

HIGHWAY SAFETY FROM THE VIEWPOINT OF THE TRAFFIC ENGINEER

by

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Traffic engineering is one of the youngest fields of civil engineering. It was created about thirty years ago in order to provide answers to the problems created by the automobile. Since traffic engineering is a relatively new area, I would like to take a few minutes to acquaint you with the nature and purpose of this field.

While it is a young profession, it may possibly be the largest. With nearly 100 million licensed drivers in the United States, there are at least that many "traffic engineers", although only a few thousand of us attempt to earn a living in the field.

The constitution of the Institute of Traffic Engineers defines traffic engineering as "that phase of engineering which deals with the planning and geometric design of streets, highways and abutting lands, and with traffic operation thereon, as their use is related to the safe, convenient and economic transportation of persons and goods".

As you can see, this covers a considerable amount of territory. It encompasses planning, the design and the operation of streets and of the facilities abutting on those streets. It is concerned with the efficient usage of these facilities. By efficient, we mean not only an economic system but also one that is convenient to the public and one that is safe.

Since traffic is composed of both man and his machine, the traffic engineering profession is concerned with both the social and the physical sciences in the solution of its problems. While the traffic engineer must apply the engineer's knowledge of physical properties and roadway design - he must also invade the field of the psychologist in an attempt to predict not what drivers can do but what they will do under varying circumstances. To do this, he must have a good working knowledge of the actual characteristics of traffic.

Research over the last twenty years has done much to improve the traffic engineer's knowledge in this area. Given this knowledge, he must apply the tools of his trade in order to achieve safe and efficient transportation. These tools include roadway design, traffic regulation and parking regulations, and the application of traffic control devices and aids such as signs, signals, markings and lighting.

The traffic engineer is highly concerned with accidents, for these are, in effect, a measure of failure. By investigating these failures, the traffic engineer can determine causative factors and may be able to reduce or eliminate these factors, thereby reducing accidents.

I wish I could stand here and tell you that given time and money, the traffic engineer could eliminate all accidents, but this is not true. Possibly the only way traffic accidents could ever be completely eliminated would be by the whole transportation system becoming so congested that it completely grinds to a halt. Although this possibility may seem to exist in some of our major cities, I don't believe it would be a satisfactory solution. I'm afraid we must accept the fact that accidents will continue to happen and concentrate our efforts on reducing the number to the lowest possible level.

There are accidents occurring which we just don't know how to prevent. More research may provide us with some of the answers but, meanwhile, we're going to have to work with what we have.

Accidents can be reduced through the application of current knowledge. For example, if every two-lane and three-lane highway were converted into a four-lane, divided highway with controlled access, the rate of fatal accidents might be halved, but it would cost about 3.5 trillion dollars to do this completely. Since this cost is probably a little high, even for the Great Society, we must apply less costly but still effective measures to reduce accidents.

There are several tools for traffic engineers which enjoy wide popular support as "cure-alls" for traffic accidents. Perhaps chief among these is the use of speed limits. The public generally believes that speed causes accidents and if speed is reduced, accidents will be reduced. However, this is not necessarily the case. While it is obvious that accidents at high speed will be more severe, speed in itself is not necessarily the cause of an accident. In fact, at speeds of 55 to 60 MPH, less accidents occur than at any other speed, except of course, zero. When speed is plotted against accidents, the dimensions of the relative speed of the vehicle to other vehicles in the stream and of fixed objects or other roadside hazards are not included.

Obviously, the omission of these dimensions can cause an erroneous picture to be drawn. Using only two dimensions, one could plot deaths against Doctor's care and incorrectly conclude that Doctors cause death. This same logic applies where speed is concerned and it should not be concluded that the more speed you have, the more accidents you will have.

In fact, our lowest accident roadways, such as those of the Interstate system, have average speeds in the range of 65 MPH.

Another popular misconception is that traffic signals reduce accidents. This again is not necessarily so. The purpose of a traffic signal is to

assign right-of-way when all other methods fail. Through this clear assignment of right-of-way, right-angle collisions at intersections are normally reduced. However, the rear-end type accidents at a signalized intersection usually increase. Therefore, you are, in essence, trading the more severe right-angle collision for the less severe rear-end collision and, depending upon the situation, this might be a bad trade.

Another tool that has recently been introduced in Kentucky is the use of median guardrail in divided roadways. This, too, has its drawbacks. While median guardrail will decrease the more severe cross-median type accidents, it will also increase total accidents on the facility. Studies as far apart as Pennsylvania and California have shown increases in total accidents as high as 30% after median guardrail was installed. Obviously, this is a tool which must be approached with care.

There are many other things that are being done by the Department of Highways that are perhaps less glamorous but that are effective in reducing the total accident picture. Among these are the placing of signs behind guardrail in order to reduce fixed object accidents, the provision of more side clearance on these signs, the elimination of large sign supports in gores (the triangular area between a diverging ramp and the mainline), the provision of cast aluminum shoes on the signs that have to be placed in these gores so that they will shatter upon impact and reduce damage. We have been doing this, by the way, for the past five years and we are also initiating the provision of aluminum light poles which cause less severe damage when struck.

