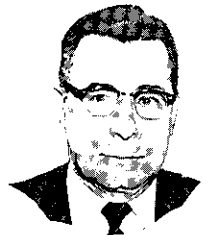


*A three-structure interchange separates traffic on I-15 west of urban Salt Lake City, Utah.*

# Safety: Our Gravest Current Highway Problem

**By Francis C. Turner**

*Director  
Bureau of Public Roads*



**T**HERE ARE numerous problems facing the construction of highways in the United States. Money is certainly one of them. Not because of penny-pinching on the part of the Federal Government or of the people who comprise it, but rather because of the chronic failure of revenue sources to keep pace with the proliferation of human needs. The United States is more dependent on highways for transportation than most other countries, but it was not until 1956 that a realistic step was taken at the federal level toward the assurance of adequate

and predictable highway financing. This step, of course, was the establishment by Congress of the Highway Trust Fund, which finances the federal share of the Interstate and other federal aid highway programs from taxes paid by road users.

It is no secret that the revenues flowing into the Trust Fund are not sufficient to complete the Interstate system in 1972 as originally planned, while maintaining the other federal aid programs at the present annual level. This situation, however, is no fault of the Trust Fund nor the result of

any bad guessing as to the revenues that would go into it. As a matter of fact, actual receipts have run just about neck-and-neck with our estimates from the very beginning.

Construction costs have gone up, certainly, just as have the costs of a loaf of bread, a new car, a haircut, a movie or any of the other necessities or luxuries of modern living. But the basic reason for the present inadequacy of the Trust Fund lies not so much in increased costs but in changing concepts of the kind of highways we should be building.

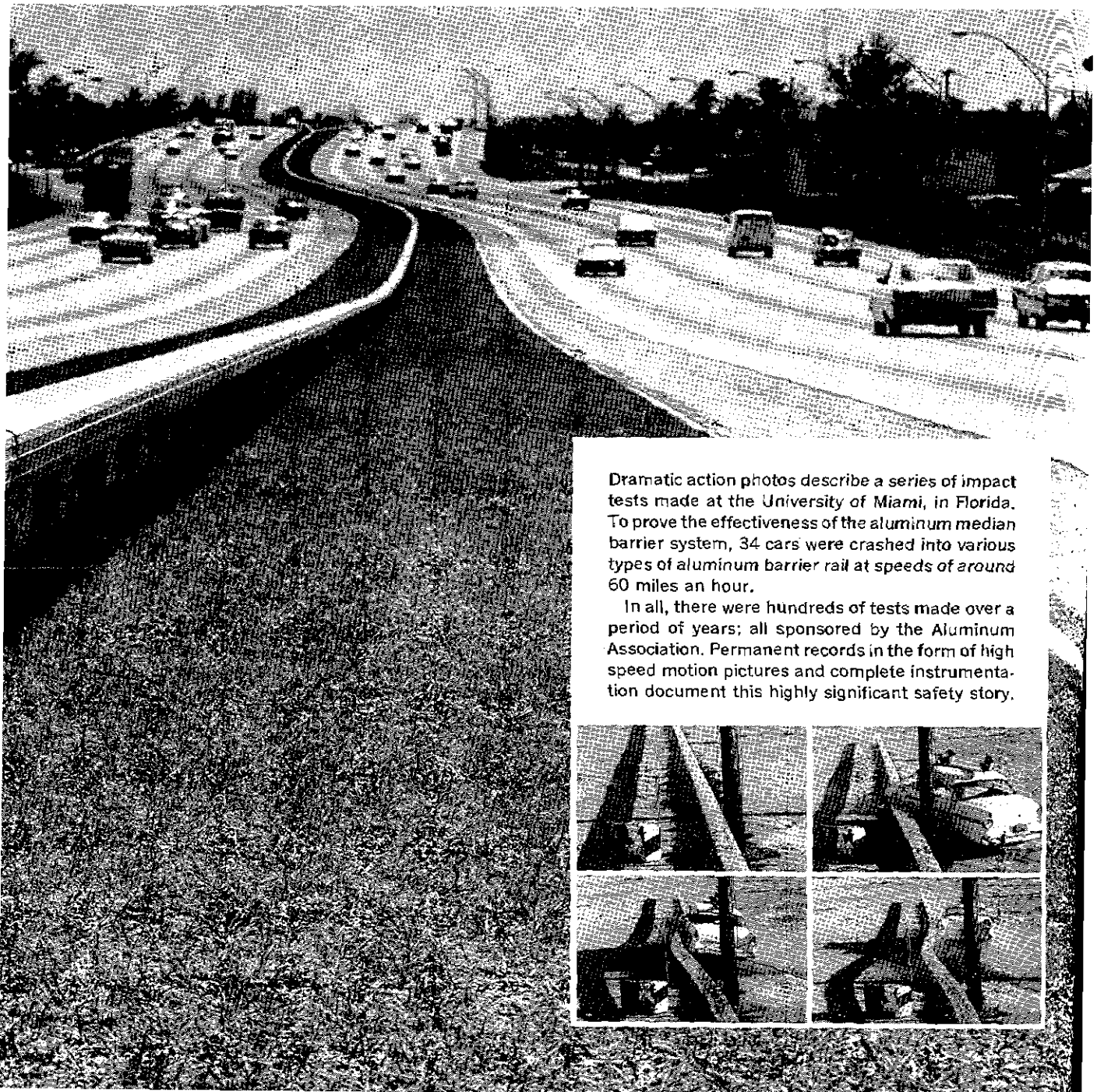
carries more than 100,000 vehicles a day during peak periods of the year. Tests employing the aluminum strong beam system bore out the engineering principle that not only does the barrier keep cars from crossing the median strip but the rail "gives" enough to ease the car to a stop without bouncing it back into traffic. This action absorbs the impact so that the accident need not seriously injure the driver or passengers. This is "people protection"!

