Why the Increasing Emphasis on Traffic Operations?

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It is a pleasure and an honor to have the opportunity of speaking at the Purdue Road School. It is particularly stimulating because you are not a group of theorists—important though theorists are in certain cases—but are operators, men who build and supervise the building and maintenance of highways. You are the working partners in the largest industry in the world—highway transportation. Thus, I assume I can forego any discussion on the subject of whether or not the automobile is here to stay.

WHAT ARE TRAFFIC OPERATIONS?

Before trying to talk about increasing emphasis on traffic operations, let us get a common understanding of what is meant by the term "traffic operations." I am not going to try to duplicate a Webster definition. In rather simple language, traffic operations involve planning for and controlling the movements of vehicles and groups of vehicles over streets and highways for the purpose of attaining maximum efficiency and safety.

Perhaps the increasing emphasis on traffic operations can best be illustrated by the parallel of what happened on the railroads. In the early days the major problems facing a railroad involved the acquisition of rights of way, the preparation of the roadbed, the avoidance of excessive cuts and fills, curves, and grades, and the laying of track. A company organization chart would show that the construction department was probably the largest of any. For a good many years this remained so, even though emphasis gradually changed to getting better roadbeds, stronger rails, and reduced curves and grades.

Then came the time when more and more trains per 100 miles of track required more emphasis on scheduling, signal systems and other safeguards, grade separations, effective use of terminal facilities, loading, "parking" and other operations. Today, if you check a company organi-
EARLY HIGHWAY PROBLEMS MAINLY CONSTRUCTION

From the time of the construction of the Appian Way by the Romans, around 300 B.C., down almost to our present generation, the major problem of highway transport was to provide some kind of location and surface which would withstand the traffic and adverse weather conditions. The problem of building a highway had little to do with limiting grades and curvature, superelevation, stabilized shoulders, grade separations, limited access, and the many other features of modern highways where traffic demands are far in excess of those calling simply for a surface that will remain stable when it rains, freezes, thaws, etc. Of course, there are other kinds of road problems. One might well be illustrated by the story of the town fathers who were debating whether to build a good road and arrest the motorists for speeding, or to maintain a mud hole and charge for pulling them out.

The term traffic operations, as we know it, is new. The need to apply engineering techniques to traffic operations came after the automobile was accepted and in general use. The stimulus to road building during the three decades prior to World War II obviously resulted from expanding motor-vehicle use. But the need for “operations engineering,” or “traffic engineering,” was not immediately widely recognized during this “get-America-out-of-the-mud” period. We began to get increasing mileages of hard-surfaced highways. More and better highways encouraged greater automobile use. And greater automobile use created a demand for more and better highways. As traffic grew, the need for greater efficiency, which includes safety, became more and more apparent.

LET'S GET TRAFFIC MOVING

My subject has to do with the reasons for, or reasons why there should be, increasing emphasis on traffic operations. Is it reasonable to have a subject and a “text” as well? For if it is, I should like to take for my text, “Let’s get traffic moving.” This I hope to inject throughout the discussion of the subject of traffic operations, for it appears that since the first ordinance against fast driving was enacted in Boston, in 1757, all too much of the emphasis, intentionally or unintentionally, has been on restricting traffic movement rather than on aiding and expediting it. To be sure, many regulations and traffic control devices which result in slower-moving traffic have been necessary in order to provide greater...
safety. Traffic control signals, stop signs, limited-time parking restrictions, and turning restrictions are in this class. Obviously, these alone are not to blame for continually decreasing average traffic speeds on busy city streets, for the tremendous increase in vehicle-miles of highway travel has been a major retarding factor.

An example of how average travel speeds have decreased can be found in a recent report on "Street Traffic Management for Los Angeles." On a 1.5-mile test run in 1937 in Los Angeles, average speed was 27.3 miles per hour. Average speed for the same run in 1947 was 14.5 miles per hour, involving nearly a doubling of travel time. There were other and comparable test runs which showed considerable, though less spectacular, decreases in average speed.

It would appear sometimes that we have gone backward rather than progressed. Our fervor for greater highway safety is one reason. And not for a moment do I belittle the objective of safer traffic movement. But isn't it possible to get both safety and reasonably free traffic movement? Must we slow our traffic to a crawl in order to keep from killing and maiming each other? If so, perhaps my earlier statement about whether the automobile is here to stay should be opened for discussion!

Let us review briefly some of the reasons why traffic has been restricted by our attempts to reduce congestion and increase efficiency. And, more important, let us see what some of the practical things are that can be done to secure more orderly, expeditious, and safe use of streets and highways.

