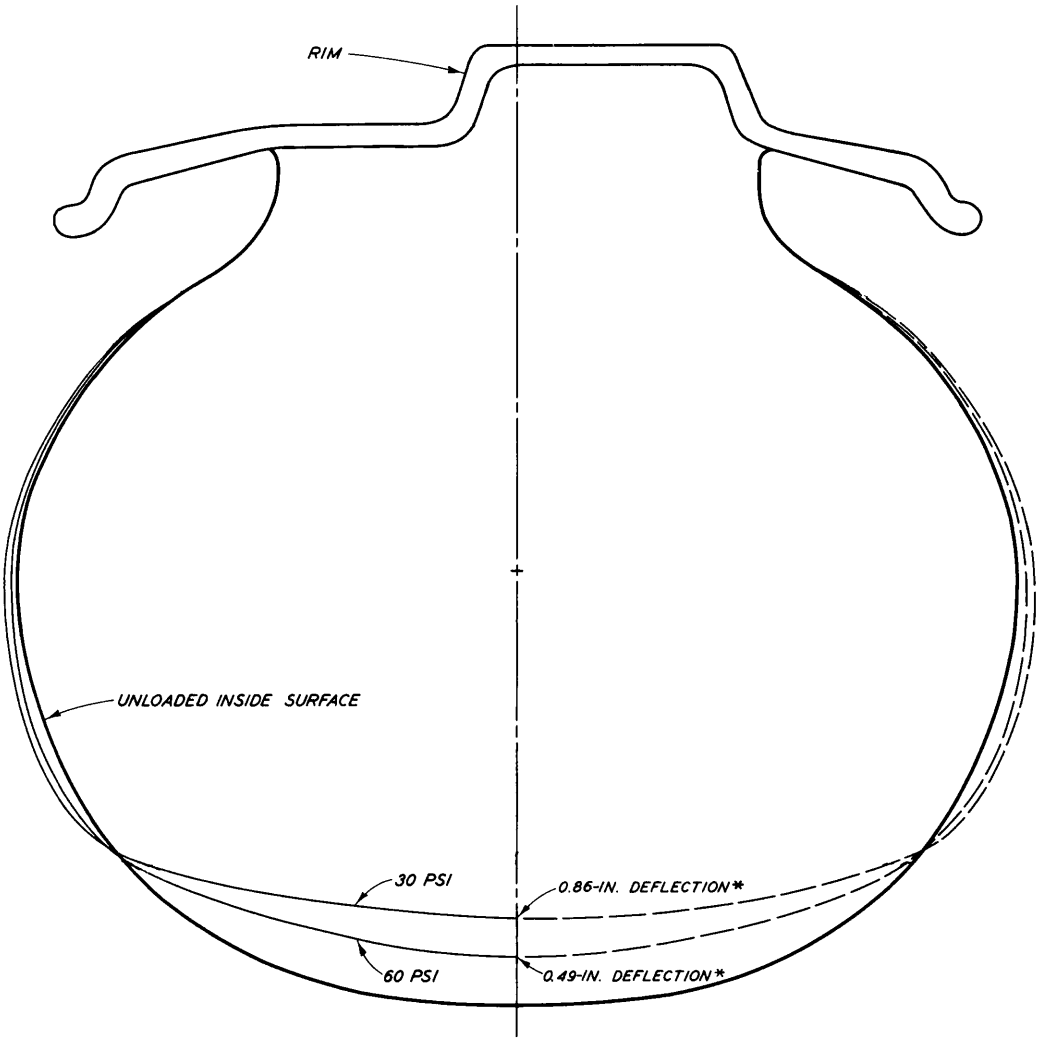
15 PSI

PASS NO.	CONE INDEX 0"-6" DEPTH	RUT IN.
1	123	0.50
2	119	0.77
3	117	1.07

NOTE: 12.00 – 22.5, 12 – PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.
CONE INDEX IS THAT MEASURED BEFORE EACH PASS.

