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WIDTH OF WAGON TIRES RECOMMENDED FOR LOADS OF VARYING MAGNITUDES ON EARTH AND GRAVEL ROADS.

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The recommendations in this circular relating to widths of wagon tires suitable for use on country roads of earth and gravel, as well as upon those of a more improved type, are based upon two factors: (1) The unit weight for width of tire commonly used for road rollers, and (2) the results secured from a large series of traction tests conducted by the Office of Public Roads and Rural Engineering, extending over several years and made in widely scattered localities throughout the United States.

An examination of several of the road rollers in general use shows that they are designed for a weight per inch of width of tire varying from 450 pounds to 650 pounds, more of them ranging from 500 to 550 pounds than within any other 50-pound division. It is apparent that, as this is the maximum weight applied to the foundation and surface of the road during construction, it is not advisable to exceed this weight except in cases of emergency, and then only occasionally.

Curves shown in figures 1 to 5, inclusive, are plotted from the results of traction tests recently conducted on a dry earth road which was constructed by the use of a 10-ton road roller having a unit weight on the wheels of 450 pounds per linear inch of width of rim, and with a constant gross load on the wagon of 5,000 pounds. The curve on figure 5 is the average unit draft, by which is meant the pounds pull per ton of gross load, for the full 40 trips; the vertical distance in each case is the measurement of the draft in pounds per ton. The left-hand point on the diagram represents the draft of the 1½-inch tire, the next point that of the 2-inch tire, and so on through the 3-inch, 4-inch, 5-inch, and 6-inch. This same curve is drawn on each of the other figures. It will be noted that it approximates very closely to a curve representing the average of the points recorded.

FIG. 1.—Curve plotted from the results of traction tests conducted on a dry earth road.
Average of first 10 trips.

FIG. 2.—Curve plotted from the results of traction tests conducted on a dry earth road.
Average of second 10 trips.

FIG. 3.—Curve plotted from the results of traction tests conducted on a dry earth road.
Average of third 10 trips.

FIG. 4.—Curve plotted from the results of traction tests conducted on a dry earth road.
Average of fourth 10 trips.

An inspection of the curves on figures 1 to 5 shows that there is a constantly decreasing unit draft from the $1\frac{1}{2}$ -inch through the 5-inch, with an increased draft for the 6-inch tires in all cases, except that one representing the average of the third 10 trips.

In conducting these experiments the road was constructed prior to the first test by being plowed up, graded, and rolled. After each test and before the beginning of the next, the road was replowed, graded, and rolled again, so that the condition of the road at the beginning of each test was as nearly the same as it was possible to

FIG. 5.—Curve plotted from the results of traction tests conducted on a dry earth road. Average of 40 trips.

make an earth road. The trips selected for comparison are those in which moisture and atmospheric conditions were practically the same.

The long series of traction tests mentioned in the first paragraph includes investigation of the influences of many factors other than of tire width, and because of the magnitude of the work many of the results have not yet been calculated, but those that have been calculated conform very closely as to relative draft with those shown on figure 5, although the actual draft in pounds varies according to the nature and condition of the road surface.

On figure 6 the horizontal distances are the pounds weight per inch of width of tire, as taken from curve on figure 5, while the vertical distances are, as before, the unit drafts.

From the curves shown on these figures the following conclusions may be drawn for well-constructed dry earth roads:

With a gross load of 5,000 pounds the unit draft decreases with the width of tire up to and including the 5-inch width.

The unit draft decreases directly as the weight per inch width of tire decreases, until a weight of 250 pounds per inch of tire is reached, as shown by the fact that the curve in figure 6 is practically a straight line.

The fact that the draft for a 6-inch tire is larger than that for a 5-inch, in all cases shown, merely indicates that there is no advan-

FIG. 6.—Showing that the unit draft decreases directly as the weight per inch width of tire decreases.

tage in increasing the width of tire beyond a certain point, and there may be a disadvantage in so doing.

It is not advisable to exceed in any vehicle a unit weight per inch of width of tire in excess of that possessed by a standard road roller.

RECOMMENDATIONS.

While there has been in the past, and to a certain extent still is to-day, wide variation in sizes and types of wagons marketed by the different manufacturers, it is believed that five sizes of wagons will be sufficient to meet all the needs of farming operations and all general work except the heaviest trucking and certain specialized haul-

ing, which is likely to be confined to city pavements. These five sizes are:

- (1) One-horse wagon having a gross load capacity of 2,000 pounds and a skein from $2\frac{1}{8}$ to $2\frac{3}{8}$ inches.
- (2) Light two-horse wagon with a skein approximately $2\frac{1}{2}$ inches, and a gross carrying capacity of 3,500 pounds.
- (3) Medium two-horse wagon with a skein not exceeding 3 inches, and designed for a gross load of 4,500 pounds.
- (4) Standard two-horse wagon with a skein of $3\frac{1}{4}$ inches and a gross carrying capacity of 6,800 pounds.
- (5) Heavy two-horse wagon having a skein of $3\frac{1}{2}$ inches and gross load capacity of 7,500 pounds.

As there is considerable difference in the practice of manufacturers regarding the size of skein used on the various types of wagons, it is recommended that wagons be not designated by size of skein but according to the gross load capacity, and that a name be adopted for each of the sizes. It is further recommended that the gross carrying capacity of the wagon be shown by stencil or plate on the back of the rear axle. The following widths of tire are recommended for each size of wagon, based on road-roller weights and on results of traction tests conducted by the Office of Public Roads and Rural Engineering:

Width of tire recommended for wagons of different carrying capacities.

Type of wagon.	Gross weight, loaded.	Width of tire.
	<i>Pounds.</i>	<i>Inches.</i>
1-horse wagon.....	2,000	2
Light 2-horse wagon.....	3,500	2½
Medium 2-horse wagon.....	4,500	3
Standard 2-horse wagon.....	6,800	4
Heavy 2-horse wagon.....	7,500	5