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"TORT CLAIMS INVOLVING ROADSIDE SAFETY"

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The Transportation Research Board is a unit of the National Research Council, which serves as an independent advisor to the federal government on scientific and technical questions of national importance. The Research Council, jointly administered by the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine, brings the resources of the entire scientific and technical community to bear on national problems through its volunteer advisory committees.

TORT CLAIMS INVOLVING ROADSIDE SAFETY
August, 1984

PREFACE

This circular contains the proceedings of a workshop sponsored by the Committee on Safety Appurtenances and held at Santa Cruz, California, August 7-8, 1984. The proceedings include several invited papers as well as summaries of working group discussions. Main discussion issues centered around topics developed by the program committee, who in turn received inputs from engineers and attorneys employed in various states. Issues were prioritized both in group discussions and by individuals.

Special credit for this publication is due William W. Hunter and Hayes E. Ross, Jr., who were primarily responsibile for planning and conducting the workshop and assembling this material. Sincere appreciation is extended to Roger L. Stroughton and other California Department of Transportation personnel who provided program inputs, local arrangements and other logistical functions. Grateful acknowledgement is also extended to each particpant for his/her contributions and suggestions.

I. INTRODUCTION

William W. Hunter
UNC Highway Safety Research Center
Hayes E. Ross Jr.
Texas A&M University

In recent years the concept of sovereign immunity from tort liability has been sharply diminished. Most states are now without this protection. The basic legal defenses of discretionary and design immunity have been in litigation, an increase in successful suits, and an increase in the skills and knowledge of attorneys specializing in tort liability as it pertains to the highway area. As an example, the number of annual new tort claims in California has tripled in the last 12-15 years.

This meeting was held to discuss how to make tort liability a more manageable problem, but with a focus toward highway safety appurtenances. Besides the members of the Safety Appurtenances committee, invitations were also sent to various attorneys, researchers, consultants, etc. The result was a mix of about 40 people of varying backgrounds that led to considerable, vigorous dialogue about the subject at hand.

The workshop scope and both objectives were described in the following manner:

1. Identify problem areas -- The workshop will focus on potential engineering problems in the planning, design, construction, operation, and maintenance of roadside safety features. Examples are nonstandard guardrail and bridge rail (too low, improper post spacing, too weak, etc.); nonstandard guardrail and treatment; absence of guardrail at "hazardous" locations (a problem of guardrail warrants for different classes of roadways); proper safety treatment for sign supports, light poles, traffic signals, and utility poles (a problem of warrants for proper safety treatment of these structures); edge dropoffs; proper use of curbs; safety treatment of drainage structures, ditches, median dikes, etc.

2. Identify solutions -- To the extent possible, the workshop will identify ways to mitigate problems. There is a need to collect and disseminate solutions that have been used by various agencies. Changes and improvements in procedures and policies may be needed at various levels, including state, county, and city transportation agencies, federal transportation agencies, research agencies, and consulting agencies. For example, it may be prudent for transportation agencies to employ cost-effective procedures in establishing warrants and priorities for safety improvement programs. Research agencies should realize the importance and implications of research reports and the degree to which conclusions and recommendations are interpreted and used by claimants.

3. Identify research needs -- Some problems have no immediate or simple solutions. The workshop will identify the nature of those problems and recommend programs to address the problems. For example, it is believed that guidelines should be developed on a national level to address the questions of "How, when and where should nonstandard features be upgraded?"

II. WORKSHOP AGENDA

To set the stage for the workshop, several individuals were invited to offer their perspective of the problem. The complete list is shown in Table 1, the agenda for the meeting. To take advantage of the variety of expertise present at the meeting, breakout discussion sessions were organized around two main topics: (1) planning, design and construction, and (2) operations and maintenance. Each participant was encouraged to offer comment on the issues addressed. Breakout groups are shown in Table 2.

III. INVITED PRESENTATIONS

The invited presentations that offered the perspectives of individuals with varying backgrounds as pertains to highway safety and tort liability follow.

TABLE 1. AGENDA

Sessions

Tuesday, August 7, 1984

I.	INTRODUCTION	
	o Welcome and Introductions	Hayes Ross, Jr., Professor and Research Engineer, Texas Transportation Institute, Texas A&M University and Chairman, TRB Committee A2A04
		Robert Defae, Attorney, California Department of Transportation
		Roger Stoughton, Senior Materials and Research Engineer, California Department of Transportation
	o Workshop Scope and Objectives	William Hunter, Program Manager for Engineering Studies, University of North Carolina Highway Safety Research Center and Workshop Chairman
II.	OVERVIEW OF PROBLEM	
	o National Perspective	Jim Stapleton, Assistant Chief Counsel, Federal Highway Administration
	o A Highway Engineer's Perspective	David Henry, Supervising Transportation Engineer, California Department of Transportation
	o A State Attorney's Perspective	Sharon Lyles, Executive Assistant General Counsel, Louisiana Department of Transportation and Development
	o A Highway Safety Research Engineer's Perspective	Don Ivey, Associate Director, Texas Transportation Institute, Texas A&M University
	o Practical Guidelines for Minimizing Tort Liability	Russell Lewis, Consulting Engineer, Annandale, Virginia
III.	PLANNING, DESIGN AND CONSTRUCTION - SUMMARY OF PROBLEM AREAS	
	Jack Humphreys, Professor, Civil Engineering Department, University of Tennessee	
	o Group Discussion Sessions	Problems in Planning, Design and Construction
	o Summary of Group Discussion Sessions	Group Leaders
IV.	OPERATIONS AND MAINTENANCE - SUMMARY OF PROBLEM AREAS	
	Jack Humphreys	
	o Group Discussion Sessions	Problems in Operations and Maintenance
	o Summary of Group Discussion Sessions	Group Leaders
V.	WORKSHOP SUMMARY	
	William Hunter	

TABLE 2. DISCUSSION GROUPS

Topic 1 - Planning, Design and Construction

Group 1	Group 2	Group 3	Group 4
Discussion Leaders			
H. Anderson	E. Nordlin	D. Woods	R. DeFea
D. Adams	M. Alfred	D. Berkman	F. Campbell
J. Beaton	J. Bryden	R. Bishop	R. Coleman
J. Carney	G. Cory	K. Dewell	R. Edgar
O. Denman	P. Hale	B. Gowan	L. Ferguson
W. Hickey	D. Henry	J. Hatton	S. Fox
W. Hunter	T. Hirsch	J. Humpshreys	D. Ivey
R. Lewis	J. Michie	S. Lyles	H. Ross
J. Stapleton	D. O'Brien	E. Post	J. Underwood
H. Taylor	C. Quan	R. Stoughton	J. Viner
W. VanWagoner	L. Spaine	D. Thomas	
	F. Tamanini	E. Tye	

Topic 2 - Operations and Maintenance

Group 1	Group 2	Group 3	Group 4
Discussion Leaders			
F. Tamanini	J. Hatton	J. Viner	P. Hale
H. Anderson	D. Adams	F. Campbell	M. Alfred
J. Beaton	D. Berkman	R. DeFea	J. Bryden
K. Dewell	R. Bishop	L. Ferguson	R. Edgar
J. Humphreys	J. Carney	T. Hirsch	S. Fox
R. Lewis	R. Coleman	W. Hunter	B. Gowan
D. O'Brien	G. Cory	S. Lyles	W. Hickey
E. Post	O. Denman	E. Nordlin	D. Ivey
L. Spaine	D. Henry	H. Ross	C. Quan
W. VanWagoner	J. Michie	J. Stapleton	H. Taylor
	J. Underwood	R. Stoughton	E. Tye
	D. Woods	D. Thomas	

II. OVERVIEW OF PROBLEM

National Perspective: The Uncertain Sea of Tort Liability Law

Jim Stapleton

Highway tort liability law has been referred to as "an uncertain sea" where "uncertainty and bewilderment ... persist to confound the stormtossed wayfarer."[1] The uncertainty and bewilderment are understandable in light of the many conflicting and frequently illogical court decisions from the various states and often even within the same state. I will attempt today neither to part this uncertain sea nor to walk upon its waters, but perhaps I can post some beacon lights to give you some direction.

Potential legal liability is a factor in inducing greater compliance with safety standards and, thus, in reducing highway deaths and injuries. As Professor William Prosser, the leading authority on tort law, once said: "When the decisions of the courts become known, and defendants realize that they may be held liable, there is of course a strong incentive to prevent the occurence of the harm. Not infrequently one reason for imposing liability is the deliberate purpose of providing that incentive."[2]

Concern for potential liability is healthy and legitimate. If that concern turns to hysteria and paranoia, it is unhealthy and counterproductive. Inaccurate and distorted perceptions of liability can adversely affect the quality of the engineer's decisions concerning highway design, construction, and maintenance. It is important to keep litigation concerns in proper prospective, and to remember that there is no substitute for good common sense combined with sound engineering judgment.

For many years the states had little fear of suits for injury or death caused by negligence in the design, construction, and maintenance of highways. The states' salvation was the doctrine of sovereign immunity which sprang from the ancient maxim that the King can do no wrong. Over the past 20 years the doctrine has undergone considerable erosion. Most states have abandoned it either by judicial decision or by statute.

A survey conducted in 1983 by AASHTO on the status of sovereign immunity in the states reported that only seven states still have sovereign immunity as to torts. However, of those seven, one (Mississippi) reported that as a result

of a court decision it would not have sovereign immunity after July 1, 1984. The other six reported that they had a tort claims act, statutorily created claims board or commission, or other legislative scheme for litigating claims against the State.[3]

The AASHTO Survey indicates that pending tort liability claims reported by 40 states total over $6.4 billion. Nearly half of that total was reported by California ($2.1 billion) and New York ($1.2 billion). This is nearly double the amount reported in the 1980 survey. To keep these figures in perspective, it should be noted that the survey does not provide a breakdown of tort claims pending against the state highway departments. Also, it should be borne in mind that the amount claimed bears little relation to the amount ultimately paid by the states. For example, the survey reflects that states reported paying a total of $24.6 million in judgments or awards of tort claims during fiscal year 1981-82.

Highway departments have a duty to design, construct, and maintain highways properly and to give adequate warning of hazardous or dangerous conditions. Although highway agencies must exercise reasonable care, they are not insurors of the roads or guarantors of absolute safety.

One of the principal factors which the courts consider in determining whether the highway department acted reasonably is whether the actions were in accord with generally accepted engineering standards and practices, such as the Manual of Uniform Traffic Control Devices (MUTCD), AASHTO standards, guidebooks, and technical publications. An action that is not in accord with these standards, if causally related to the accident, will very likely result in liability. However, these standards are considered as the minimum expected, and compliance with the minimum does not mean that you are home free.

For example, it has been held that you cannot abandon sound engineering judgment and use mere compliance with the requirements as a shield to avoid liability where it can be shown that something more than the minimum requirements was necessary to provide reasonable safety under the circumstances.[4]

The major defense to tort liability by highway departments is based on the exemption from liability for descretionary activities. The descretionary exemption doctrine has been adopted in many states by judicial decision and in several others by statutes patterned after the Federal Tort Claims Act. For several years the doctrine was read so broadly as to almost reinstate complete immunity with regard to design defects.[5]

As a tool for identifying discretionary acts of government which should be immune from tort liability, many courts apply an analysis which distinguishes between decisions made at the "planning level" and those at the "operational level." Planning level functions are generally interpreted to be those requiring basic policy decisions, while operational level functions are those that implement policy. As a general rule, under this operational-planning level test, the approval of the design of the highway has generally been held to be discretionary and not subject to "second guessing" by the courts. The operational-planning distinction is more a method of arriving at a desired result--a balancing of the equities in the particular case--rather than a reasoned application of a precise rule. Application of the rule has resulted in many seemingly conflicting decisions.[6]

A recent decision in Iowa in the case of Butler v. State[7] is a good illustration of the planning vs. operational level activities test and of how the "reasonable and prudent care" standard is applied in judging the conduct and the liability of the highway department.