TIRE DEFLECTION ON SAND VS NUMBER OF PASSES
THREE INFLATION PRESSURES
SPEED RANGE 2 TO 5 MPH

PLATE 7



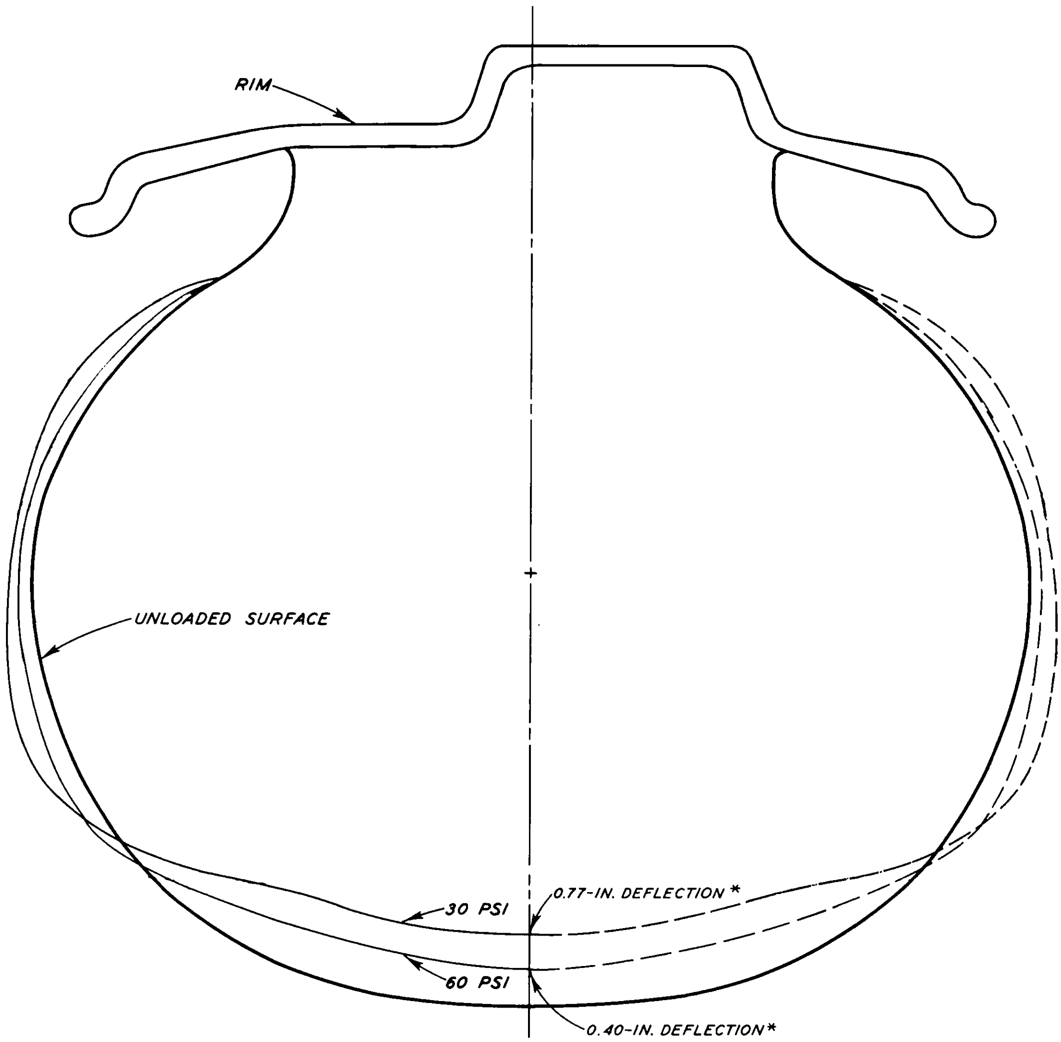
INFLATION PRESSURE PSI	PASS NO.	BEFORE-TRAFFIC CONE INDEX 0" - 6" LAYER	BEFORE-TRAFFIC RATING CONE INDEX 0" - 6" LAYER	RUT DEPTH AFTER FIRST PASS, IN.
30	1	127	79	0.66
60	1	125	78	1.36

NOTE: 12.00 - 22.5, 12 - PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.
* DEFLECTIONS SHOWN ARE AVERAGES OF THE DEFLECTIONS MEASURED BY THE LINEAR POTENTIOMETER IN GAGE 1 ON ALL WHEEL REVOLUTIONS OF THE FIRST PASS.