GROWTH OF TRAFFIC VOLUME AND SPEED

Three simple factors provide a measure of the phenomenal growth and increasing importance of highway transportation in the United States.

One such factor is the number of vehicles in operation from year to year. Many of you have seen the number of vehicles on the highways of the nation double a couple of times. Just to pick a year, there were less than 10 million vehicles, including both passenger cars, trucks, and buses, on the roads in 1920. Today, less than three decades later, there are in excess of 40 million vehicles.

A second factor is the number of miles these vehicles operate each year. In 1920, average annual mileage was in the vicinity of 5,000 miles per motor vehicle. At the present time, best estimates indicate that 10,000 miles per year per vehicle is reasonable. Obviously, this doubling of average annual mileage assumes its full importance only when
coupled with the increase in number of vehicles in operation cited above. It then means an eight-fold increase in annual vehicle-miles of vehicular traffic between 1920 and today.

The third factor is the volume of freight and passengers transported by motor vehicles. Since 1925, ton-miles of freight carried by trucks increased some $6\frac{1}{2}$ times and passenger-miles by private motor vehicles some $3\frac{1}{2}$ times.

Reluctant as I am to overuse figures, which I agree many of you will not remember, I do so not only to point out that highway transportation is almost every year reaching new highs in importance to our whole national economy, but to indicate also how rapidly these changes have taken place. The figures used above do not go back to the days when patrician ladies rode in ornate and graceful horsedrawn chariots. Yet some of us can remember what highway and traffic conditions were when horsedrawn vehicles were more numerous than horseless carriages. But the main changes which I am talking about have taken place during the lifetime of practically every person in this audience, in less than 30 years. What of the future? Well, very substantial increases in traffic seem unquestionable—at least a 50% increase by 1960—and here is a basic reason why emphasis on traffic operations is bound to grow.

Fortunately, traffic speeds have not increased by anything like the growth in vehicle-miles. The example which I used in my opening remarks is not typical of what has happened in all urban areas. However, speeds on downtown city streets have not increased greatly, if at all, in the last few decades. Those of you who have read Can Our Cities Survive? by Jose Luis Sert may recall the author's example of speed changes through the years. He says that in 1910 it took ten minutes and twenty seconds to go by horse and buggy from First to Tenth Street in Los Angeles, whereas at the time he wrote his challenging book, it took fourteen minutes and twelve seconds to travel the same route by automobile. Speeds on arteries outside business centers have increased—and that is one reason for the greatly increasing suburban residential development. And by the way, one major part of the answer to Jose Sert's question, "Can our cities survive?", must involve traffic operations. For our cities have serious congestive heart trouble, and it's high time that a lot more be done about it—and much must be through traffic engineering.

Outside cities, differences in prevailing speeds have less to do with whether the year is 1920, 1930, or 1940, but vary more with the character of the highway. Here is an example in a setting which many of you know about. A comparison of 55 miles of the Merritt Parkway and 53 miles of the Boston Post Road involving the same origin and
destination showed for the parkway: (1) a one-third time-saving (88 minutes versus 128 minutes), (2) one stop against 41 on the Post Road, and (3) less gasoline used (2.75 gallons against 2.9, despite the two additional miles on the parkway). The fatality rate on the Parkway is about one-third of that on the Post Road.

What, then, can highway planners and builders do about traffic volumes and speeds?

There isn't much they can do about growing traffic volume, except to consider it in present and future arterial and other road design, construction, and maintenance. Let us not be “caught short” as we have so many times in the past by failing to consider even obvious trends of increasing traffic volumes. I need not point out to you who are in the highway building, maintaining, and operating “business” that many highways have become obsolete almost before construction was completed.

On this subject Commissioner MacDonald stated in his outstanding David Beecroft Memorial Lecture last November that: “Most of the improved mileage has been built under public pressures and also legislative edict, to stretch the dollars over maximum lengths. In general the design tolerances have been too meager for today's quantity and characteristics of traffic. Overloaded highways (by traffic capacity) are one of the chief underlying causes of highway accidents.”

About the matter of speed—there is much we can do. I don't mean that we should immediately start designing for 100 miles per hour, although I have little doubt that up to a reasonable human limitation, design speeds should be increased as years go by. What does warrant great emphasis in highway design and maintenance, and even in structural improvements to existing roadways, is to help keep vehicles moving rather than restrict their movements. This is particularly important in and near cities. The emphasis, in my opinion, should be upon travel time between origins and destinations rather than upon speed attainable at any given location upon a road network. For example, it does little good to be able to travel at 60 miles per hour on a highway if traffic signals force traffic to stop at frequent intervals or, worse yet, if intersections at grade result in numerous traffic accidents. Thus, I wish to re-emphasize my text, “Let’s get traffic moving.”