The facts are as follows:

The Butler family was traveling in a mobile home on Interstate 80 on a wet and windy night. While trying to pass a truck a gust of wind pushed the mobile home onto the shoulder and the mobile home struck a guardrail placed just off the shoulder. The guardrail "speared" the motor home injuring the several members of the Butler family. The guardrail struck by plaintiffs was designed to protect motorists from a bridge pier in the center of the median. When the guardrail was installed in 1965, it was in conformance with the plans approved by the Federal Highway Administration, and it met the then existing standards of the traffic engineering profession.

The guardrail struck by plaintiffs consisted of a piece of W-beam steel directly attached to 6-inch diameter round posts. The entire structure was 75 feet long. The "end treatment" consisted of a piece of guardrail flared toward the median, away from the westbound traffic, a distance of 18 inches on an 85-foot radius curve.

The state of the art concerning the design and placement of guardrails changed rapidly between 1965 when the guardrail in question was installed and 1974 when the accident occurred. In that time the state made five major changes in the guardrail standards for new construction.

The Court held that the decisions made concerning the design and placement of the guardrail and decisions made over the course of the years not to update the guardrail were decisions made at the operational level, and were not covered by the discretionary function exemption.

However, the Court said that "The determination that the state is not protected by the discretionary function exception, which gives tort immunity to the state, has no bearing on the state's liability. Whether the state was negligent is a question of fact to be determined under tort principles.

The Court went on to say: "The reasonableness of the state's decisions at the operational level requires the fact finder to balance such factors as (1) the danger imposed by the outmoded device; (2) the increase in safety a new device or design would provide; (3) the cost of upgrading; (4) the state's available resources; (5) other known hazards which pose a greater danger to motorists; and (6) any other relevant factors, including other needs in the highway system ... At any one time the DOT may be aware of many facets of the state's highway network which have become outdated due to recent design changes or advancements. At

the same time, however, the DOT will have a limited budget with many competing demands placed on it. The DOT acts as a reasonable agency when it attempts to prioritize the needs of the entire highway system and make maximum use of its limited resources to best serve all of the traveling public. Whether the DOT succeeds in meeting this standard is a question for the fact finder." (336 N.W. 2d. 416 at 420-21.)

The case of Zaleswki v. State[8] arose out of an accident on a bridge in which a car collided with a truck, mounted the curb, and came in contact with the bridge railing and, after shearing off five bridge posts, plunged into the Mohawk River. The bridge railing was constructed with three-rail aluminum bridge railing supported by posts made of cast aluminum alloy and bolted to the bridge.

Although the state's witness testified that the bridge was constructed in conformity with good engineering practices, when it was completed in 1960, there was testimony, and the state conceded, that cast aluminum alloy bridge posts were extremely brittle and that discontinuous rails would not absorb and distribute impact.

The state contended that at the time the bridge was designed and built it was constructed in accordance with good engineering practice and, therefore, the correctness of design was not subject to review by the courts.

The Court set forth the rule that the state is obligated to provide barriers of sufficient strength to hold an automobile traveling at a reasonable rate of speed at points of particular danger along its highways and bridges. The Court went on to say that design immunity from liability does not apply where it can be shown that the plans of the bridge were approved without adequate prior study or lacked a reasonable basis and that subsequent events demonstrated the existence of a dangerous condition known by the state.[9]

The case of Ducey v. Argo Sales Co.,[10] a 1980 California decision, provides a good example of the trend in court decisions dealing with the question of the duty of a state to erect median barriers, and a state's financial feasibility defense.

The facts are as follows:

In February 1972, Patricia and Dennis Ducey were seriously injured when a car driven by Dolores Glass crossed a freeway median in Fremont and collided head-on with their car. Dolores Glass was killed. The Duceys sued her estate, her employer, and the State of California.

The claim against the state was based upon the state's failure to provide a median barrier.

The freeway is a four-lane highway with tall oleander bushes growing in the middle.

The freeway was built in 1958. The 1968 warrants provided that construction of a barrier on a 46-foot-wide median was justified when average daily traffic exceed 40,000 vehicles. Daily traffic on this section of the freeway exceeded the amount beginning more than three years before the accident. There were 18 cross-median accidents between 1964-1967 in an 8-mile stretch including the crash site.

A contract for construction of a cable-type barrier was awarded in late 1968, but the appropriation was cancelled in February 1969 because of plans for widening the highway in 1972-73, which, under DOT standards, would necessitate metal-beam guardrail. The accident occurred three years later.

The Court concluded that the jury could properly find that the barrierless, heavily traveled freeway constituted a dangerous condition, and that the state could be held liable for failing to erect a median barrier.

The state argued that as a matter of financial reality it could not afford to construct median barriers on all freeways on which they are needed, and urged the Court, as a matter of policy, to relieve it of liability resulting from its failure to install such barriers.

The Court held that the question of the reasonableness of the state's action in light of the practicability and cost of the applicable safeguards is a matter for the jury's deliberation.

Just before he retired in 1979 as the Federal Highway Administration's Associate Administrator for Safety, Howard Anderson, in an address to the National Highway Safety Advisory Committee, focused attention on the problem of incompatability between the design of the highway and the vehicle. He pointed out that in 1979 about 50 percent of our vehicle fleet was made up of mid or full-size vehicles, whereas by 1990 about 70 percent of the vehicles produced will be of minicar and subcompact size. He pointed out that recent research indicates that "forgiving" highway hardware such as sign supports and traffic barriers, which work well when struck by full-size vehicles in the 4000-pound range, are not so "forgiving" when struck by a vehicle in the 2000-pound range.

Small car incompatability with highway design has serious tort implications.

I submit that a state is courting tort liability if it designs and constructs roadside safety features today based on criteria which fail to take into consideration whether such features will effectively fulfill their intended safety function when struck by a vehicle in the 2000-pound range.

Judical decisions increasingly reflect a recognition of the important societal goal of compensating injured parties for damages caused by negligent acts. The decisions also indicate a clear trend towards a "risk distribution" justification for imposing liability. An example of this is found in the case of Hicks v. State which abolished the doctrine of sovereign immunity in New Mexico. The Court said: "(I)t would appear that placing the financial burden upon the State, which is able to distribute its losses throughout the populace, is more just and equitable than forcing the individual who is injured to bear the entire burden alone."[11]

The highway engineer's position is not an easy or an enviable one. He has a responsibility to

provide the safest driving environment available resources will permit. He has a duty to discover hazards or defects by reasonable inspection and to correct them, or at the minimum adequately warn the highway user of their presence.

Knowledge of highway liability law can help to make the highway engineer a more effective dicisionmaker. For example, knowledge that deviation from the standards of the MUTCD may result in a finding of negligence encourages the engineer to carefully document decisions that adopt treatments not specified in the Manual.

Knowledge that although the engineer may be engaged in a discretionary activity the state may have the burden of showing that discretion was in fact exercised, enables the engineer to understand the importance of documenting that he made a considered decision after consciously balancing the risks and advantages.

Knowledge of tort liability law integrated with the consistent exercise of sound engineering judgment will result in more effective decisions and reduced potential liability.

REFERENCES

1. Harrison v. Escambia County School Board, 419 So. 2d 640, 655 (1982).
2. W. Prosser, Law of Torts, 23 (4th Ed. 1971).
3. AASHTO, Survey on the Status of Sovereign Immunity in the States (1983).
4. Fraley v. City of Flint, 221 N.W. 2d 394, 397 (Mich. 1974).
5. See Dalehite v. United States, 346 U.S. 15 (1983).
6. Harrison, 419 So. 2d 640, 650 (1982) (Ervin, J., dissenting).
7. 336 N.W. 2d 416 (Iowa).
8. 384 N.Y.S. 2d 545 (1976).
9. Id. at 546.
10. 602 P.2d 755 (Cal. 1979).
11. 544 P.2d 1153, 1155 (N.M. 1976).

A Highway Engineer's Perspective

David Henry

The problem of tort claims involving roadside safety is one of obsolete roads and deep pockets. I say obsolete not from the standpoint that the roads are worn out, hazardous, or nonfunctional, but from the standpoint that our standards have changed. Design standards affecting safety have been in a continuous state of change for the past 30 years while most of our existing roads were being built. Consequently, very few roads completely conform with the latest standards regarding shoulder width, slopes, guardrail, and fixed objects.

The drivers using our roads vary greatly in skill and their willingness to take risks. Consequently, accidents are inevitable. And, whenever accidents result in very large economic losses or severe disabilities, there is a good chance that someone will be looking at the road to see if lack of modern standards can be tied into the accident cause or severity.

According to law, nonstandard does not equal hazardous, i.e., "a substantial risk of injury when used with due care." However, when a jury is feeling very sympathetic toward a badly injured plaintiff which they would sincerely like to help, it doesn't take much to give them an excuse to award damages.

This is where the "deep pockets" come in. It sometimes appears that the mere need of an injured plaintiff is sufficient justification to award damages when the defendant is perceived as the "rich" state.

The number of new tort cases against the State of California has doubled in the past ten years and continues to rise as shown in Exhibit A. In the 1982/83 year there were 512 new cases filed with prayers totaling $1.25 billion. Our estimate of exposure, of course, is much smaller than the actual prayers.

Our best defense against tort suits is a systematic, prioritized program of highway safety improvements. Not only can you reduce accidents, and the severity of accidents, but you can also demonstrate to a jury that you are acting in a reasonable and responsible manner.

Our effort to upgrade roadside safety on freeways started in 1966 with a program we called CURE (Clean Up Roadside Environment). Under CURE we converted all ground-mounted sign posts to breakaway, installed slip bases on all electrolliers, and installed guardrail at all bridge rail ends, piers, and abutments. Upon the completion of CURE, we went into our programn of clearing fixed objects from freeway off-ramp gores, or protecting them with crash cushions.

The CURE program together with the incorporation of safe roadside standards in all new freeway construction resulted in a dramatic reduction in the fatality rate from run-off-the-road accidents. Exhibit B compares the fatal accident rate for various kinds of accidents on California freeways in 1980 with the rate in 1965. Note that in most categories, including run-off-road, the rate has dropped to about half the 1965 rate.

It is interesting to note that the category of accident with the lowest rate (cross median) is the one most often involved in tort suits. Our most vulnerable situation from the standpoint of tort suits is the lack of median barrier where our own "warrants" would indicate that a barrier is needed. In the median barrier case, you usually have the totally innocent victim who was in no way responsible for the accident.

Our safety program includes a Median Barrier Monitoring System in which we conduct an annual review of cross-median accidents and traffic volumes to identify locations which warrant the installation of a barrier. All locations which meet the warrants are added to our inventory for programming as soon as funds are available. Our current inventory of median barrier needs amounts to about $50 million.

Blanket-type programs of improving safety on freeways by upgrading standards has proven to be very cost-effective, but applying the same concepts to the conventional highway system is a vastly different matter since (1) usually speeds are lower on conventional roads, (2) traffic

volumes are lower, and (3) there are many more roadside obstacles. Thus, the economic factors are not the same.

To illustrate the problem, Exhibit C is an inventory of the number of fixed objects on conventional state highways together with the 1974 accident data involving the fixed object. The biggest killer in this group is trees because there are so many of them. The next largest is utility poles; then comes unprotected bridge ends.

Exhibit D lists the frequency of any one fixed object being involved in an accident. This table demonstrates the problem of justifying a program of removing these fixed objects on a blanket, systemwide basis. It simply is not cost-effective.

That does not mean we can forget about trees, utility poles and bridge rail ends. It simply means we have to be more selective about what we spend our resources on. Three years ago California was a defendant in a lawsuit involing an accident where a car ran into a utility pole. The same pole had been hit on two previous occasions and each time the utility company restored the pole in the same location. The jury found for the plaintiff. We can argue that it is not cost-effective to move all poles, but we cannot justify doing nothing in the face of a recurring accident problem.

Nonbarrier (steel and concrete baluster) bridge rails, which were standard prior to 1958, are another problem. It would cost well over $100 million to upgrade all nonbarrier bridge rails. It is not cost-effective to upgrade them all, but we have developed a priority system for upgrading a select few bridge rails which have the highest potential for being impacted by out-of-control vehicles, and have dedicated $1 million per year for this program. This systematic process of dealing with a large inventory of substandard highway features provides an opportunity to demonstrate that we are aware of our safety problems and are managing our resources in a responsible manner.

EXHIBIT A.