TIRE DEFLECTION ON SILT SECTION 1 VS TWO INFLATION PRESSURES

SPEED RANGE 2 TO 5 MPH

SCALE IN INCHES

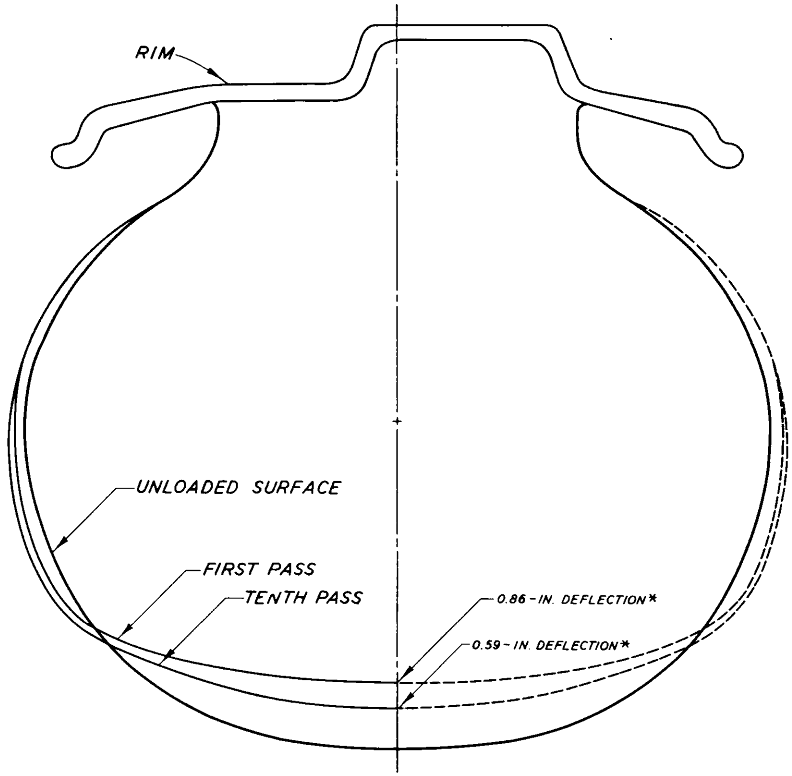


INFLATION PRESSURE PSI	PASS NO.	BEFORE-TRAFFIC CONE INDEX 0"-6" LAYER	BEFORE-TRAFFIC RATING CONE INDEX 0"-6" LAYER	RUT DEPTH AFTER FIRST PASS, IN.
30	1	66	28	2.24
60	1	65	27	6.30

NOTE: 12.00-22.5, 12-PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.
* DEFLECTIONS SHOWN ARE AVERAGES OF THE DEFLECTIONS MEASURED BY THE LINEAR POTENTIOMETER IN GAGE 1 ON ALL WHEEL REVOLUTIONS OF THE FIRST PASS.

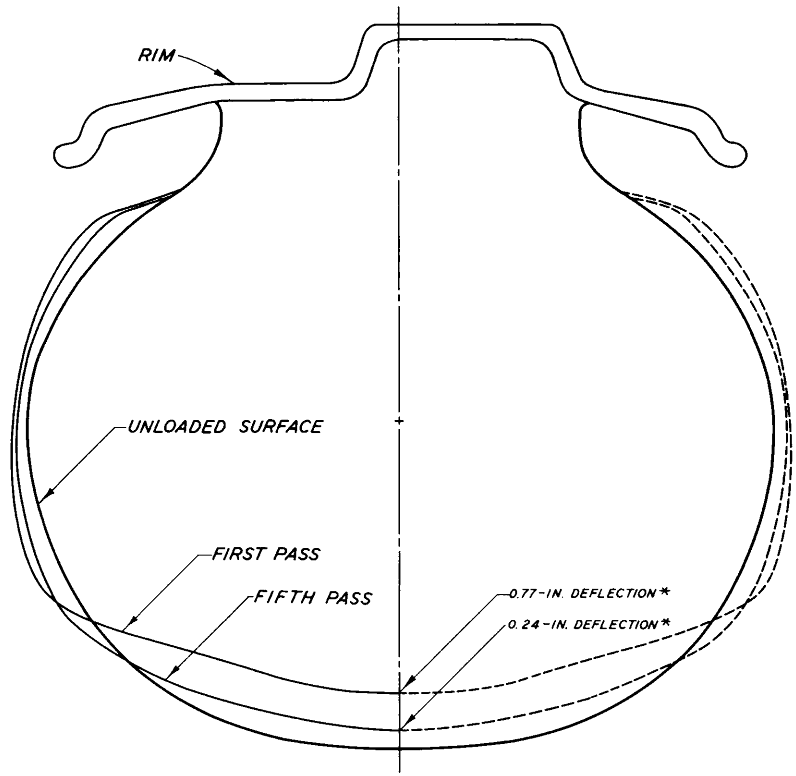
TIRE DEFLECTION ON SILT SECTION 2 VS TWO INFLATION PRESSURES

