

unable to rely on private automobiles for their transportation needs. For such people walking is the most frequently used mode of travel. Walking is important, not only as a means to shop and visit friends, but as a means of exercise. Road facilities must be planned and designed for everyone, not just senior citizens.

Not all safety hazards are under our immediate control. Driver inattention is listed as the main cause of accidents, with unsafe speeds and alcohol involvement listed as contributing factors. Designing a highway system to accommodate those under the influence of alcohol and speeders would be impossible, but, with the help of law enforcement personnel and the Legislature, we will do our best to protect the motoring public from these menaces. No longer are faster speeds necessarily better; it is the convenience and safety of every user of the highway system that is meaningful to us.

The engineering profession is changing as the needs of society change, I ask each of you to take seriously what you learned during this Forum and in this workshop.

I placed a special emphasis on the older drivers as a standard to meet when considering changes in the way we think about highway design and construction. Catering to their needs serves us twofold. When we meet the minimum needs of those who are having the most problem with the system as it is today and who will be sharing a considerable portion of this system, we will all stand to prosper. We take our mission seriously and any shortcut that compromises the safety of our people is unacceptable.

DESIGN—A BEGINNING STEP

by *Glen Kelly*

I would like to thank Calvin Grayson for including me and the other people from the preconstruction area in this work session and the Transportation Forum.

In the construction and the design areas of the Transportation Cabinet, we feel we are considering transportation safety from the ground up. The preface of our highway design manual includes a paragraph which states, "the prime importance is the design and construction of a modern, safe, and functional network of highways that serve the national defense and the citizens of the Commonwealth and be a credit to the Department and the Commonwealth. To this end the designer must be of conscientious effort to geometric design features, construction, and right-of-way cost, arraign traffic volumes, utility maintenance, and safety." The terms "safe" and "safety" are problems in this statement in forming the basis of most of our designs.

If you drive the roads in this state and drive through construction work zones, you'll see that we are addressing safety in our design process.

I'd like to take a few minutes to comment on our design standards, design processes, changes in the design area, traffic control, and risk or liability.



There is a reference book that we in road design use primarily as our standard or guide or design manual. It is the 1984 AASHTO "Green Book," *A Policy on Geometric Design of Highways and Streets*. The Green Book's foreword includes the statement, "Although a few of the design values may be considered inviolable, it is an intent of this policy to provide guidance to the designer by referencing the recommended range of values for critical dimensions. Sufficient flexibility is permitted to encourage independent designs tailored to particular situations." I strongly believe that flexibility is the key element for the most effective design.

While our designers are committed to safety, design is somewhat of a balancing process—weighing safety, terrain, traffic volumes, maintenance considerations, right-of-way and utility impacts, and overall cost in development of construction plans. Our standards are documented to guide our engineers to know when certain solutions are most applicable for given situations. Much of the process remains with the designer and the designer's ability to select those guides to address the unique problem. Optimum design is the result of the individual designer's balancing the various specific elements and using the standards and guides that are available to address specific project issues within the established design process.

Our design process was established to demand communication between effective transportation districts. The effectiveness of our design product (\$300 to \$400 million worth of work that we bid each year in this state) is largely dependent upon the involvement and participation of each of you in this room. We, in design and preconstruction, actively solicit and welcome your thoughts in the design process. We hold formal reviews in both the preliminary and final stages. All of you, at one time or another, are invited to attend these reviews and offer comments. Again, your involvement and input are critical in this process if we are to maximize the design product for our customers.

As Gilbert mentioned in his opening remarks, we're going through a tremendous period of change in the design area, both in this state and in this country. Drivers are getting older, trucks are getting bigger, and cars are getting smaller. We have to modify what we're doing to address these changes. We did this in the 1984 Green Book by increasing anticipatory time for decision making and increased sight distances. Numerous research studies are available on truck dimensions for larger trucks and other design elements.

Products are now being marketed that give us safer barrier systems and other facilities for our highways. These new products and new design guides are an important part of our design effort to address design changes and growth. We're committed to teaming with the Transportation Center and other transportation research groups, various governmental units in the state, and industry in order to meet these changes to make our road system even better and safer for Kentuckians.

Fortunately, we also are experiencing tremendous change in the way we are developing plans. We've moved away from the transit and chain field book (which was the standard when I started in the business) and are becoming more automated throughout this state and nation. Three-dimensional views of the road system are being produced by computers today. In the near future, we'll be able to list a road on a computer and simulate

driving through that road prior to construction. We'll be able to sit at the intersection and visualize the sight lines during the actual design process. With the new technology, there is no question that we'll be able to provide a better and safer system.