While safety is the major consideration, the advantages of the aluminum system are an attractive plus to highway engineers and commissions. Aluminum requires virtually no maintenance, minimizing the hazard of work crews on the median strip. Aluminum, while it is strong, is light in weight; installation goes fast with less manpower, and two men can lift a 25 foot section if repairs are needed following a crash.

More and more highway departments are specifying aluminum for bridge rail, light poles, signs and fences. And they look to the men at Reynolds for help in many ways: from preparing specifications and estimating costs to assisting with installation and service techniques. Call your local Reynolds Sales Office or write direct: Reynolds Metals Company, Highway Division, Richmond, Virginia 23218.

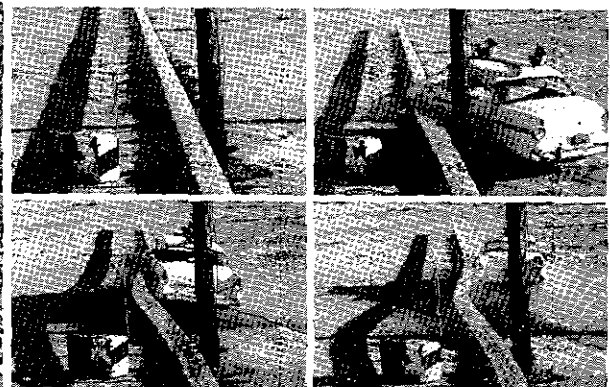


**REYNOLDS**  
*where new ideas take shape in*  
**ALUMINUM**



Dramatic action photos describe a series of impact tests made at the University of Miami, in Florida. To prove the effectiveness of the aluminum median barrier system, 34 cars were crashed into various types of aluminum barrier rail at speeds of around 60 miles an hour.

In all, there were hundreds of tests made over a period of years; all sponsored by the Aluminum Association. Permanent records in the form of high speed motion pictures and complete instrumentation document this highly significant safety story.