SPEED RANGE 2 TO 5 MPH



PASS NO.	CONE INDEX 0" - 6" LAYER	RUT DEPTH IN.
1	127	0.66
10	104	2.39

SILT SECTION 1



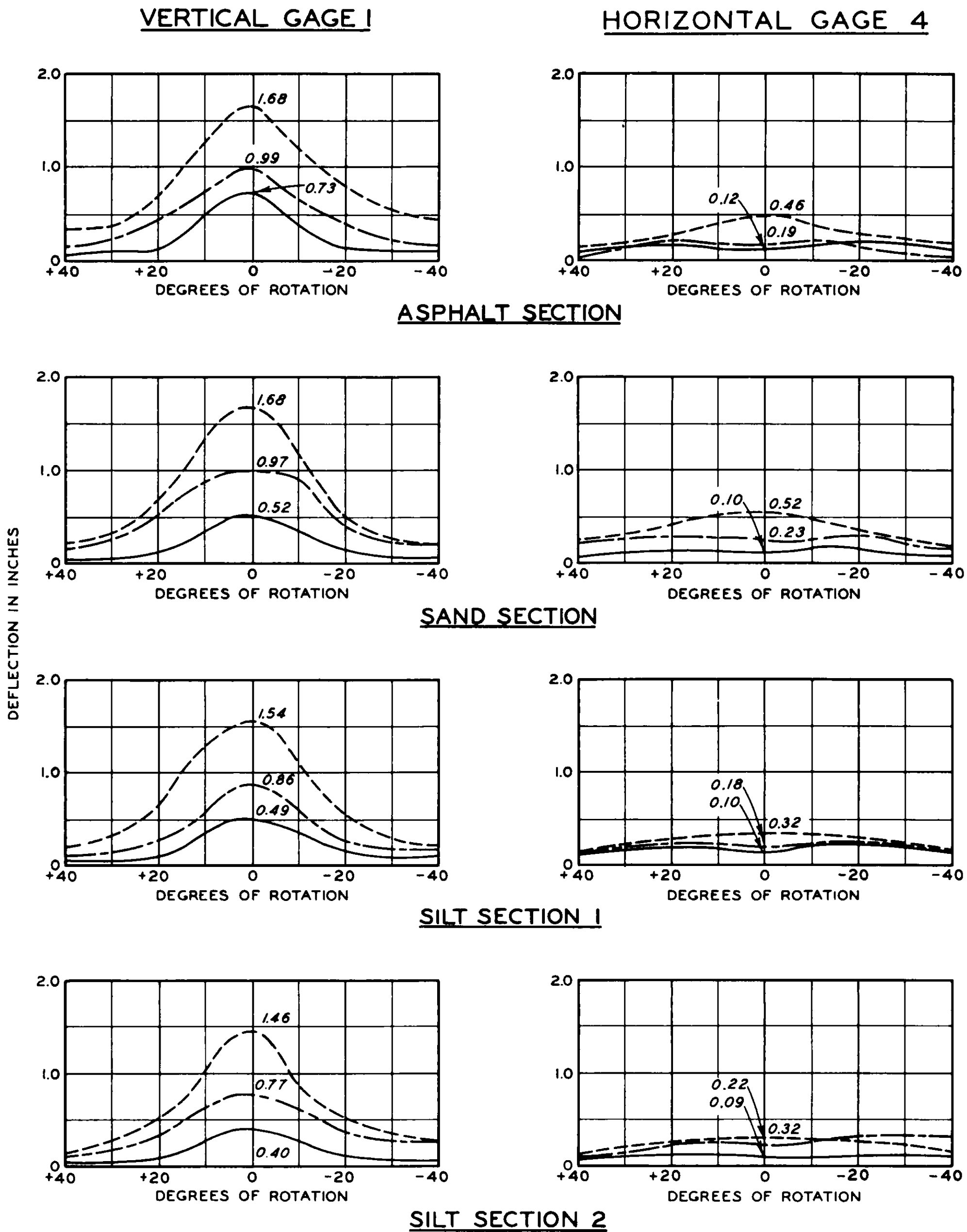
PASS NO.	CONE INDEX 0" - 6" LAYER	RUT DEPTH IN.
1	66	2.24
5	45	8.86

SILT SECTION 2

NOTE: 12.00-22.5, 12-PR TUBELESS TIRE.
WHEEL LOAD 2950 LB.
* DEFLECTIONS SHOWN ARE AVERAGES OF THE DEFLECTIONS MEASURED BY THE LINEAR POTENTIOMETER IN GAGE 1 ON ALL WHEEL REVOLUTIONS OF THE INDICATED PASS