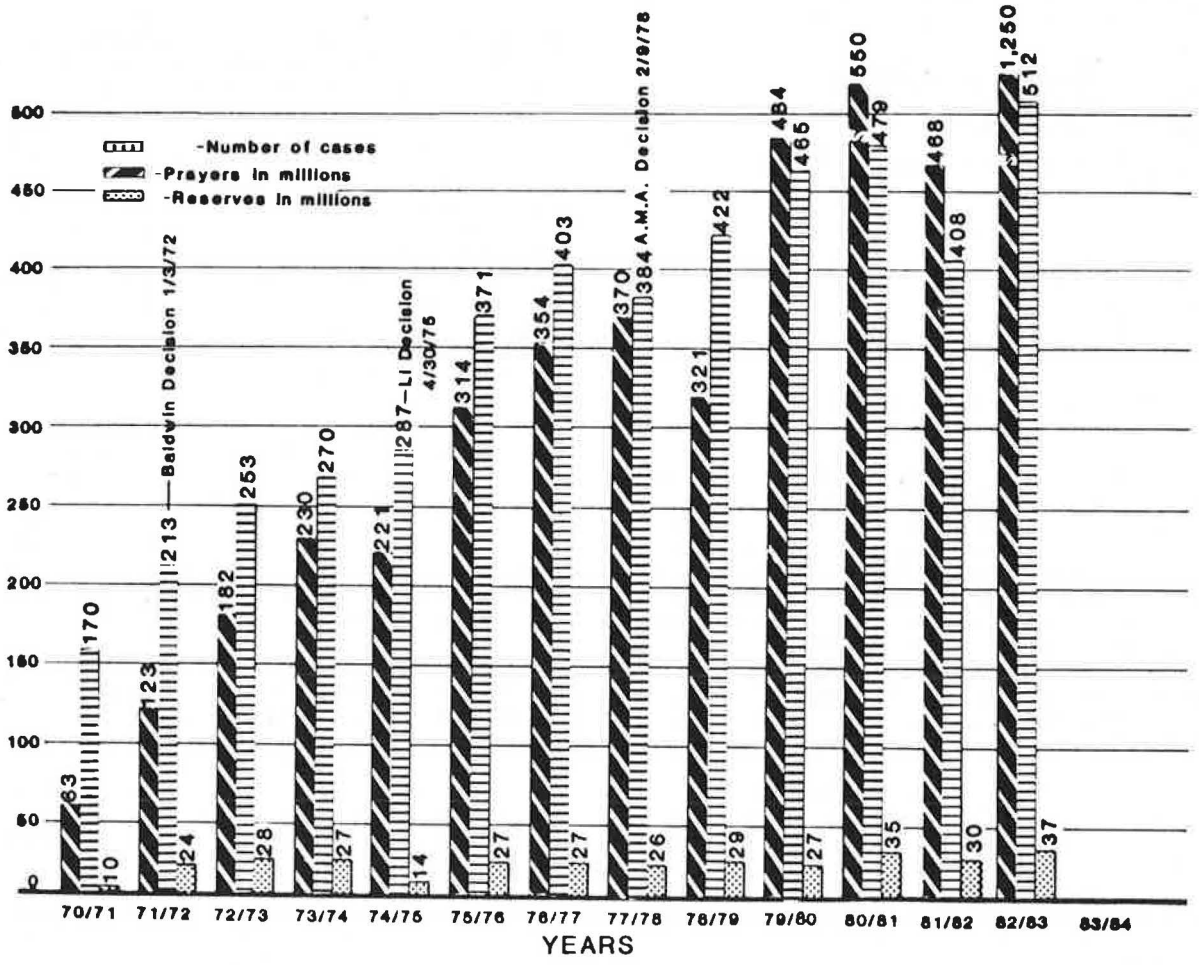


EXHIBIT B.

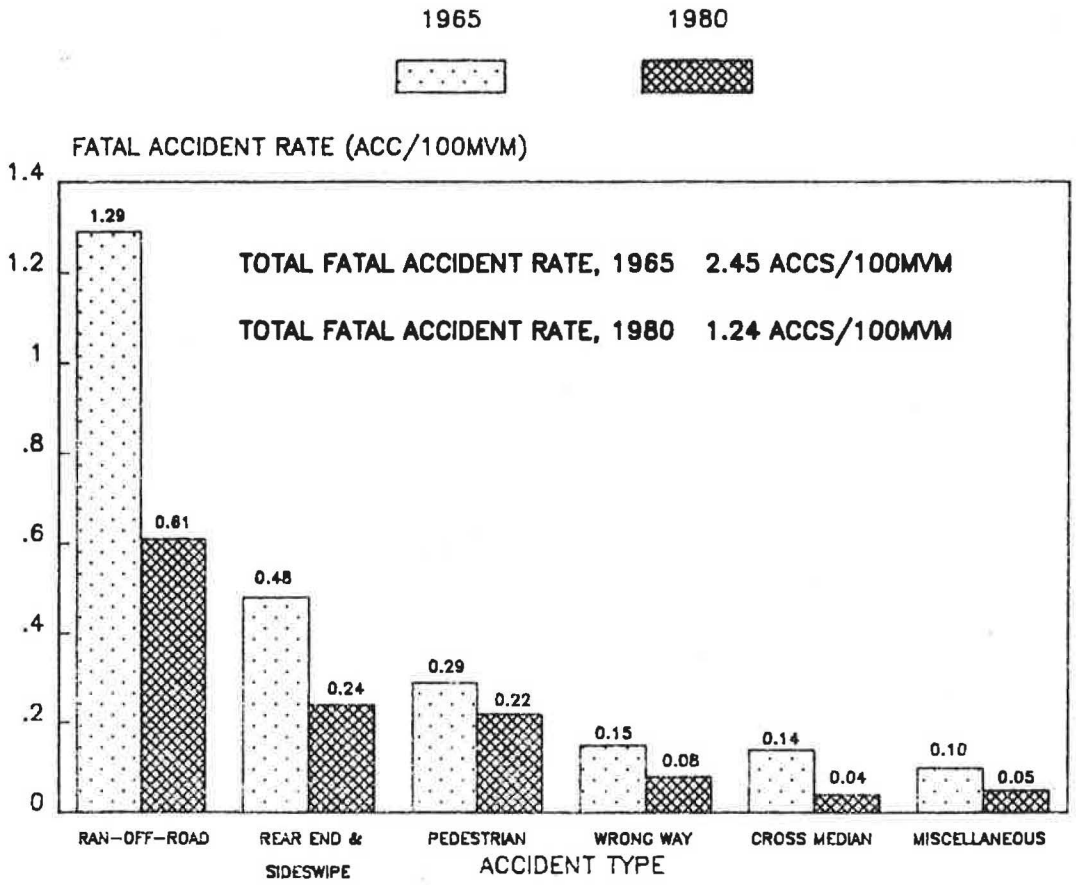


EXHIBIT C.

TYPE OF FIXED OBJECT	NO. OF OBJECTS	1974 ACCIDENTS			
		FATAL	INJURY	PDO	TOTAL
SIGN OR LIGHT SUPPORT	2,800	0	57	57	96
UTILITY POLES	94,000	16	212	262	490
TREES	210,000	30	258	175	463
BRIDGE OR CULVERT HEADWALL	16,500	8	38	30	76
BRIDGE, PIER OR ABUTMENT	620	1	8	10	19
TOTAL	323,920	55	555	534	1,144

EXHIBIT D.

CATEGORY	ACCIDENTS/OBJECT/YEAR	YEARS/ACCIDENT
SIGN OR LIGHT SUPPORT	.034	29
UTILITY POLES	.005	200
TREES	.002	500
BRIDGE OR CULVERT HEADWALL	.005	200
BRIDGE, PIER OR ABUTMENT	.031	32

A State Attorney's Perspective
Sharon F. Lyles

Louisiana, like most states, has a full gambit of tort claims with plaintiffs' attorneys becoming more innovative each day as to causes for why a state highway agency should be held liable.

Tort claims against the state are a serious problem in Louisiana. Having lost sovereign immunity many years ago, tort claims have been escalating. For the period 1972-1983 tort judgments paid by legislative appropriations have escalated from approximately $180,000 in round figures in 1972 to just over $12 million in 1983. The figures for 1984 have not yet been finalized, but are expected to exceed the $12 million mark. One case (Dwight P. Allemand v. Harold LeBlanc, et.al No. 68,757, 32nd J.D.C., Terrebone) with a $17 million judgment against the Louisiana Department of Transportation and Development was compromised and paid this year for $9-1/2 million.

Changes in Louisiana jurisprudent account for much of the increase, the courts having "processed" to what is called "strict liability" or Louisiana Civil Code 2317, liability in tort. Strict liability means that a plaintiff many recover by showing: (1) that the "thing" which caused the damage was in the care or custody of the defendant; (2) that the "thing" was defective in that it posed a condition creating an unreasonable risks of harm; and, (3) that the defective "thing" caused the injury. The state is strictly liable, whether or not the state highway agency had actual or constructive notice of the alleged deficiency. The only defenses available area:

1. Fault of the victim.
2. Fault of a 3rd party (who in many cases is unknown).
3. Force majeure (Act of God).

In Louisiana, proposed Legislative remedies such as limitation of liability or legislative restoration of the "notice" requirements have in the past several years been woefully unsuccessful. Legislative remedies aside, the only other solutions are engineeirng prevention of defects that cause these accicents.

In terms of numbers of lawsuits, Louisiana Department of Transportation and Development receives an average of about two new tort suits each working day.

In 1979, to help make the engineering division, particularly in maintenance areas, aware of the problem areas, the Legal Division started transmitting a copy of each new suit received to the district offices for compilation of any available information on file that might aid defense of the suit. Additionally, the engineering division developed a computer program to classify the types of accident by defect type.

The computer program produced the following statistics:

Year	No. of Claims	Amt. of Demand
1979	134 claims	121 Million
1980	216 claims	180 Million
1981	311 claims	354 Million
1982	363 claims	384 Million
1983	274 claims	353 Million

These figures do not include "Small Claims" which are claims of $2,000 or less. (La. R.S. 13:5141 et seq.)

The "Number 1" problem area was shoulders from 1979-81. Shoulder problems include no shoulder, inadequate shoulder width and low shoulder. In 1982-83 the "Number 1" problem area changed from shoulders to signs. The Maintenance Division has used these statistics to justify legislative appropriations for maintenance. (See tables 1, 2 and 3 for more detail.)

Another problem is funding for maintenance and reconstruction of areas found to have inadequate designs. Louisiana has been experiencing budgetary problems which has translated into a lower level of personnel and materials to perform needed work.

In terms of what can be done to improve the problems, my recommendation is better communication between legal and engineering divisions of state highway agencies.