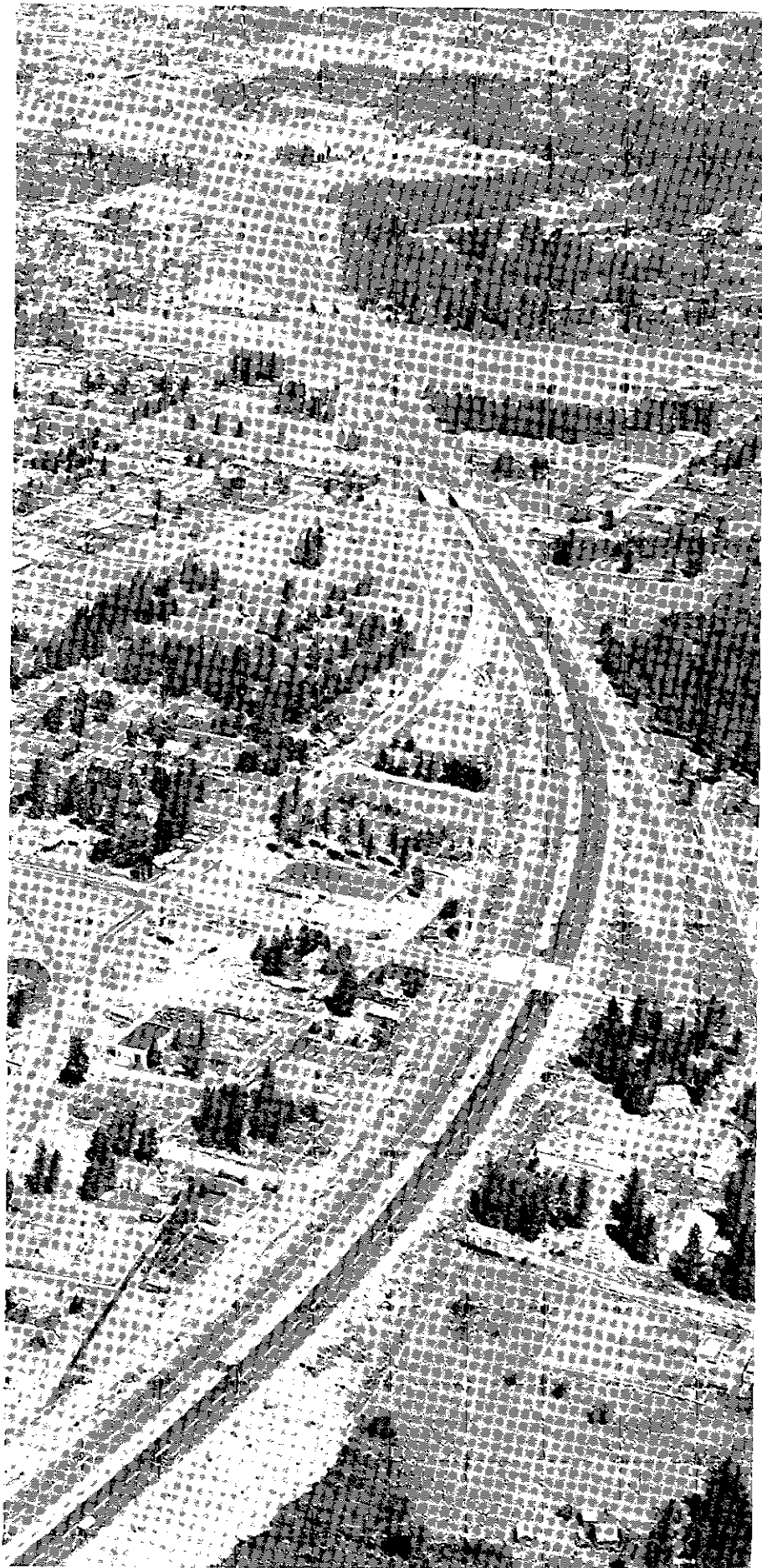
190 is shown as it winds gracefully through the suburbs of Coeur D'Alene, Idaho.

