

of a binder course between the concrete base and the surface mixture. Theoretically a paint coat forms a perfect bond between the two courses, but at best it is difficult and inconvenient to prepare and apply, and unless the conditions on the street are ideal the practical results are frequently entirely different from those obtained in theory.

Also for the purpose of overcoming the tendency of the wearing surface to shove under traffic, several cities have recently adopted what is known as "anchor concrete," a form of construction patented by W. B. Brady, of Chicago. Anchor concrete is merely a slush coat of cement mortar spread $\frac{1}{2}$ in. deep upon the freshly laid concrete foundation. Before this slush coat has received its initial set, clean, hard, broken stone about $1\frac{1}{2}$ to 2 in. in diameter is spread evenly over it and imbedded into the slush coat by light tamping. When dry, this produces a very rough but rigid surface and acts as an anchor for the topping which is laid directly upon it. This form of construction is especially effective on steep grades.

Where the traffic is light, such as on suburban or residential streets, it may be possible to eliminate all forms of intermediate courses and lay the wearing surface directly on the concrete base, but to do away with the binder course generally, as a few municipalities have recently done, regardless of traffic or other conditions, is a serious error.

STANDARD METHOD OF TRAFFIC RECORDING.*

The object of this report is to suggest a uniform method of recording, analyzing and standardizing quantity and weight of traffic on streets and roads, and for reducing it to unit bases of quantity and of tons per yard of used traffic width of roadway per day, or per square yard of used roadway surface, which is the same thing. It is wise to recall the two legitimate causes of wear and destruction of pavements; they are traffic and weather, separately and combined. Many records of traffic have failed to state the width of the road and are defective in other respects. Many cannot be reduced to any unit basis for comparison with one another. Many have unnecessarily subdivided the vehicles into too many kinds, sizes, etc., by methods which are complicated and unnecessary for practical, general use. Traffic records should be based on a simple, accurate method of counting and recording traffic and reducing it to standard units of quantity and tonnage. The method should be such as to be quickly understood and applied.

The period during which traffic should be counted is for 12 consecutive hours from 7 a.m. to 7 p.m. and during six consecutive or other different week-days. If average weather and what is known to be average traffic conditions are selected, then a record for only three consecutive week-days gives valuable information. No traffic should be counted in abnormal seasons of snow and ice, nor during continuous rainy, very cold or excessively hot days. The traffic should be counted at or near the centre of a block and not at an intersection of two streets. The traffic is that which passes both ways along the street or road.

The general classification of vehicle traffic for practical results, is as follows: First, horse vehicles, subdivided for vehicles drawn by one, two and three or more horses; second, auto vehicles. The vehicles and horses must both be considered in computing the weights of traffic from the quantities counted and recorded. For general traffic counting

and the reduction of the quantities of vehicles to tonnage of traffic, the average weight of all vehicles, empty and loaded, drawn by one horse can be taken as 1 ton of 2,000 lb.; by two horses as 2 tons; by three or more horses as 4 tons. In like manner the average of all auto-vehicles, loaded and empty, for transportation of persons and goods can be taken as $1\frac{3}{4}$ tons. All bicycles and ridden horses, because light and very few, are best omitted from street traffic recording.

For recording traffic, sets of four cardboard slips, about 9 x 2 in., fastened together at the end, may be used; twelve sets are needed. One set is used for each hour. Each set is marked for location where traffic is counted, name of observer, date, the hour represented by the set (as 7 a.m. to 8 a.m., etc.). There must be at least two observers for each location, to relieve each other at the end of each hour or two hours, because one recorder cannot work accurately for a longer period. An ordinary conductor's punch is needed and a hole is punched in a slip for each vehicle passing in either direction along the street in front of the recorder. One-horse vehicles are punched on white cardboard; two-horse on yellow; three and more horse vehicles on red; all auto vehicles are punched on blue slips.

A blank form for one-day traffic record consists of a consolidated record of the quantity of traffic during each of the twelve hours from 7 a.m. to 7 p.m., with totals and reductions to unit bases. It gives details of name of city, width of roadway, effective width used by traffic, which averages $\frac{1}{2}$ yd. less on each side or 1 yd. less than the full width between curbs or edges of the street, the kind and quality of pavements, the weather and other needed facts are shown. This form reduces the one day's traffic to standard units which are the total vehicles and total tons of traffic on the whole street; also per yard of effective width of the street. This is the equivalent of number of vehicles and tons per square yard of used roadway surface.

From the forms for the one-day traffic records a consolidated traffic record is compiled. It consists of a condensed statement covering the six or other number of days' traffic. It shows the data day by day, together with the final totals and the average per day. These totals are reduced in quantity and tons to the standard units of yard of effective width (square yard) of roadway surface subjected to the traffic. These are the true bases for comparing the traffic of one street with another and for establishing the relation of different amounts of traffic to wear on pavements, cost of maintenance and for many other useful purposes.

Traffic records are seldom needed annually; but at longer intervals up to once in five years or according to local conditions.

NOVEL METHODS OF HAULAGE.

During the operation of excavating for the foundations of large buildings it is a familiar sight to see an additional team whose duty it is to assist the haulage of the earth wagon to the road level, but this method has been superseded by a donkey engine at the corner of Simcoe and Richmond Streets in the city of Toronto.

The donkey engine is located on the roadway at the top of the incline, which is exceptionally steep, and uses the curbing as a brace. When a wagon has been filled and moved by the horses to the bottom of the incline, a cable is let down and secured to the tongue of the wagon by a hook; the horses are started on the upward path as the throttle is opened and it is interesting to see mechanical horse-power pitted against the more fleshy nature. If any conclusions are to be drawn from the action of the horses a by-stander would take it that the horses imagine they are on an elevator.

* Committee report of J. W. Howard, consulting engineer, New York, chairman, presented before American Society of Municipal Improvements, Dallas, Texas, Nov. 12-15.