TABLE 1. ACCIDENT AND CLAIMS SUMMARY

1979 - 1983
CLAIMS

CONDITION	CLAIM AMOUNT	NO. CLAIMS
SHOULDER	$203,935,706	157
DESIGN, ETC.	$201,049,525	107
SURFACE	$123,683,633	161
WORK SITE	$121,102,215	107
SIGNS	$94,664,421	96
PROPERTY	$94,365,486	45
RR CROSSING	$59,835,430	39
BRIDGE	$59,713,449	55
DRAINAGE	$48,569,651	16
SIGNAL	$36,309,772	126
MARKING	$29,136,161	26
SIGHT DISTANCE	$27,425,450	23
TRAFFIC CONTROL	$26,125,700	7
MAINTENANCE	$24,816,773	28
LEFT TURN	$10,893,211	18
LIGHTING	$7,614,655	14
EQUIPMENT	$6,400,870	4
DEBRIS	$6,386,497	13
FERRY	$5,204,479	3
MOWING	$4,062,350	4
GUARD RAIL	$3,511,109	6
TUNNEL	$2,350,000	1
OTHER	$2,000,000	1
STEEL CABLE	$1,110,000	2
DOTD OPERATOR	$227,000	1
UNDER - $100,000	$286,867	9
TOTAL	$1,200,780,410	1,069

TABLE 2. ACCIDENT AND CLAIMS TREND

1980 - 1983

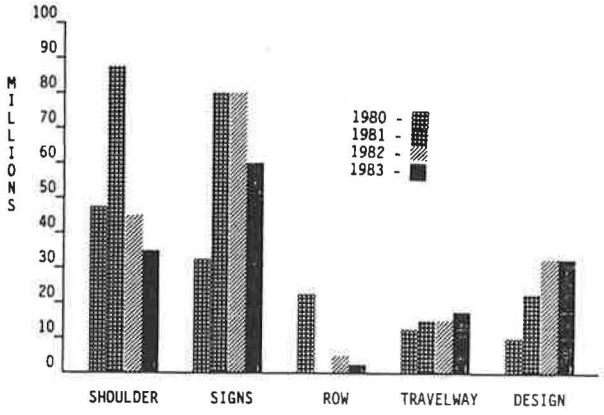
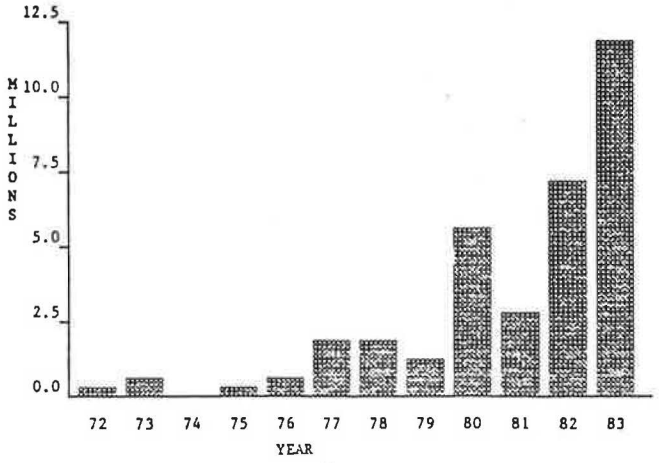


TABLE 3. LEGISLATIVE APPROPRIATIONS FOR DOTD

JUDGEMENTS IN TORT CASES

(Amounts do not include interest paid)



A Highway Safety Research
Engineer's Perspective
Don Ivey

There are two objectives of this talk. First, to describe three problems that either are, or should be, the purview of conscientious engineers and researchers to correct. Second, to describe three recent research developments that MAY, and I emphasize MAY, result in improvments in some aspects of highway safety and in the ability of states to defend their construction and maintenance policies.

First, there are the three perceived problems:

1. Over-publication of marginally valuable research.

2. Representation of transportation system resistance to change as a major drawback to achieving appropriate levels of safety.

3. The ability of untrained, uneducated and non-objective individuals to qualify as expert witnesses in our courts.

"Even as we speak," an insulated, academically-oriented, idealistic, university professor, part-time highway safety researcher, and self-acknowledged societal philosopher is writing a report on some aspect of highway safety. This philosopher is making recommendations for immediate implementation of his "findings" with little understanding of how his particular recommendations might fit into an overall plan for safety improvement by a state department of transportation, and no concern for the economic feasibility of the proposed "improvements." Indeed it is not always beyond debate that particular recommendations will have a positive influence on safety. Whether or not the research is credible or the recommendations feasbile, once published, such a report will become part of the arsenal for plaintiff attorneys seeking financial gain at the public's expense.

Almost everything published by researchers relative to highway safety has the potential for use in Tort Claims, either for or against the states, and in my view, much more is published than should be. The reasons for over-publication of marginally valuable documents are understood. The incentive to publish to advance in the academic community, the justification of research expenditures, the desire for personal recognition and many other more subtle influences on both individuals and organizations combine to produce an avalanche of published documents, in a field where fewer well-done and well-considered treatises, subjected to stringent peer review would be more productive. As we are called on as members of TRB, SAE, ITE, FHWA, ASCE, ASTM and other organizations, to review and recommend whether these papers should be published, we can exert a major and even immediate influence on this problem.

By "transportation system inertia," I mean the well-measured pace at which research ideas, innovations and designs are implemented by state DOT's. The idealistic researcher described before is extremely frustrated that it takes so much time to get good ideas implemented and converted to "standard procedure" on our highway system. It has been estimated that new ideas and designs take approximately ten years to achieve general acceptance and implementation in the field. This position has usually been stated as a complaint against the inertia of state DOT's. Considering

the massive investment in transportation networks, and the correspondingly high levels of funding required to make even small physical changes, it is not clear to me that this inertia is entirely inappropriate. It is possible, if one takes an evolutionary viewpoint toward the development of our transportation systems, to argue that this inertia, or lag time in implementation of new technology, is entirely appropriate for our society at this time. If it is not in the best interest of society (note this is possibly a somewhat different interest than the maximization of highway safety), then evolutionary theory dictates either it will change, or the society will change.

In the meantime, I plan never to apologize to an attorney or a court for the inertia in the system when we have all seen that inertia guard against the quick implementation of ideas and designs that appear excellent in the early development stages but are later determined to have some dominant flaw. A noted exception to this personal policy on apology is when a state DOT CONTINUES TO CONSTRUCT facilities using old concepts and designs when there are better and proven cost effective approaches that have been provided by engineers and researchers.

The final problem is by far the most embarrassing of the three because it reflects so badly on the professionalism of conscientious engineers and scientists. It is the ability of untrained, uneducated and totally non-objective individuals to qualify as experts in our courts.

Figure 1 gives my highly pretentious, oversimplified and irreverent representation of the categories into which many self-proclaimed experts may be divided. I have tried to describe caricatures in our society which might fit the specific combination of knowledgeability and objectivity.

Category 1 -	The Professional Teacher - traditionally considered to be both knowledgeable and objective, someone a pupil, individual (or court) could trust.
Category 2 -	The Used Car Salesman - He may be quite knowledgeable in his field but is not likely to give you the full benefit of that knowledge.
Category 3 -	The Tent Service Evangelist - Knowledge and objectivity are not even in his vocabulary.
Category 4 -	The Second Lieutenant - Trying hard, extremely conscientious, but without the experience or training to get the job done.

Table 1 gives some of the characteristics I suspect you have all observed during your careers. Although this may seem a problem to you associated primarily with the defense side of Tort Claims, I assure you it is an absolute delight to plaintiff attorneys.

The degree of hazard, defined as the ability of individuals in these categories to help a jury or judge reach the wrong decision, is given on the lower line of Table 1. It seems apparent to me that the most hazardous individuals in the courtroom are those in Categories II and III, the non-objective, whether they be knowledgeable or uninformed. By far, the most hazardous is the individual who is both knowledgeable and non-objective. He is a scientist or engineer acting as an advocate, and one who has the technical capabilities to appear creditable.

The obvious question is, how can a court be guarded against the influence of non-expert and/or non-objective individuals who represent themselves otherwise? There do not seem to be easy answers but there are some possibilities. As a precedent, society guards itself by requiring registration by qualified engineers. Although this is certainly an imperfect tool, it has resulted in considerable benefit in preventing many unqualified individuals from calling themselves engineers.

Self-regulation by engineering societies through devices similar to university accreditation committees are cumbersome but somewhat effective measures that could be applied to individuals seeking accreditation of their expertise in specific fields. Perhaps a more feasible approach would be to provide courts with information on specific subject areas which would be useful in examining proposed experts. This information could be provided through the auspices of reputable engineering or scientific societies if they chose to undertake the task.

Finally, the factors that influence a judge to accept many unqualified individuals as experts, with admonitions such as "his experience (or lack of experience) goes to the weight of the testimony," might be critically considered by the legal community. Once an individual is accepted, the weight of his testimony may be primarily a function of personality, charisma or whether he has taken a course on "How to Win Friends and Influence People."

In my view, this is the most serious problem faced in Tort Claims and one which should justify detailed consideration by the engineering, scientific and legal communities.

FIGURE 1. OVERSIMPLIFIED AND HIGHLY IRREVERENT REPRESENTATION OF EXPERT WITNESS CATEGORIES

	Category I	Category II
KNOWLEDGEABLE	(The Professional Teacher)	(The Used Car Salesman)
	Category IV	Category III
UNINFORMED	(The Second Lieutenant)	(The Tent Service Evangelist)
	OBJECTIVE	NON-OBJECTIVE

TABLE 1. CHARACTERISTICS OF EXPERT CATEGORIES

CATEGORY	I KNOWLEDGEABLE OBJECTIVE	II KNOWLEDGEABLE NON-OBJECTIVE	III UNINFORMED NON-OBJECTIVE	IV UNINFORMED OBJECTIVE
EDUCATION	Basic educational training. Continuing education to acquire new techniques and knowledge.	Same as I	a. Unrelated basic education b. No effort toward continuing education	Same as III
EXPERIENCE	Use and/or development of appropriate engineering and scientific information and analytical tools in field of proposed qualifications.	Same as I	No experience related to use or development of scientific information and analytical tools in field of proposed qualification. May cite investigation of thousands of accidents.	Same as III
OPERATIONAL MODE	Analyzes facts. Uses best analytical tools to define specific situations and events. Develops opinions based soundly on these facts and appropriate analyses of same. Represents situation accurately to attorneys and courts.	Determines most advantageous opinions. Forces the facts and/or analyses to fit those predetermined opinions. Disregards information not to helpful to advantageous opinions.	Unconcerned by facts or purposely uses them inappropriately. Does not look for information related to the situation. May misuse analytical procedures in support of opinions.	Uses "common sense" and layman's experience to deduce causes, influences, and characteristics of accidents. May be an excellent "investigator". May misuse analytical procedures in honest efforts to develop opinions.
DEGREE OF HAZARD	Minimal	Extreme	Significant	Minimal

Minimizing Tort Liability -- Guidelines and Related Thoughts

Russell Lewis

I have been asked to discuss the NCHRP Synthesis Report "Practical Guidelines for Minimzing Tort Liability" which I recently prepared for the Transportation Research Board.* As the attorneys with whom I often work would say in their favored latin, "res ipsa loquitur" -- or more simply put, the document speaks for itself. A copy of the summary taken from the report is attached for your information.

Related Thoughts and Concepts

For the few moments I have with you, I prefer to share some of the thoughts on this subject that have come to me during my training and expert witness activities and the preparation of the report itself.

My trip to participate in this meeting started deep in the Adirondack Park of upstate New York, where I maintain my summer office. I started by canoe, as there are no roads into my camp. My initial "roadside hazards" as I paddled down the lake consisted of loons and beaver cavorting about in the early dawn. In less than twelve hours, however, thanks to modern modes of transportation, I was here in Santa Cruz -- in the woods again, but overlooking the Pacific Ocean.

The relevant thought that strikes me is how times have changed. In the pioneer days when the west was settled, life was recognized as hard and dangerous. When a family started out across the plains in a wagon, they took their chances with lack of sustenance, adverse weather and hostile tribes. If they were injured or killed on route, so be it. Today, however, society feels that it should take better care of its members. When people are injured on our modern highways, juries will often seek a means for taking care of the persons financially. Thus, the proverbial deep-pocket concept has evolved. Times are different, and there are some worthwile reasons for these changes. The management procedures employed by highway agencies must be updated, however, to accommodate new social and legal principles.

The best means of limiting liability is to reduce accidents. There are limits to what can be accomplished by such programs, however, as highways are inherently dangerous. It is an enormous challenge to provide and operate a system having the following properties:

- The network extends over the entire countryside.
- The facilities are utilized 24 hours a day in all kinds of weather.
- Vehicles range in size from bicycles to tractor-trailers--differing in size, weight, power and mechanical condition.
- Operators are mostly non-professional -- with widely varying levels of competence.

If one were to set out to design a hazardous activity, the road systems used by the traveling public might well evolve from such an exercise. The only more hazardous situation that immediately comes to mind is attempting to maintain these roadways under traffic.

Thus, accidents are inevitable on our highway systems and cannot be completely avoided. That is all the more reason to prepare for inevitable claims. Activities need to be conducted in a manner that lays the groundwork for an effective defense, for use whenever needed. The synthesis report defines steps to be taken toward this objective.

Problems associated with the Defense

I often use analogies during my training course for highway agency personnel. One might compare the changing climate in the highway field to the game of football. At one time it was merely a ground game. Then one day the forward pass was invented. Examination of the rule book revealed that it was a legal maneuver, and the game began to change tremendously. Just imagine what would happen to a team today that concentrated only on its ground game and failed to adopt new defenses against the pass. It would surely lose every game. And that is just what will happen to highway agencies in court if they fail to adjust to the new rules.