The gravest current highway problem is the problem of highway safety and the greatest challenge we collectively face is to do everything humanly possible to solve it. The statistics are grim *enough*. Last year highway accidents injured 10,000 people *every day*, killed 1,000 *every week* and cost well over \$800 million in senseless economic waste *every month*. But figures don't tell the depth of human misery resulting from motor vehicle accidents. In some cases, ironically, the survivors are possibly the real losers. The records show that highway travel today is much safer than it used to be in terms of *miles of travel*. In 1934, for instance, the fatality rate per 100 million vehicle *miles* was 16.7. In 1966, the rate was 5.7. In other words, had the 1934 rate continued, we would have had more than 150,000 fatalities in 1966 instead of the 52,500 we had.

This is little or no consolation; *one* traffic death is too many. But the comparison does indicate that the persistent efforts over the years to improve the transportation *system* is paying off many thousandfold. By *system*, I mean the driver, the vehicle and the environment; and by the environment I mean the road and everything on and alongside it, plus the weather.

The fact that we have made progress is reason enough to redouble our efforts to make the vehicle, the driver and the road they travel as foolproof as possible. Unfortunately, the causes of accidents don't fall into neat little compartments. Sometimes the vehicle is at fault, *sometimes* the highway, sometimes the driver, often a combination of two or more of these.

Obviously there is no such thing as a perfectly safe driver, a perfectly safe vehicle, or a perfectly safe highway. Just as obviously, there is a kind of law of diminishing returns in trying to achieve perfection in any of these three





elements. A driver will just take so much training and education. A perfectly safe automobile would be one that either didn't move or would encase and insulate the driver so securely and expensively that he wouldn't or couldn't buy it—or be able to move it around after he had bought it. Likewise, any approach to a perfectly safe highway would involve expenditures of money and appropriations of land that would be utterly prohibitive. We have to assume, then, that there is perhaps an irreducible minimum of traffic accidents and deaths, but we must proceed with all the means at our command to dip down to that bare irreducible minimum.

We now have about 26,000 miles of the Interstate system in use—more than 64 per cent—and the traffic fatality rate on the open sections is less than one-third of that on the older, conventional highways. Our experience to date proves that the built-in safety features of the Interstate system, derived from decades of research, experience and observation, will save about 8,000 lives a year when the entire system is completed.

On the other hand, while the Interstate system will carry nearly one-fourth of the total traffic, how about the other three-

fourths? As to new highways on the federal aid systems, the approach of course is to incorporate as many of the Interstate-type design features as possible within the limitations of available funds.

On the older highways, we are getting good results with the so-called Spot Improvement Program, and the potential for the future is promising. This program was undertaken in the spring of 1964 and it is designed to rid the federal aid systems of high hazard accident locations by 1969. The state highway departments are being encouraged to program a substantial portion of ABC (primary-secondary-urban) funds to federal aid projects aimed specifically at eliminating accident-inducing features and locations. This kind of approach to the problem is really the only practical avenue that is available to us within our limits of money and time.

I am convinced that the efforts directed toward building safer roadways and shoulders, and at the same time eliminating many of the boobytraps from the older highways, will pay off a thousand-fold in the prevention of accidents and the saving of life and limb. But this is not enough. We must also direct our efforts towards the elimination of other highway and roadside hazards.

We are calling for the elimination of all unnecessary sign supports, light standards, drainage structure obstructions and other appurtenances from proposed plans. Where the need for such features does not permit elimination, they are to be located in unexposed positions. In cases of necessary roadside appurtenances, adequate protection for the out-of-control vehicle is to be provided in the form of guardrail, special grading of the surrounding area, impact-absorbing devices or other means.