We are trying to eliminate as many unnecessary signs as possible.

The Highway Department is beginning a program of elimination of guardrail ends which Mr. Henry will cover in more detail.

We have initiated the use of rumble strips to alert drivers to impending hazardous locations such as toll plazas and temporary ends of the Interstate system.

We have placed mile markers on all Federal and State highways throughout the state to assist in accident reporting and locating. Along this line, we are working with the Department of Public Safety in developing a computerized record system that will allow much better accident investigation.

Our District traffic engineers are currently inspecting at the site fatal accident locations in the state, whenever there is any indication of a possible roadway or traffic control defect.

Traffic engineers are working with the Division of Design in reviewing all roadway designs from both the viewpoint of providing sufficient capacity and of eliminating possible confusion on the part of the driver.

We are currently preparing a State Manual on Uniform Traffic Control Devices to conform with the law passed by the last session of the Legislature requiring all local government to follow these uniform procedures, thereby eliminating much driver confusion.

We have been working with several cities to improve traffic operation on their street systems, thereby eliminating congestion and accidents, although, due to our lack of time and personnel, we have hardly scratched the surface on what needs to be done in this area. We are hopeful that the Highway Safety Act, which allocates 40% of its funds to local government will be extremely helpful in this area.

We have initiated a program of providing flashing lights at school crossings and are installing 30 or 40 of these a year on a priority basis as our budget allows.

The Highway Department has provided a manual which requires the proper signing of construction projects and much improvement has been made in this area, although there is room for still more improvement.

We are in the midst of a statewide program of modernization of our signs and signals. This consists mainly of enlarging the signs on our primary and secondary roadway systems and of providing at least two indications of each signal phase for each direction of travel.

More street lighting is being installed at hazardous locations such as limited access facility ramp entrances and exits, and more continuous lighting is being used to avoid the rapid succession of light and dark spots on such facilities.

A very popular tool is the pavement edge line, and I am sure you have noticed a significant increase in the use of edge lines on many of our roadways.

With these programs, and many more, we are chipping away at the accident situation. However, to quote Alice in Wonderland, "it takes all the running you can do to stay in the same place. If you want to get somewhere else, you must run at least twice as fast as that".

This is approximately our situation. We are running as hard as we can and perhaps staying even. The problems are growing at an ever increasing rate. With the increasing population, increasing vehicle ownership and increasing trips, traffic congestion and accidents are compounding. It is obvious that when one additional vehicle is placed in a traffic stream for an hour and is opposed by 500 vehicles per hour, the accident potential created is not one, but 500, plus the number of overtaking and passing maneuvers, plus the number of crossing vehicles that are met. The supply of traffic engineers is not matching this pace.

It is estimated that the Interstate system, when completed, will carry about 20% of the traffic. However, this leaves 80% of the traffic on lower class roadways. With traffic volumes increasing nationally at a rate of over 5%, and over 6% in Kentucky, there will be more traffic on the existing roadway system after the completion of the Interstate system than there is now. Therefore, the problems we are facing today will grow larger.

The greatest number of accidents are now occurring on our older highways and, in all probability, this will continue to be the case. Further stress must be placed on the improvement of traffic movement and control on street and highway systems below the Interstate class if any great reduction in accidents is to be obtained, or if traffic chaos is to be prevented.

In addition, the migration to urban areas that this country is experiencing is placing the load in areas that are already near the breaking point. More effort must be exerted in order to cope with urban congestion. While both the Division of Traffic and the Division of Planning in the Highway Department are working on urban problems, efforts from all levels of government from national to local, and expansion of private engineering firms in this field are needed if success is to be found. More off-street parking facilities must be provided by government and/or the private sector in order to free streets to be used for their basic purpose, that of moving traffic. The cost of a curb parking space, by the way, is considerably greater than the cost of an equivalent space provided off the street.

Yet the problems are certainly not limited to urban areas. While over half the accidents occur in urban areas, 85% of the fatal accidents occur on rural highways. Obviously, concentration is also needed on rural problems if fatalities are to be reduced.

The Division of Traffic is attempting to alleviate the rural accident situation through the use of improved traffic control devices including signs, signals and markings. Through investigation of high accident frequency locations, we are eliminating hazardous locations where possible and providing better warning systems if physical improvements cannot be made. However, the nature of the rural problem, which is a general scattering of accidents over many locations that often do not have any glaring comparative deficiencies, causes accident reduction to be a difficult undertaking. As in the urban situation, much more work is needed.

If it appears that I presented you with more problems than solutions this morning, that is a correct evaluation of the picture. We have more problems than solutions. While we are now working diligently toward accident reduction, concerted efforts must be made by government, business and the public at large before truly significant inroads can be made into this problem.

With such efforts, considerable improvements can be obtained through the use of available traffic engineering techniques.