The problems encountered in defending a highway agency in tort liability actions are formidable. For example, a plaintiff's case may be directed to the one point on the road where the accident occurred. The defense, however, may have to defend its actions over the entire road system in an attempt to show why limited resources were not allocated to the point in question. This is a most difficult undertaking, particularly considering that the lack of funds is generally not held by itself to be an acceptable defense. Simply put, the deck is stacked against public agencies. Negligence of the driver will most often be discounted, and the public agency will be held accountable to a significantly higher standard.

Challenges for the Highway Profession

The highway profession needs to do a better job of educating the public as to the safety-related trade-offs inherent in the design and operation of highway facilities. Safety cannot simply be maximized, because all the other competing demands must be considered. These problems are rarely, if ever, brought out in court. In some cases, if the agency had undertaken to improve conditions at the accident site, the overall safety of the road network would be diminished -- by not performing other work that had a higher potential safety payoff.

Providing a "safe" highway environment is an optimization process. For example, consider the trade-offs between safety and mobility. The engineering profession could design a very safe highway. The stretch of road could be managed in a manner similar to that of an airport runway. A control tower would be erect overlooking the

*Lewis, R.M., "Practical Guidelines for Minimizing Tort Liability," Synthesis of Highway Practice, No. 106, National Cooperative Highway Research Program, Transportation Research Board, December 1983.

facility. All vehicles would be operated by highly qualified pilots meeting stringent licensing, periodic requalification and medical testing standards. All vehicles would be under constant contact and supervision of the control center. Only one vehicle would be released at a time. After each vehicle had cleared, the next vehicle would be relased. By incorporating such procedures, a very high level of safety could be obtained, but at an enormous reduction in capacity. By maximizing safety, mobility is minimized!

Management and Program Needs

The principal recommendation is that tort liability risks must be managed. Tort claims are not a problem that can be solved. They are an inevitable by-product of operating a highway system, and therefore, tort liability considerations must be included in the development of the overall management program. The purpose of the synthesis report was to offer pracitical and implementable program elements to meet this objective.

Research Needs

After completing my first draft, the NCHRP review panel stated that I omitted one item that researchers consider essential; namely, recommendations for further research. After going back to the "drawing board" (my computer/word processor CRT, in this case), I concluded that there were indeed major shortcomings to be addressed with respect to highway tort liability. Simply put, we do not know either the character or the magnitude of the problem.

There are several characteristics of the problem that make it very difficult to grasp.

- The rapid growth in tort liability claims presents a "moving target," making the task of program development more difficult.
- Changing legislation, judicial interpretations and case law are, in effect, continually altering the "rules of the game."
- The time delay between an incident, filing a claim, trial and possible appeal results in a final accounting which takes many years to accomplish. Thus, factual current information as to costs associated with tort liability is impossible to obtain.
- Most complaints filed in tort liability cases cite all conceivable highway elements and functions in order to have the broadest possible basis for a claim. For example, frequently design, maintenance and operation are all cited as being negligently performed. Therefore, it is difficult to correlate risks with agency functions and/or elements of the road system.

While many of these problems are not amenable to solution through research, two areas of need stand out.

Procedures for Assigning Tort Liability Costs to Highway Function and Element: Effective management of the risk of tort liability requires knowledge as to the sources and magnitude of the problem. Information is needed as to tort liability costs by highway function (design, construction, maintenance, etc.) and by elements and appurtenances (ditches, guardrial, luminaire poles, etc.). Since this data is not directly available, it requires some subjective assessment. Therefore, a procedure is needed which defines the methods of evaluating these costs together with a set of guidelines which will minimize variations between individuals making such assessments.

Standard Statistical Tools for Tabulating Tort Liability Costs: To develop meaningful analyses and forecasts, tort liability data from many different jurisdictions must be aggregated. To accomplish this, all data inputs must be standarized. There is a need for uniform definitions, procedures, forms and codes.

The situation is analogous to working with highway accident data. As accidents are statistically rare events, one needs to accumulate accident data over time and/or road network to develop statistical significance. Therefore, uniform accident reporting procedures have been developed which permit the combining of data from different agencies. By this means, sufficient data is amassed to enable accident rates to be developed by system components and features.

Accidents which result in claims are statistically even rarer events. Therefore, the need for standard data collection and tabulation procedures is essential to building an adequate data base.

ATTACHMENT

SUMMARY OF "PRACTICAL GUIDELINES FOR MINIMIZING TORT LIABILITY"

Transportation agencies today are faced with a changing situation regarding their vulnerability to tort suits arising from alleged dangerous conditions on street and highways. Improvements that have been made to the highway network, for higher levels of service by the traveling public. A new concept of social justice has evolved in which a "deep pocket" is sought to recompense persons who have suffered severe damages. There is now general acceptance that drivers make mistakes and that roadways should not overly punish them for minor transgressions. As a result, the forgiving roadway approach to highway design has been established.

Currently with these changes, sovereign immunity has been eroded or lost completely. Moreover, a series of court decisions in several states has severely limited the common law defenses discretionary and design immunity. This loss of protection has occured during a time of litigation growth caused by the snowballing effect of successful suits and the increasing sophistication of attorneys in the field of highway tort liability.

Changes in the law, which varies among the states, have increased potential payments for tort

judgments. The movement from contributory negligence to comparative negligence no longer bars judgments simply because the driver was also at fault. Furthermore, it should be recognized that public agencies generally are held to higher standards than motorists. The principle of joint and several liability is particularly onerous for public agencies, as it enables plaintiffs to collect their entire awards from any one defendant. Recent court decisions have also expanded the scope of equitable indemnity to parties not named in the original suit, thus increasing cross complaints that may be filed against agencies, utility companies and contractors.

The principal recommendation of this synthesis is that tort liability risks must be managed. The implementation of an effective risk management program requires several steps, which include establishing organizational structure, staffing the requisite functions, publishing policies and procedures, and training agency personnel.

One protion of an overall program concerns pre-accident actions. Accidents are inherent in the nature of the highway system, and effective handling of them requires advance planning. The best method of reducing liability is through accident reduction, which should be one of the major objectives of every highway agency. The elements of such a program encompass every facet of an agency's operation, however, and the subject is well beyond the scope of this report. Nevertheless, it should be recognized that a well organized and documented accident reduction program will strengthen defense capability when inevitable accidents do occur.

One problem that an agency faces is that a plaintiff need only attack the department's actions at the accident site, whereas the agency may be forced to defend its whole program for the entire road network under its jurisdiction. For example, it may be claimed that an obstacle feature should have been upgraded to accommodate changing traffic characteristics. The agency must explain why it elected to utilize its resources elsewhere on the system. A well organized highway programming procedure is essential to defend against such allegations. The agency must show that it has the following program elements in place and operating efficiently: an ongoing data collection and analysis system to monitor its operations and identify problem locations, a method of selecting appropriate countermeasures, a procedure for prioritizing needs and scheduling improvements, and a means of evaluating project and program effectiveness. With this information in hand, it may be possible to show that the reason that a planned improvement is scheduled for a future year is keyed to the level of funding provided by the legislature. There is a responsibility, however, to warn the public of danger conditions which have not been eliminated and to seek low-cost, temporary measures for reducing hazard levels when such means are available.

Post-accident actions which may reduce liability risks include to following: instructing personnel as to their responsibilties if they are at the scene when an accident occurs, and agency investigations to augment information in police reports. Accident data must be evaluated, as it may establish notice of dangerous locations.

To prepare for trials, procedures need to be established with regard to the release of information and production of documents. Agency personnel should be instructed as to what to expect and how to properly respond during depositions. In many instances expert witnesses may be needed, particularly when such experts are utilized by the plaintiff. It is recommended that a cadre of agency experts having good communications skills be trained and utilized. In-house experts are best used to explain agency procedures and actions. In those instance where an expert opinion is desired as to the level of safety provided or the appropriateness of performance, outside experts may well be perceived as less biased by members of a jury.

Exhibits of various kinds can be most helpful in explaining site characteristics and features to a jury. Consideration should be given to obtaining enlarged ground and aerial photographs and to the preparation of display boards and models. Other techniques such as site reconstructions have been performed -- for example, where a work site condition is no longer in place.

An effective loss mitigation program includes many facets. An aggressive program to achieve legislative change to place reasonable bounds on liability is an important program component. Consideration must be given to the means of funding tort liability judgments. The relative merits of commercial and self insurance should be explored along with coverage variations that are availiable. Either way, payments need to be budgeted. A decision needs to be made as to the merits of having the transportation administrator responsible for all costs associated with providing and operating the highway system including the cost of liability judgments, as opposed to such payments being made from the general fund. Risk shifting to other parties, such as contractors and lessors of agency property, can be accomplished through both indemnity agreements and insurance clauses.

Organizing the risk management function involves staffing arrangements for both legal and engineering activites. With the transportation agency a risk manager may be needed along with any additional staffing that is in order. If the organization is large, district claims officers may be needed on either a full-time or collateral basis. A tort liability committee is a useful means of operation relative to processing claims and case preparation should be identified and corrected. Examples include facilitating out-of-state travel for obtaining expert witnesses, and rapid techniques for purchasing evidence items.

The management of claims should encompass established procedures for identifying potential suits, receiving claims, maintaining the confidentiality of claims filed, controlling the release of information, and claims investigations. Other related elements which need to be established are a settlement program and safety-related training activities. To manage risk one must know the character and magnitude of

the problem. Procedures are needed which quantify potential claims and judgments and relate these to agency functions (design, construction, maintenance, etc.) and to highway elements and features (ditches, guardrail, sign supports, etc.).

The last chapter of the synthesis contains specific action guidelines for each agency function. These may be used as a checklist of ideas for consideration and implementation.

III. & IV. DISCUSSION GROUP RESULTS
Jack Humphreys

Prior to the meeting, separate lists of problems/issues for the topics of Planning, Design and Construction (Table 3) and Operations and Maintenance (Table 4) were prepared by the workshop organizers. These were to serve as starting points for the group discussions. It was acknowledged that duplication existed between problems and lists. Groups were also told to freely add other problems/issues discussed, as well as identify solutions and/or recommend research. Results are shown below. Problems/issues numbers and short titles generally refer to Tables 3 and 4, unless a discussion group for the two major topics.

Topic 1. Planning, Design and Construction

Group 1

Problems/Issues Prioritized	Suggested Solution or Recommended Research
1. Lack of communication to state-of-the-art engineering knowledge and research results to design, construction and maintenance personnel (New Item).	Develop an approach (may require research) that supplies design, construction and maintenance personnel with the latest technology in regard to highway safety appurtenances and other roadway features so that the technology can be applied sooner.
2. Problem of limited funds precluding immediate and full adoption of all recommended safety standards (Item #2, Table 3).	The cost effectiveness approach to allocating limited funds tends to be accepted as reasonable by juries. (Juries make similar deliberations about the value of a life.) This approach should be followed. The cost effectiveness approach needs to be continually refined to take into account new research findings about both costs and benefits.
3. The inability to design and test safety appurtenances with unusual design vehicles (Item #3).	Technology does not exist to design all barriers for all vehicles. There is a need for more compatibility between vehicle and roadway designers. The minicar presents a particular problem. Need data concerning the minimum vehicular weight that can be accommodated. General consensus is to at least consider "giving notice" to vehicle operators that safety features on some or all roads have not been designed or tested with certain classes of vehicles.
4. Accident problems in construction zones (Item #5).	More research needed to develop appropriate standards for various classes of construction zones. Need guidelines for temporary barriers. Recommend a rewriting of Part 6 of the Manual of Uniform Traffic Control Devices.
5. Design standards do not consider all persons "legally" using the roadways (Item #11).	There is concern that current designs may be ignoring a large percentage of drivers "legally" using the roadway. More consideration should be given to designing for the "impaired" driver (e.g., a driver with a 0.02% BAC level). This might approximate those drivers using the roadway who are impaired by stress, fatigue, etc. Such an approach would be considered reasonable by juries.

Table 3. Discussion Topics in the Area of Planning, Design and Construction.