GROWTH OF TRAFFIC ACCIDENTS

Another important and fundamental reason for increasing emphasis on traffic operations is the seriousness of the traffic accident situation. It is true that traffic fatalities, in terms of vehicle-miles of travel, have,
reached a new low since the war. Preliminary estimates indicate about 8.1 deaths per 100 million miles of travel for 1948 compared with a rate of 19.0 in 1925. This is real progress. Nonetheless, with some 32,000 persons killed and a million injured last year, there is still a tremendous job to do.

More figures would be burdensome. What I want particularly to emphasize is that at least some part of the accident prevention job is yours, and I definitely include maintenance men. As the accident rate is lowered, as it has been during the past few years, we may expect to reach a critical point where continued emphasis on education and enforcement can no longer produce reductions. Reductions, after such a critical point is reached, will be dependent largely upon higher standards of highway design, construction, maintenance, and traffic engineering. Commissioner MacDonald recently said that “the pressures for accidents build up in geometric ratios . . . with traffic volumes.” He then went on to say that “the astronomical number of accidents that do not (quite) happen is terrifying,” and that “the accident potential can only be reduced with certainty by reducing the possible conflicts of traffic units.” In other words, traffic safety must be built into highways.

Progressive highway officials agree that they must accept part of the responsibility for traffic accidents, for sufficient evidence now exists to demonstrate that to a heretofore unrealized extent safety can be built into highways. The days when you built a slab of pavement connecting one point to another, opened it for use, and expected the drivers to “look out for themselves,” are gone forever.

UNDERBUILDING

Another important reason for the increasing need for emphasis on traffic operations is our apparent penchant for underbuilding. Thin pavements, narrow lanes, poor shoulders, inadequate sight distances, sharp and insufficiently banked curves, and excessive grades are only a few of the “built-in” features which have come right back and smacked us with delays, congestion and accidents. Failure to provide center strips or islands to produce “divided highways” for heavy traffic is expensive, accident-wise. This is shown clearly by New Jersey studies indicating that when three or four-lane highways were rebuilt with a central dividing area, accidents were reduced one-third. Today most road leaders favor divided highways. Yet as relatively short a time ago as 1932 I made a survey of opinions of highway department people as to divided roadways and found but few who advocated them. Our ever-growing, oh, so healthy child—highway transportation—is forcing us to provide
new and more suitable "clothes"—another reason for increasing emphasis on traffic operations.

Prognostications of future events in transportation are hazardous at best. But certainly they are less hazardous if based upon sound highway and traffic planning techniques. We all realize that a highway having many of the outdated features just mentioned should have been built right in the first place. There is small satisfaction in the thought that twenty years ago, which is within the lifetime of many pavements, there were no planning surveys, few, if any, studies of highway capacities, and essentially no studies of driver behavior.

Inability to foresee progress in highway transportation or to insist upon design adequacy is no more vividly brought to the attention of the public than through continued use of weak and narrow bridges. Physically widening a highway is not particularly difficult, but widening most bridges in any practical manner is next to impossible.

These and other inefficiencies of many present-day highways have resulted in a demand for a much more bold and forward-looking approach. Leaders are now insisting upon proper planning, upon proper emphasis, upon the dynamics of the highway's use, and upon consideration of the human element and the traffic stream. Commendation is due the many state highway departments and the U. S. Public Roads Administration for their foresight in carrying out and utilizing the highway planning surveys and for the numerous studies of driver behavior which have been conducted.

The idea of locating new urban arteries according to results of origin-destination surveys is comparatively recent. The placement of bridge abutments based on studies of lateral placement of vehicles is new. Relatively new is the use of driver behavior data in the computation of sight distances for designing highway curves (both horizontal and vertical).

To incorporate such traffic operations features in the original design of highways will save millions of taxpayers' dollars in the prevention of functional obsolescence and lessening of accidents. A highway or street which prematurely becomes obsolete is as wasteful as one which has failed structurally. In some cases an obsolete highway is even more wasteful than one structurally deteriorated because of the "built-in" traffic hazards. At least, the built-in hazards do not "function" actively if a highway is broken up until almost impassable.

An important new publication designed to provide for greater "built-in" safety in residential subdivision streets will be ready for distribution soon. It is entitled Building Traffic Safety Into Residential Developments, and will be published by the National Association of
Home Builders, the Urban Land Institute, and the National Committee for Traffic Safety. I recommend it to any of you who have responsibilities in connection with street and highway construction in residential subdivisions. It is another evidence of increasing emphasis on traffic operations.