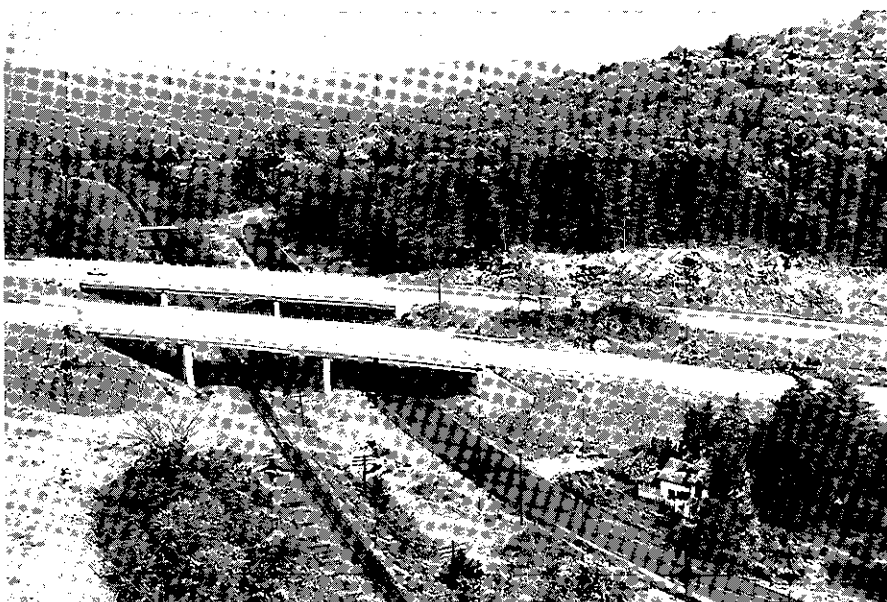
Recently, the Secretary of Transportation directed the Federal Highway Administrator and the Federal Railroad Administrator to undertake an immediate program aimed toward appraising the grade crossing problem, both on highways which are a part of the federal aid system and on other roads and streets which are not on this system. The program includes development of guidelines for diagnosing the hazards which exist at railway-highway grade crossings and the development of an inventory and classification of all existing railway-highway crossings.

The Administrators were instructed to undertake a program to test and demonstrate the application of the currently best known means for grade crossing protection, and to establish a method for appraising the effectiveness of each installation.

There is now underway in the Texas Transportation Institute (Texas A&M) a research project for the Texas Highway Department in which the Bureau of Public Roads is cooperating. This grade crossing study is intended to analyze accidents and determine the cost and effectiveness of current and possibly new types of grade crossing devices for the State of Texas. This overall study is expected to cover approximately a three-year period.

A part of the study includes the development of a diagnostic procedure in which a "team" will review grade crossings and identify the physical features which contribute to crossing hazards. It is expected the results of the

*Danger lurks where roads and railroads cross at grade. Here, I-84 spans the railroad tracks near Newton, Connecticut.*



study will be helpful in implementing the Secretary's program, although results will not be available for the immediate program to be undertaken.

In addition, it is expected the Bureau of Public Roads will undertake research relating to railway-highway crossings to develop in the shortest possible time a set of alternative aids for reducing the number of grade crossing accidents.

One of the promising research areas lies in the field of radio communication between the locomotive and the vehicle on the highway, or from the locomotive to highway appurtenances which, in turn, would communicate with the vehicle on the highway. The solution involving vehicle-locomotive communication components could be expected to result in a sharp reduction of accidents, since the communication could be extended to warning devices in the automobile (horns, lights and other devices), or could be extended to an automatic application of braking systems in the vehicle if research proves this to be a feasible solution.

The Bureau expects to issue instructions relating to a railway-highway grade crossing program in which the states will be asked to undertake protective projects aimed toward achieving the objectives stated by the Secretary of Transportation. Each state highway department will be asked to select a grade crossing for installation of protective devices. These will be subjected to appraisal as to their effectiveness and this data used in determining the types of protective installations which will contribute most to accident reduction.