1. Many accidents involve the "innocent bystander." Examples are a median crossover accident, an accident in which a vehicle penetrates an overpass and strikes traffic below, an accident in which a vehicle encroaches into a rapid transit busway or railway, etc. Should more emphasis be placed on prevention of these types of accidents as compared to single vehicle, run-off-the-road accidents?

2. Increasing demands are being made of transportation agencies in the area of highway and roadside safety. Limited funds preclude immediate and full adoption of all recommended safety standards. Many agencies are now using cost effectiveness of benefit/cost analysis procedures to evaluate alternate safety programs and to establish priorities and action plans. These procedures typically require that estimates be made of the monetary value of life, a very sensitive issue. Is this the most rational approach to establish priorities and policies? Do the courts view these as rational, acceptable procedures? Is there a better way?

3. Many accidents which lead to court cases involve "unusual" conditions; for example, cases involving motorcycles, high-ride, four-wheel drive pickups, recreational vehicles, cars or campers pulling trailers, trucks and buses. Safety appurtenances are not designed or tested with these "special" vehicles, yet the plaintiff often contends that there should have been a safety device in place that could handle them.

   a. Should safety devices be designed to handle all types of vehicles legally allowed on state highways? On local roads?

   b. If not all types can reasonably be accommodated, which types can be?

   c. To what extent should the federal government encourage or regulate the use of "universal" safety appurtenances?

   d. Is there any way in which a state or local agency could "give notice" to vehicle operators that safety features on some or all roads have not been desinged or tested with certain classes of vehicles, and the governmental agency is not responsible for any accidents involving safety features and these special classes of vehicles? In other words, could this be accomplished by the highway agency with signing, or by legislation (e.g., issuing warnings when vehicles were registered), or by requiring special high limited insurance for selected classes of vehicles?

   e. If more versatile safety appurtenances are desirable, inadequate funding for research and construction is the main roadblock to their development and implementation. What efforts should be made to increase funding.? For example, should "special" vehicles pay extra fees to finance "universal" safety appurtenances? Or should all vehicle operators allowed on public roads have "equal" safety at equal cost to them?

4. Accidents occur where vehicles impact a barrier at a 45^{o} - 90^{o} angle, while skidding sideways, while yawing rapidly or heading backwards, while braking so the car noses down under the barrier, etc. We do not design or test barriers for these conditions, yet sometimes plaintiffs contend that the barriers should function under these conditions.

   a. Should barriers handle a wider range of impact condition?

   b. What are reasonable limits, if any, for barrier impact conditions? Should these limits be established and officially adopted by AASHTO? FHWA?

   c. Should a research project be initiated to conduct tests at some extreme conditions on standard barriers, for example 90^{o} impacts?

   These tests would clearly show that the barriers do have limits and might not be helpful under these impact conditions. Movies of these tests could be used for accidents where no barrier was present.

5. Construction zones continue to cause problems.

   a. What safety standards now exist?

   b. What research or new standards are needed?

   c. How can standards best be enforced?

   d. Should construction zones have the same level of safety as up-to-date roadways?

6. Problems arise because legal cases go to trial several years after the accident and there is minimal information on the accident and on the highway condition at the time of the accident.

   a. What highway condition information is most helpful to attorneys such as photologs, as-built plans with all changes, etc.?

   b. Are multidisciplinary accident investigation team examinations helpful? Should their procedures be modified? Should they expand on the number of cases investigated?

   c. What type of traffic accident records are needed? How best provided?

7. Utility poles -- When and how should they be safety treated?

8. Guardrail end treatment -- What is the preferable design? BCT? Twisted and turned-down end?

9. Designers of highway safety hardware are continually having to play "catch-up" with the motor vehicle industry in order to design

functional items of safety hardware. What can be done within the vehicle industry to ensure greater compatibility between vehicles and highway safety hardware? Is this an area for NHTSA?

10. Because of increased development older rural roadways frequently carry increased volumes at increased speeds. Planning agencies may propose and/or program improvements for realigning and/or upgrading these roadways to provide better levels of service.

    a. To what extent should spot safety upgrading be done in the interim? (Guardrail, tree or utility pole removal, etc?)

    b. What are the legal implications if local citizen opposition delays the implementation through harassment, stalling tactics or legal means, and accidents occur on older roadway which does not include the latest safety features?

11. Is it possible to develop a "design driver" for whom the roadway environment is designed, or is the necessary to design for all persons "legally" using the roadways? (Note: This is a similar question to the "design vehicle" topic already on the list.)

12. To what extent should "normal" highway design standards apply to scenic highways, park roads, etc.? Should specific guidelines be developed by agencies other than, for example, the National Park Service? (Scenic barriers, such as rock walls, vs. guardrail, for example.)

13. Improper signing is often claimed as a defect in the highway.

    a. What have we learned about signing requirements?

    b. To what extent must all hazards or possible hazards be signed?

Table 4. Discussion Topics in the Area of Operations and Maintenance.

1. Problems arise because of obsolete barriers. There are hundreds of miles of these still in existence.

    a. What type of upgrading program should highway agencies use?

    b. How should it be documented?

    c. How long is it reasonable to leave an obsolete barrier in place?

    d. Some older barriers may have vehicle containment properties but, on balance, are not quite as good as newer barriers. How can this concept be promulgated, that the older barrier is not extremely hazardous and obsolete just because it is no longer a standard, and that a newer barrier only has a few additional assets?

2. Problems arise when accidents occur at locations that have a history or reputation of being hazardous.

    a. When citizens make complaints about a "hazardous" roadway, what is the best way to handle these complaints, in light of possible future legal cases due to accidents at those locations?

    b. Should highway agencies do periodic inventories of highway locations that need safety improvements?

    c. How should these be documented? What language should be used?

    d. What is a reasonable time period in which to upgrade these locations?

    e. To what extent is lack of funding an excuse for delaying improvements? How should this be documented?

3. Problems arise when highway agenices don't follow their own manuals; for example, by not installing a median barrier as soon as it is warranted in the manual.

    a. How should manuals and other policy guideslines be written to minimize problems?

    b. If a highway agency has insufficient funds, for example, to do maintenance work mandated in a maintenance manual, how should this be documented, both at the state agency level and at the local maintenance station level?

    c. How often should manuals be reviewed and updated?

    d. How often should design, constructution, operations and maintenance people be given refresher training on agency standard specifications, plans, manuals, procedures, test methods, etc.? How critical is training in the prevention of legal problems? What type of training is most useful?

4. Problems arise because of lack of communication between the engineering and legal division of a highway agency.

    a. What forms of communication would be useful other than that occurring on individual legal cases?

    b. Would a permanent joint committee of engineers and attorneys have any value?

    c. Would it be helpful if the legal division prepared an annual report summarizing the type of engineering problems they had encountered in legal cases the previous year?

    d. Many cases are similar and require a collection of the same set of reports, standards, movies, etc., by the engineer for the attorney. Is there value in

preparing a standardized basic packet of information for common types of legal cases to reduce engineering time and ensure completeness of coverage? Should agencies prepare, for example, a "history of median barrier" which includes all previous standard plans and specifications, and describes changes in design, warrants, etc., through the years? Is there a reason why attorneys would prefer not to have these histories or information packets in existence?

e. What are the pros and cons of having engineers and/or attorneys who specialize in certain types of cases?

5. Sometimes attorneys and engineers do not realize pertinent information is available, either within their own agency or from other states. For example, many agencies are unaware of edge-of-pavement dropoff tests CAL-TRANS did 10 years ago, or the ones done recently at TTI.

   a. Would there be value in having a specialized information service related to highway safety design and tort liability cases?

   b. Would a new TRB committee or a permanent subcommittee of TRB A2A04 be helpful in keeping highway safety subjects that were directed toward engineer and attorney users?

   c. Could one or more transportation libraries compile automated bibliographies on selected highway safety subjects that were directed toward engineer and attorney users?

   d. Would it be useful to have a periodical in which highway safety cases were reported briefly in simple language? Does such a periodical exists now?

   e. What training classes should agency attorneys provide agency engineers and vice versa?

6. Vegetation control -- How can problems of reduced sight distance, large trees in the clear zone, and grass and/or ground cover around breakaway sign and luminaire support be minimized?

7. Restoration of damaged, substandard hardware -- Must it be restored to its original condition? To full current standards or something less but better than substandard system?

8. Routine maintenance of safety devices -- How can this be achieved in a timely manner?

9. Where roadside features contrary to good safety practice are required or mandated by "others," how do we protect ourselves or assign the responsibility. Such things as utility poles, trees, monuments, etc. should be considered.

10. When is operational maintenance justified over preventative maintenance for highway safety hardware, if at all?

11. Pavement surface and pavement edge discontinuties (potholes, edge dropoffs, dips, bumps, etc.) -- When should corrective measures be taken?

Group 2

Problems/Issues Prioritized	Suggested Solution or Recommended Research
1. Lack of feedback to the highway departments concerning the number and disposition of tort claims involving their highway system (New Item).	Highway engineers occassionally get involved as experts in tort claims but have no information concerning the volume of claims broken down by type of highway involved, urban or rural, construction zone, principal highway deficiencies claimed, crash circumstances, type of vehicle, dollar amount if pre-trial settlement, court judgment amount, etc. Legal office should provide such information as cases are settled in the form of quarterly and/or annual summary reports. Recommend research to study tort claim settlements and decisions in at least several government jurisdictions to determine what feedback would be of value to highway engineers responsible for the establishment of warrants and priorities for highway safety improvements.
2. The inability to design and test safety appurtenances with unusual design vehicles (Item #3).	Not physically or economically possible to test and design for all vehicles (e.g., motorcycles would need to be redesigned to give the rider better protection). Can accommodate vehicles weighing 1,800-10,000 pounds. Could accommodate vehicles up to 25,000 pounds for median barriers, bridge railings and guardrail in "innocent bystander" locations. Other heavier vehicles could be handled in special, high-risk situations. The federal government should only encourage the use of adequately tested designs.

	Availability and economics generally bring about universal hardware. However, flexibility must be allowed for different environments and material availability in different geographic areas. In their normal oral and written communications, the state motor vehicle and driver registration departments could make the driving public more aware of the potential dangers associated with the various vehicle/safety appurtenance interactions. In considerations to increase funding, some special vehicles already pay higher "use" fees in most states to finance costs induced by their operation. Recommend research to initiate a national study to develop the information that could be disseminated in a public awareness campaign to alert drivers to the potential dangers associated with certain vehicle/appurtenance interactions.
3. Accident problems in construction zones (Item #5)	The only universal or national safety standards for construction zones relate to signing. Some state highway departments (e.g., California) already have developed and now have some years of experience with fairly detailed standards or procedures to other states and local governments. Safety standards can best be enforced by developing a traffic control plan which also establishes the responsibility of the contractors or engineers before work commences. Whenever physically and economically feasible, should have at least the same level of safety as the existing road approaching at each end. If this is not possible, speed restrictions should be considered.
4. The "innocent bystander" accident and the tendency of juries to pay larger and more frequent amounts to innocent parties (Item #1).	More emphasis should be placed on the prevention of accidents involving median crossover, dropping from a bridge onto traffic below, crashing into a school yard, etc., as compared other types of run-off-road accidents. A means of quantifying the emotional value of innocent bystander accidents would be helpful in establishing warrants or making cost/benefit studies aimed at establishing the priorities for the correction of roadside safety problems. Recommend research to study tort claim results (wins, losses and settlements) in terms of highway safety functions could lead to the development of numerical emotional factors and where or when they should be applied.
5. When and how should utility poles be safety treated (Item #7).	A recent cost-effectiveness study recommends: (1) every effort should be made to move the pole away from the roadway, (2) if relocation is not possible, consider underground line placement, thereby eliminating the pole, and (3) consider the breakaway technique if the aforementioned are not feasible. Recent research at TTI and SwRI has developed tested techniques for breakaway poles that appear workable. A major problem appears to be failure to get the highway department or utility company to initiate action to move pole(s). Consider research to document the reasons why utility pole accident problems are not being solved simply by relocation. The study should involve areas or locations where utility pole accident rates are high.
Group 3 Problems/Issues Prioritized	Suggested Solution or Recommend Research
1. Lack of a Model Tort Liability Act (New Item).	Prepare a model Tort Liability Act following the guide of the model Traffic Ordinance and recommend the act to the states for their consideration. (Note: Don Woods, Texas Transportation Institute, has prepared such a draft document.)
2. Legal cases go to trial several years after the accident (Item #6).	Engineers and lawyers should discuss serious accidents shortly after their occurence. No pertinent information should be withheld from attorneys. A

	detailed investigation of all serious accidents, including photographs, should be implemented.
3. The inability to design and test safety appurtenances with unusual design vehicles (Item #3).	It may be appropriate to "give notice" to vehicle operators that safety features on some or all roads have not been designed or tested with certain classes of vehicles. Licensing or registration pertaining to unusual vehicles could be a useful time to inform operators. Recommended research to establish procedures regarding what vehicles can be designed for and tested.
4. The extent to which spot safety upgrading should be done (Item #10).	Warn of problem locations by special signing or advisory speed zone. Take actions for known (proven) hazardous locations or situations.
5. Unqualified expert witnesses (New Item).	Try to utilize the appropriate technical society or professional engineering registration process to take action against unqualified or unethical witnesses. Guidelines should be prepared for: (1) certification of technical experts for various aspects of the highway, and (2) ethical behavior as an expert witness.