TIRE DEFLECTIONS ON SILT SECTIONS 1 AND 2 VS NUMBER OF PASSES

30-PSI INFLATION PRESSURE
SPEED RANGE 2 TO 5 MPH



LEGEND

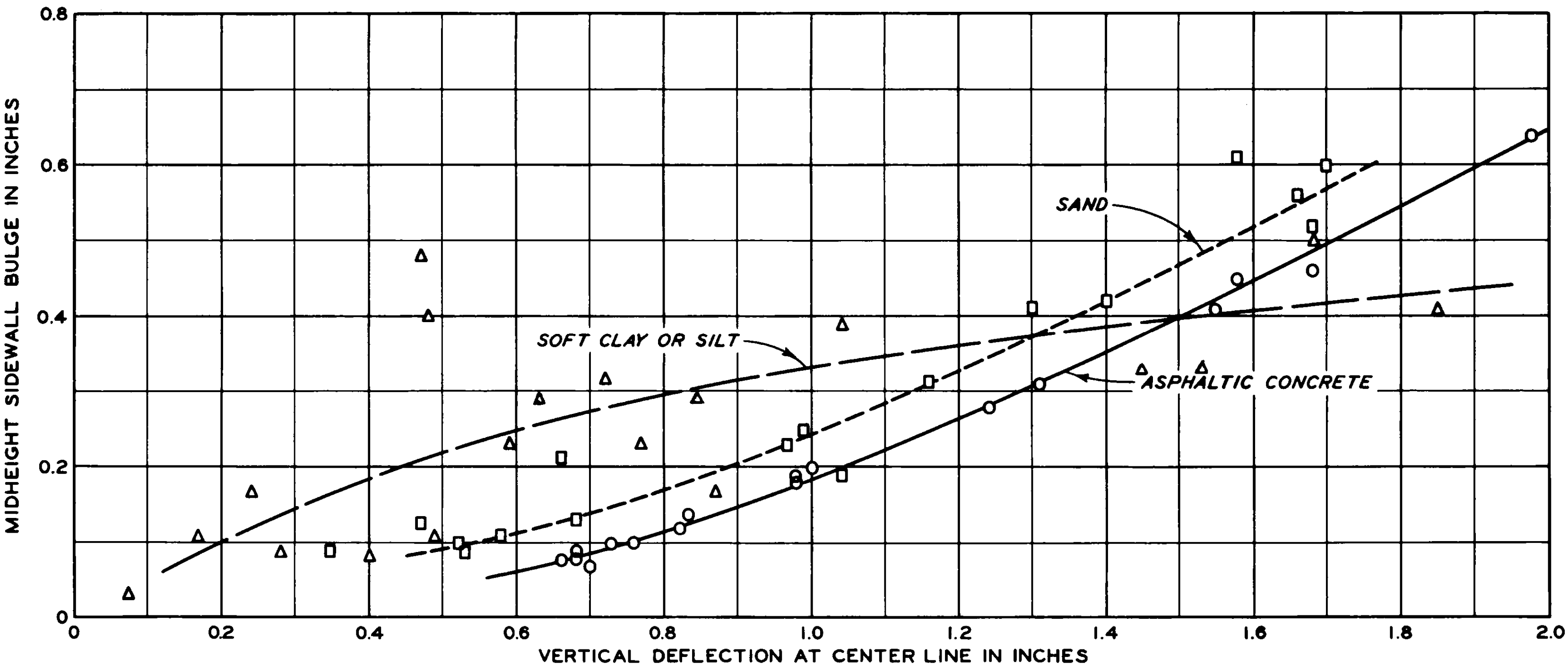
———— 60-PSI TIRE PRESSURE
—·—·— 30-PSI TIRE PRESSURE
— — — 15-PSI TIRE PRESSURE

NOTE: NUMBERS ON CURVES DENOTE INCHES OF DEFLECTION AND ARE AVERAGES OF THE DEFLECTIONS MEASURED ON ALL WHEEL REVOLUTIONS OF THE FIRST PASS.

DATA SHOWN FOR SILT SECTIONS WERE OBTAINED IN THE CHECK TESTS.

12.00-22.5, 12-PR TUBELESS TIRE.

VARIATION IN VERTICAL AND HORIZONTAL DEFLECTION WITH DEGREES OF ROTATION



LEGEND

ASPHALTIC CONCRETE ○———○
SAND □- - - -□
SOFT CLAY OR SILT △— —△

NOTE: ALL DATA OBTAINED AT VERTICAL REFERENCE PLANE.

RELATION OF SIDEWALL BULGE TO VERTICAL DEFLECTION OF TIRE

THREE DIFFERENT SURFACES