The other major problem is actually a group of related problems brought about by the ever-increasing urbanization of our country. In 1940, 57 per cent of the population lived in urban areas; by 1950, 60 per cent; and by 1960, 63 per cent. And by 1990 it is forecast that 219 million people will be living in the cities and their satellite communities—more people in urban areas than we have in all 50 states



*Signing is a vital factor in highway safety. Shown: Experimental signing on I-95 in Northern Virginia tests driver reaction.*

today. The problem is brought into sharper focus by the fact that, even now, nearly half of all motor vehicle travel occurs on city streets which account for only 13 per cent of the total mileage.

In this connection I want to mention a current program that the Bureau has developed and is encouraging. It is the so-called TOPICS program, which is an acronym for "Traffic Operations Program to Increase Capacity and Safety." This has the twin purpose of relieving traffic congestion and enhancing highway safety in cities. The relatively new policy involves an expansion of the federal aid primary system to permit the selection of principal streets and downtown grids, in areas of 5,000 or more population, to receive federal aid for certain kinds of engineering improvements. These do not involve major construction work but improvements of traffic operations which can step up speeds on urban traffic arteries as much as 25 per cent as a result of a relatively modest investment. TOPICS may involve such improvements as channelized intersections, added approach lanes to signalized intersections, left turn slots, pedestrian and highway

grade separations, control systems tied directly to traffic conditions, separate bus lanes, reverse direction lanes, unbalanced lanes, and improved truck and bus loading stations.

What we are striving for in this program, of course, is greater utilization of existing highways, thus providing a great deal of additional traffic service at minimum cost. Obviously, it is no substitute for the needed new freeways and other urban arterials that must continue to be built to catch up with and then keep pace with the expanding urbanization of the country.

The American people are demanding that the accident rate on our Nation's highways be reduced. To accomplish this, both existing roads and highways in the planning stage must be brought up to high safety standards. The public has indicated quite strongly that it is no longer satisfied with just getting from here to there. They want not only more highways, but safer, more useful and more pleasing highways, and one of the great challenges of these times and of the future is to accommodate our road building efforts to this desire.

ETDP

# The "No Zig When You Should Zag" Highway

**By William J. Flanagan**  
*New Jersey Turnpike Authority  
Executive Director*



**T**HE OVERRIDING consideration before the New Jersey Turnpike Authority when it started to plan its expansion program in September 1965 was that of safety. All the inventive engineering know-how available was put to work to devise not only the most modern and feasible method of widening the heavily traveled northern section of the turnpike from six to 12 lanes but, also, to design a dual/dual facility which would provide the ultimate in safe travel for the burgeoning traffic, which reached a record peak of almost 74 million vehicles in 1967.

Construction on the widening program was begun in November 1966 and, today, work is progressing satisfactorily toward the scheduled completion date of January 1, 1970. The New Jersey Turnpike, the world's busiest toll highway, will then feature a unique safety design along the expanded section north of Edison, New Jersey.

What is unique about the new design? The dual/dual concept has been perfected to provide certain outstanding safety factors. Twenty-one miles of the 30 northern miles to be widened will consist of four three-lane roadways—two northbound and two southbound—but with an innovation. Each roadway will be independent and separated from the other three by a median surmounted by double-face steel guardrail. There will be individual exit and entrance ramps at each interchange. (The present six-lane turnpike has a 10-foot median separating the three-lane roadways running each direction). The north- and southbound sections of the expanded facility will be divided by a 26-foot median, and the two roadways on each side will be similarly separated, so that the completed highway will have three median barriers.

What will this mean to the patrons traveling the New Jersey Turnpike in the future?

The answer is obvious. By the use of separate ramps to exit from each of the four three-lane roadways at each interchange, vehicles will not be required to negotiate the hazardous manue-