Group 4

Problems/Issues Prioritized	Suggested Solution or Recommended Research
1. Guardrail end treatments remain hazardous (Item #8).	Continue research with various end treatments. Disseminate findings.
2. Timing of development of standards relative to new technology developed through research (New Item).	Try to avoid premature adoption of standards prior to the conduct of needed research. Example include passenger vehicle downsizing, barriers for trucks and buses, and multi-service level criteria for traffic railings.
3. Recent accident date (Unpublished) tends to show larger impact angles and many instances (perhaps 50%) of yawing in traffic railing accidents (Item #4).	Conduct crash testing in conjunction with computer simulation based on the finding of studies providing insight as to impact condition
(Note: This problem/issue is certainly related to Item #'s 3 and 11. Item #4 receives the priority over #3 (unusual vehicles) because it is thought to be more researchable. Item #11 (developing a design driver) is thought to be at least an order of magnitude more difficult to research than Item #4).	
4. The "innocent bystander" accident and the tendency of juries to pay larger and more frequent amounts to innocent parties (Item #1).	Consider the amounts juries pay to innocent victims and utilize this in cost effectiveness evaluations. Recommend research to determine what the additional cost factor is that results from juries giving more frequent and more generous awards to innocent victims.
5. Accident problems in construction zones (Item #5).	Develop safety standards for construction zones. Develop criteria for lowering standards (if applicable) for maintenance zones. Investigate the nature of accidents in both construction and maintenance zones.

Topic 2 - Operations and Maintenance

Group 1

Problems/Issues Prioritized	Suggested Solution or Recommended Research
1. Pavement surface and pavement edge discontinuities (Item #11, Table 4).	Identify extent of dropoffs, potholes or bumps that lead to incorrect responses by unaware drivers. Prepare a synthesis based on best knowledge available. (Note: Some recent guidelines published by TTI in Research Reports 328-1 and 328-2F. Also Special Report by select TRB study group entitled "The Influence of Roadway Surface Discontinuities on Safety.")
2. Lack on communication between engineering and legal division of a highway agency (Item #4).	Highway agency legal section recommended where not present now. Attorneys should specify accident information needs. Develop staff investigator to conduct proper examination of serious accidents.

	Recommend professional development program for attorneys and engineers who deal with tort liability.
3. Routine maintenance of safety devices (combination of Items #8 and #10).	Compile synthesis of maintenance of raodside elements. Develop maintenance priorities.
4. Restoration of damaged, substandard hardware (combination of Items #1 and 7).	Do not replace in-kind if newer specifications. Inventory systems to determine: (1) that the system functions, and (2) that the system meets the original specifications. Prioritize replacement accordingly, perhaps with the use of a time-phase program. Maintenance staff must receive current information about new hardware and techniques for upgrading older hardware.
5. Failure of highway agencies to follow their own design manuals (Item #3).	Continuous review of manuals to keep current. Engineering and legal staffs need to decide on allowable tolerances in any deviations for items like pavement dropoffs. Develop timing for various inspection procedures.

Group 2

Problems /Issues Prioritized	Suggested Solution or Recommended Research
1. Obsolete or older barriers (Item #1).	Inventory facilities. Determine barrier performance limits. Develop better accident and exposure information. Monitor performance of barriers. When working on a facility, take the opportunity to upgrade, if possible. Document any planning and replacement activities. Recommend research to develop a management plan for the removal and replacement of obsolete or older barrier. Survey the states for practices in this regard.
2. Failure of highway agencies to follow their own design manuals (Item #3).	Update manuals as new standards are developed (i.e., don't rely on memoranda). Need simple manuals and training for maintenance staff. Design standards generally apply to new construction; these should be considered as guidelines and not absolutes. Reasonable engineering judgement has its place. The new roadside design text should cover funding, priorities and warrants; this document should be helpful in court. Recommend research to develop innovative ways to keep maintenance personnel informed.
3. Lack of communicaiton between the engineering and legal divisions of a highway agency (combination of Items #4 and #5 - a tie in actual priority).	A tort committee involving legal and engineering staff would be helpful. Advantages to have in-house legal specialist(s) in tort law. More training for engineers in regard to legal issues; role playing in California DOT has been helpful. Consider teaching tort law to engineering students. Recommend A2A04 subcommittee to examine what pertinent information is available from the states.
4. Problem of accidents occurring at hazardous locations (Item #2).	Need procedure for identifying locations prioritizing needs and documenting plans and actions. Avoid interdepartmental friction in regard to action items. Be careful about the language used in reports; words like "hazardous" can have profound legal implications.

Group 3

Problems/Issues Prioritized	Suggested Solution or Recommended Research
1. Obsolete or Older barriers (Item #1).	Need inventories of roadside features and rational assessment of risk. Re-inventory when standards change. Need periodic review of roadway conditions to determine if barrier changes are needed. Use inventories, accident and exposure data to develop and upgrading program. Documentation very important. When standard plans or specifications are changed, record reasons in a permanent file or publication. At the program level, document: (1) the older features and the problems they create, (2) available new features and their advantages, and (3) the resources

	available to provide the new as well as satisfy other needs. Research report authors should be careful not to unnecessarily downgrade older designs simply to inflate the newer designs. Be careful in the language used to describe older systems; terms like "obsolete," "substandard," etc., can have far-reaching consequence. National research should be initiated to attempt to outline a process transportation agencies should use to upgrade older roadside features. The new AASHTO guide will not be comprehensive enough to satisfy this need. Recent and ongoing hardware research will be helpful in deciding where upgrading is needed. Examples include previous research at SwRI on bridge rail retrofit; the effectiveness of barriers with lowered rail heights due to soil buildup, overlays, etc., and retesting of barriers with lighter weight vehicles.
2. Problems of accidents occurring at hazardous locations (Item #2).	Accident statistics on specific highway locations and also on certain types of features and hardware are prerequisites in a program to improve roadway safety. Legal statistics concerning number and total dollar value of tort claims by highway feature and for hardware could also be quite useful in a safety program. Citizen complaints should initiate a review of available data to detemine if corrective measures are necessary.
3. Failure of highway agencies to follow their own design manuals (Item #3).	Failure to conform to manuals is the single most effective weapon possessed by a claimant's lawyer. On the other hand, conformance also proves to be a effective defense. Manuals should receive legal review as to language problems and unattainable goals. Deviations from standards should be documented at the time the decision is made. There should be continuing training of personnel regarding standards pertinent to their work and the necessity of documentation of deviations.
4. Lack of communication between the engineering and legal divisions of a highway agency (Item #4).	Recommend staff meetings between engineers and attorneys at the state level as well as joint committees at national level. Annual reports summarizing engineering problems would be helpful. Standardized packets of information for common types of legal cases would also be helpful. There is concern that engineers and/or attorneys who specialize in certain types of cases can experience "burnout". Recommend research to develop a national tort claim data bank by establishing reporting methods and incorporating actual claim statistics into engineering decisions.
5. Pavement surface and edge discontinuities (Item #11).	Distribute recent and upcoming reports to states for their consideration. Research recommended to examine accident tort claim data, followed by the testing of drivers in various situations, to determine if the testing translates into similar actions by the average unsuspecting driver.
Group 4 Problem/Issue Prioritized	Suggested Solution or Recommended Research
1. Lack of communication between the engineering and legal divisions of a highway agency (Item #4).	Recommend: (1) permanent committee of engineers and attorneys at state and national level, (2) annual report of court actions by problem areas, (3) standardized information packets for similar cases, and (4) specialization by case type among engineers/attorneys. Recommend research to develop national data bank in regard to tort claims.
2. Obsolete or older barriers and restoration of damaged, substandard hardware (Items #1 and #7).	Upgrading program should be based on history and surveillance. Document why treatment is or is not to be dones. Short installations should be upgraded when

	damaged. Long installations should be upgraded when major portion damaged; otherwise, replace in-kind.
3. Problem of accidents occurring at hazardous locations (Item #2).	Recommend statewide accident surveillance system with procedures for identifying problem locations. Apparent problem areas require investigation and report. Reporting language should be factual and non-inflammatory. Citizen compalints should be handled promptly, courteously and objectively. Record of time, date and action should be made of citizen complaints.
4. Pavement surface and edge discontinuities (Item #11).	Disseminate previous and upcoming reports about corrective actions to the states.
5. Failure of highway agencies to follow their own design manuals (Item #3).	Manuals to be carefully drafted to reflect reality. Language in manuals should not mandate procedures. Continuing training programs necessary to keep staff current. Training must extend to worker level to both serve the public and prevent legal problems.

Perhaps to be expected, there was wide diversity among the groups as to priority problems/issues. Part of this is certainly due to the varied backgrounds of individuals composing the groups. Tables 5 and 6 present the priorities for each discussion group. In regard to the topic of Planning, Design and Construction (Table 5), Items 3 ("unusual" conditions) and 5 (problems in construction zones) each appeared in the top-five issues of all four groups, while Items 2 (accidents at hazardous locations), 4 (lack of communication between engineering and legal divisions,) and 11 (pavement surface and edge discontinuities) each received top-five ratings in three of the four groups.

TABLE 5. Group priorities for the topic of Planning, Design and Construction.

Item	Priorities Group 1	2	3	4
1. "Innocent bystander"		4		4
2. Lack of cost/benefit procedures	2			
3. "Unusual"conditions	3	2	3	
4. Wider range of impact conditions				3
5. Problems in construction zones	4	3		5
6. Trails much later in time than accident			2	
7. Treating utility poles		5		
8. Guardrail end treatment				1
9. Lack of compatibility between vehicle and highway designers				
10. Spot safety upgrading			4	
11. Design for perons "legally" using the roadway	5			
12. Standards for scenic highways, roads, etc.				
13. Improper signing				
14. Lack of communication of available engineering knowledge to design, construction and maintenance personnel	1			
15. Lack of feedback regarding tort claims		1		
16. Lack of Model Tort Liability Act			1	
17. Unqualified expert witnesses			5	
18. Timing of standards relative to research				2

TABLE 6. Group priorities for the topic of Operations and Maintenance.

Item	Priorities Group 1	2	3	4
1. Problems with older barriers		1	1	
2. Accidents at hazardous locations		4	2	3
3. Failure to follow design manuals	5	2	3	5
4. Lack of communication between engineering and legal divisions	2		4	1
5. Lack of communication between states and agencies				
6. Need for vegetation control				
7. Restoration of damaged, substandard hardware				
8. Routine maintenance of safety devices				
9. Roadside features not controlled by the highway agency				
10. Operational versus preventive maintenance				
11. Pavement surface and edge discontinuities	1		5	4
12. Combine #8 and #10	3			
13. Combine #1 and #7	4			2
14. Combine #4 and #5		3		

Having heard all the group summaries and rankings, participants were given one final opportunity to rank the problems/issues discussed at the workshop. A follow-up survey was mailed to each attendee, as well as other members of the Safety Appurtenances Committee. Listed were most of the original problems/issues in both the Planning, Design and Construction category (Table 3) and the Operations and Maintenance category (Table 4), as well as any additions receiving a top-five priority ranking from any of the separate groups. A few of the items from each category were deleted, while others were combined to follow the desire of the discussion groups. The complete listing of items by category is shown Tables A1 and A2 Appendix A.