MAKING BETTER USE OF EXISTING STREETS

I have just pointed out some serious aspects of "underbuilding," and how important it is that traffic safety and good operating features be built into streets and highways. But let me hasten to add that I am laboring under no illusions that you are going back to your jobs next week and tear out the existing streets and highways and rebuild them all to new and improved standards. (Not a bad idea in some places, is it?)

Much as we would like to see new multi-lane expressways for moving the great bulk of traffic, both in rural and urban areas, the facts that have to be faced are that the great bulk of traffic is long going to move over the thousands of miles of already existing streets and highways. It is probable that this will remain so during the lifetime of most of us. We never get fully "caught up." Getting the best possible use out of present traffic facilities is one of the toughest problems facing traffic engineers today. If you remember the "text," "Let's get traffic moving," and why it is being stressed, you realize that the job of making best use of today's streets and highways is difficult. It is no easy task, for example, to get safe movement of traffic at a very busy intersection where you know there ought to be a grade separation, without seriously restricting movement.

Time doesn't permit describing any great number of the techniques now used for improving street and highway use. I will mention one or two, but I want to point out that the American Automobile Association has recently published a little booklet on this subject, entitled Traffic Tune Up, and there are a hundred or so copies here for distribution.

One of the techniques illustrated is the use of channelizing islands. At an odd-shaped intersection in Seattle, Washington, there had been 10 accidents during one year. The installation of six relatively inexpensive channelizing islands not only speeded up traffic through the intersection, but only one accident occurred during the year following the change. Less subject to objective measurement are the results of a change from angle to parallel parking on an Adrian, Michigan, street illustrated by "before and after" photographs. However, one need not be a traffic specialist to see that the change produced effective results.
You are familiar, I am sure, with the new *Manual on Uniform Traffic Control Devices* which is not only an effective guide on the installation and use of traffic signs, signals, markings, and islands, but which has become the legal standard for use on all federal-aid projects. This manual and the book *Traffic Engineering Functions and Administration* are basic references which should be in the hands of every highway and road man concerned with highway construction, maintenance, and use.

These matters are brought up at this time because in many cases local street and highway officials are interested primarily in physical highway problems and not in traffic operations. This is so, I presume, because we are not too many years past the "get-America-out-of-the-mud" period, when major attention had to be given to the structural aspects of highways.

Now we are in a period when there simply must be more attention given to traffic operations. We cannot avoid or evade this responsibility, for it reminds me of the alarm clock ad—"first it whispers and then it shouts!" Well, the need for effective traffic operations is in the not-shouting-but-screaming stage! As a matter of fact, there are many states in which traffic engineering service is very limited. However, as one of the nation's most progressive states, Indiana has an able traffic engineer—my friend Mr. W. F. Milner. Indiana has another advantage in that another friend of mine, your nationally famous Highway Commissioner, Mr. Samuel Hadden, is fully aware of the need for increasing emphasis on traffic operations.

**LACK OF QUALIFIED PERSONNEL**

Thus far I have discussed some of the reasons for increasing emphasis on traffic operations. My last point is a little different, but I think it is of great importance. In fact, my last point might well be listed as a major reason why there is not more attention given to traffic operations.

The lack of trained personnel in traffic engineering is as serious as the lack of trained highway engineers. City after city has set up a traffic engineering department or division by ordinance and appropriated funds for its operation, only to hit a snag in trying to get qualified personnel. Obvious reasons are the too low "placement" of the position in importance level and the predominantly low salaries offered. I hesitate, particularly before this audience, to draw the parallel between engineers and potatoes. But when potatoes get scarce, the price goes up. Traffic
and highway engineers are scarce, but the “price” hasn’t gone up enough to make the profession attractive to enough competent new people.

Another reason for the shortage of persons trained in traffic operations is the lack of training facilities. The Bureau of Highway Traffic, Yale University, has supplied a goodly percentage of the newly trained men during recent years; and last year the University of California opened its Institute of Transportation and Traffic Engineering, where traffic engineering training will be offered. Purdue University and some others provide traffic engineering courses (and of course your highly regarded Professor J. L. Lingo and his Public Safety Institute do offer fine traffic training). In addition, numerous traffic engineering short courses are available at various colleges and universities.

Some of you are getting more and more into operations, and may be interested in practical training courses which will help you.

Let me re-emphasize, in closing, that the time is fast arriving when the public is going to demand that more attention be given to the dynamics of highway transportation. Highway users want not only all-weather roads—they want ALL-TRAFFIC roads! They will not consider their tax dollars well spent until they get an all-weather roadway where traffic movement is swift, smooth, safe, and comfortable.