As mentioned earlier, Kentucky, like every other state, still has the construction program for new roads, but the major portion of today's budget is directed toward reconstruction of our existing highway network. In the reconstruction of our highways, traffic control issues can be given paramount consideration during the design process. In Kentucky, the public demands a level of capacity and safety during construction, comparable to what they experienced before construction. Additionally, we must address protection of workers adjacent to the traffic being maintained.

We have a formalized process for traffic control plan development to assure the motorists' safety through the construction zones and for the workers in the zone. This process is used on all major highway projects and it's working well. I feel we've generally experienced tremendous success in our traffic control efforts. The best example is the \$300 million Watterson Expressway project in Louisville that is approximately two-thirds complete and handling 100,000 vehicles per day. In this job, we have maintained the same laneage that was available before construction and we have a safe environment both for the workers and for the vehicles traveling through the construction zone. The success we've experienced on the Watterson is largely the result of the involvement and commitment of many of you in this room. That is the key for us to maximize and optimize capacity and safety on future projects; we need your input and help in the preconstruction and design areas on these projects.

Liability, a concern Dr. Turner talked about earlier, scares us in design area. It has become a common term whenever a problem arises in our state. We have complex problems in design and it appears that there have been occasions when, in lieu of analyzing and solving a problem, we perhaps avoided it because of liability fears. These transportation problems are not going away; they've got to be solved. Perhaps there is no protection from liability for our designers, but I am satisfied that inaction or fear of legal action is not the solution. If we make a careful evaluation of the available alternatives, using appropriate standards, we may not come up with the perfect solution, but we will come up with a solution that's the most effective and that can be implemented to solve the problems we are experiencing.

In summary, I can say that we, in preconstruction, do consider safety issues from the ground up. Our traditional design process has served us well, providing Kentucky with a network comparable to any in the country. The challenges facing us today are certainly changing. However, we have new technology to address these changes and the opportunity to provide a better and safer product. There's no doubt in my mind that our conditional processes will adapt to meet these challenges.

I think that the three C's—commitment, cooperation, and communication—have been a key to success for the preconstruction area in our Cabinet. I believe that we have been successful and will continue to be successful. I know we have the commitment from the few old heads, such as myself, left in the department as well as the many young, energized people I see. We will

continue to communicate and cooperate and work through the roadblocks of the future. Thank you.

HIGHWAY DESIGN—A RISKY BUSINESS

by Daniel S. Turner

It is my pleasure to participate in this Forum.

My topic is "Highway Design—A Risky Business." The other speakers on this panel are going to be delivering similar presentations, all involved with the role of safety as it relates to highway design, construction, and maintenance. I'm going to deviate slightly from that topic by taking a different viewpoint. This is a viewpoint that you might not have expected. I'm going to illustrate the rapid growth of litigation as a driving force in highway safety.

Legal Issues Emerge

Highway engineers design and install warning signs along modern roadways. These signs have a specific purpose. They alert a motorist to a possible hazard so that the motorist has the opportunity to adjust his or her driving path and avoid an accident. I use a lot of slides in my presentations and one of my favorite slides shows a warning sign that highway agencies should have heeded 20 years ago. The message on the sign is simple, "Warning—Litigation Ahead." When I use this slide it never fails to draw a good laugh from the audience. I usually pause as the laughs slowly continue around the room. I can almost read the thoughts of people in the room as they contemplate the sobering menace of suits. I can see the smiles fade as they wish that they had been warned of the amount of money they were about to lose in court.

The Problem

I recently read that there are now 800,000 attorneys in the United States. In an audience of highway managers and safety coordinators, this fact is enough to cause scowls and long faces. When I ask members of the audience for their definitions of attorneys, I usually receive comments as severe as, "A bunch of blood-sucking leeches." This is certainly a severe reaction, apparently highway people are not enamored with lawyers.

Even though it is easy to blame the increase in highway suits on the large number of attorneys, that is not a fair analogy. The number of suits has skyrocketed because Americans have become the most litigious society on the face of the earth. We love to sue anyone, anytime, for anything. Twenty thousand civil suits are filed in the United States each day. This incredibly high number of suits is not a sudden occurrence. The private sector has become accustomed to the legal system and to being sued. Now that suits have spread to the public sector, government managers are having trouble accepting the concept of being held liable for their actions.