Each recipient of the survey was asked to rank each problem/issue on a scale from 0 to 8, with the priority being represented by:

Low		Moderate		High
0 1	2	3 4 5	6	7 8

The questionnaire was mailed in late January, 1985, and most of the 33 responses were received in February, 1985.

Table 7 shows the results of the survey for the topic of Planning, Design, and Construction, and several points are rather apparent. First, an examination of the mean values for each problem/issue shows very little variation (range of 4.15 to 5.84), and all problems/issues have mean priority values of moderate. Second, the standard deviations show a large amount of spread. Third, the spread is confirmed by the range values, where all are either 6 or 7. In other words, there was considerable disagreement among the 33 respondents concerning the priority of each problem/issue.

The problem/issue with the largest mean value (i.e., the highest overall priority) concerned the need for more state-of-the-art training of design, construction and maintenance personnel. Interestingly, this issue was ranked highly at other Safety Appurtenances Committee summer meetings involving different attendees. Problems in construction zones was ranked second in priority; this issue had received high priority at the meeting (Table 5). Third place was a tie between the need for benefit/cost procedures and developing effective end treatments, although the latter had a smaller standard deviaiton. Next in order was how to undertake spot safety upgrading.

The results for the topic of Operations and Maintenance show more spread in the mean values and lower standard deviations (Table 8), although the ranges are still quite large. Examining the mean values shows that the top five problems/issues (2,1,4,3, and 6, respectively) fall between 5.8 and 6.5., with a sharp dropoff thereafter. Dealing with accidents at hazardous locations was the top-ranked problem, and decisions, followed closely by the failure to follow design manuals. The fifth ranked problem/issue focused on the schedule of maintenance of safety features. These results matched well with those from the actual meeting (Table 6).

Some of the disagreement between the results from the summer meeting and the follow-up survey for the Planning, Design, and Construction topic can probably be explained by two factors: (1) the survey was mailed about 5 months after the meeting, so that the issues were not as fresh, and (2) the survey included members of the TRB Safety Appurtenances Committee who did not attend the meeting.

TABLE 7. Follow-up survey results for the topic of Planning, Design and Construction.

	Problem/Issue	Mean	Standard Deviation	Range
1.	Innocent bystander	4.74	1.88	7
2.	Use of benefit/cost procedures	5.64	2.03	7
3.	Unusual conditions	4.64	2.22	7
4.	Range of impact conditions	4.52	2.12	7
5.	Construction zones	5.67	1.66	6
6.	Trial date	4.56	1.97	7
7.	Treating utility poles	5.19	2.15	7
8.	Guardrail end treatment	5.64	1.93	7
9.	Spot safety upgrading	5.58	1.77	7
10.	Design for persons "legally" using highway	4.15	1.92	7
11.	Personnel training	5.84	2.10	7
12.	Feedback on tort litigation	5.30	1.86	6
13.	Model Tort Liability Act	5.27	2.45	7
14.	Unqualified expert witnesses	5.47	2.20	7
15.	Timing of adoption of standards	5.03	1.96	6

TABLE 8. Follow-up survey results for the topic of Operations and Maintenance.

	Problem/Issue	Mean	Standard Deviaiton	Range
1.	Restoring and upgrading safety features	6.42	1.89	7
2.	Accidents at hazardous locations	6.49	1.42	6
3.	Failure to follow design manuals	5.94	1.50	6
4.	Problems of communication	6.09	1.51	5
5.	Need for vegetation control	3.52	1.91	6
6.	Maintenance of safety features	5.76	1.64	6
7.	Roadside features not controlled by highway agencies	4.30	1.85	7
8.	Pavement surface and edge discontinuities	5.03	1.67	7

V. WORKSHOP SUMMARY

William Hunter

The topic of tort liability as applied to roadside safety was enthusiastically discussed by the workshop participants. While the problems are numerous, there are steps that can be taken that will hopefully slow a mushrooming amount of litigation. Issues that seemed to surface repeatedly included the following:

1. There is an urgent need for continuing communication between all parties concerned, but particularly engineering and legal staff. Lawyers need to be notified quickly about cases that could lead to litigation, and engineers need feedback from lawyers about trends in litigation (Leading problems, verdicts, etc). State-of-the-art practices in appurtenance design and maintenance need to be transmitted to all appropriate levels on the engineering side.

2. National guidelines need to be formulated in regard to when and how appurtenances should be upgraded.

3. There needs to be a national data bank of tort litigation developing, utilizing standardized codes and forms.

4. Good documentation of complaints, solutions, design manual changes, etc., is imperative.

5. Unethical witnesses are causing litigation problems to proliferate. Perhaps engineering, scientific and legal societies should undertake the task of accrediting individuals who desire to serve as expert witnesses.

6. TRB needs to consider the creation of a committee or subcommittee, composed of individuals of varying backgrounds, to stay abreast of the problem of tort liability and the roadside.

APPENDIX A
FOLLOW-UP SURVEY PROBLEM SUMMARIES

Table A-1. Summary of Problems in Planning, Design and Construction.

1. "Innocent Bystander"

Many accidents involve the "innocent bystander". Examples are a median crossover accident, an accident in which a vehicle penetrates an overpass and strikes traffic below, an accident in which a vehicle encroaches into a rapid transit busway or railway, etc. Should more emphasis be palced on prevention of these types of accidents as compared to single vehicle, run-off-the-road accidents?

2. Use of Benefit/Cost Procedures

Increasing demands are being made of transportation agencies in the area of highway and roadside safety. Limited funds preclude immediate and full adoption of all recommended safety standards. Some agencies are now using cost effectiveness or benefit/cost analysis procedures to evaluate alternate safety programs and to establish priorities and action plans. These procedures typically require that estimates be made of the monetray value of life, a very sensitive issue. Is this the most rational approach to establish priorities and policies? Do the courts view these as rational, acceptable procedures?

3. Unusual Conditions

Many accidents which lead to court cases involve "unusual" conditons: for example, cases involving motorcycles, high-ride, four-wheel drive pickups, recreational vehicles, cars or campers pulling trailers, trucks, and buses. Safety appurtenances are not designed or tested with these "special" vehicles, yet the plaintiff often contends that there should have been a safety device in place that could handle them. This problem raises the following questions:

a. Should safety devices be desinged to handle all types of vehicles legally allowed on state highways? On local roads?

b. If not all types can reasonable be accommodated, which types can be?

c. To what extent should the federal government encourage or regulate the use of "universal safety appurtenances?

d. Is there any way in which a state or local agency could "give notice" to vehicle operators that safety features on some or all roads have not be designed or tested with certain classes of vehicles, and the governmental agency is not responsible for any accidents involving safety features and these special classes of vehicles? In other words, could this be accomplished by the highway agency with signing, or by legislation (e.g., issuing warnings when vehciles were registered), or by requiring special high limit insurance for selected classes of vehicles?

e. If more versatile safety appurtenances are desirable, inadequate funding for research and construction is the main roadblock to their development and implementation. What efforts should be made to increase funding? For example, should "special" vehicles pay extra fees to finance "universal" safety appurtenances? Or should all vehicle operators allowed on public roads have "equal" safety at equal cost to them?

4. Range of Impact Conditions

Accidents occur where vehicles impact a barrier at 45^{o}-90^{o} angle, while skidding sideways, while yawing rapidly or heading backwards, while braking so the car noses down under the barrier, etc. We do not design or test barriers for these conditions, yet sometimes plaintiffs contend that the barriers should function under these conditions.

a. Should barriers handle a wider range of impact conditions?

b. What are reasonable limits, if any, for barrier impact conditions? Should these limits be established and officially adopted by AASHTO? FHWA?

c. Should an FCP project be initiated to conduct tests at some extreme conditions on standard barriers; for example, 90° impacts?

These test would clearly show that the barriers do have limits and might not be helpful under these impact conditions. Movies of these tests could be used for accidents where no barrier was present.

5. Construction Zones

Construction zones continue to cause problems.

a. What safety standards now exist?

b. What research or new standards are needed?

c. How can standards best be enforced?

d. Should construction zones have the same level of safety as up-to-date roadways?

6. Trial Date

Problems arise when legal cases go to trial several years after the accident and there is minimal information on the accident and on the highway condition at the time of the accident.

a. What highway condition information is most helpful to attorneys such as photologs, as-built plans with all changes, etc.?

b. Are multidisciplinary accident investigation team examinations helpful? Should their procedures be modified? Should they expand on the number of cases investigated?

c. What type of traffic accident records are needed? How best provided?

7. Treating Utility Poles

Utility poles continue to be involved in a large number of serious single-vehicle accidents. Potential safety treatments for utility poles include crash cushions, guardrail, relocating the poles, underground lines, and breakaway devices. Guidelines are needed to identify when and how the poles can be treated cost effectively.

8. Guardrail End Treatment

Guardrail ends pose a serious hazard to motorists. Safety Treatments now in use include a twisted and turned-down design, the breakaway cable terminal (BCT), burying the end in a backslope, earth berms, and crash cushions. Litigation has arisen in some states as a result of the use of the turned-down design. While the turned-down end and the BCT designs do not meet all performance requirements, they have significantly reduced the hazard of the stand-up, untreated end. What is the preferable design? Is more research needed to develop modified designs or new designs?

9. Spot Safety Upgrading

Because of increased development, older rural roadways frequently carry increased volumes at increased speeds. Planning agencies may propose and/or program improvements for realigning and/or upgrading these roadways to provide better levels of service.

a. To what extent should spot safety upgrading be done in the interim? (Guardrail, tree, or utility pole removal, etc.?)

b. What are the legal implications if local citizen opposition delays the implementation through harassment, stalling tactics or legal means, and accidents occur on the older roadway that does not include the leatest safety features?

10. Design for Persons "Legally" Using Highway

Is it possible to develop a design driver for whom the roadway environment is designed, or is it necessary to design for all persons "Legally" using the roadways?

11. Personnel Training

There exists a lack of communication of state-of-the-art engineering knowledge and research results to desing, construction and maintenance personnel at all levels. An innovative approach is needed that supplies these personnel with the latest technology in regard to highway safety appurtenances and other roadway features so that the technology can be applied sooner.

12. Feedback on Tort Litigation

Some highway department (e.g., California) maintain up-to-date surveys of their highway facilities, make periodic traffic counts, and maintain extensive accident records. All of these factors are necessary to set priorities for traffic safety improvements. However, highway departments are getting feedback on the number and disposition of tort claims involving their highway system. This is an important factor to be considered, because it is a strong indicator of public response to the safety problem.

13. Model Tort Liability Act

Following the guide of the Model Traffic Ordinance, a Model Tort Liability Act needs to be prepared and recommended to the states for thier consideration. The increasing exposure of state and local governmental units combined with the wide variety of approaches to liability for units of government make it desirable to have a nationally accepted Tort Liability Model. This model would be similar to the Traffic Laws and Ordinances Document. It would be intended to guide legislators on reasonable limits and exposure while

reasonably protecting the interest of the public.

14. Unqualified Expert Witnesses

There appears to be an increase in the use of unqualified or unethical expert witnesses, often lacking knowledge or objectivity. How can this problem be minimized? Should the enigneering societies address this problem?

15. Timing of Adoption of Standards

Development of standards relative to new technology developed through research can be mistimed. Examples include passenger vehicle downsizing barriers for trucks and buses, and miltiservice level criteria for traffic railings.

Table A-2. Summary of Problems in Operations and Maintenance

1. Restoring and Upgrading Safety Features

There are hundreds of miles of obsolete barriers and other roadside appurtenances still in existence. It is not feasible to bring all such hardware up to current standards, especially in light of the fact that standards frequently change. Questions that must be addressed are as follows:

a. What type of upgrading program should highway agencies use?

b. How should it be documented?

c. How long is it reasonable to leave an obsolete barrier in place?

d. Some older barriers may have vehicle containment properties but, on balance, are not quite as good as newer barriers. How can this concept be promulgated, that the older barrier is not extremely hazardous and obsolete just because it is no longer a standard, and that a newer barrier only has a few additional assets?

e. Should obsolete hardware that is damaged by vehicular impacts or is in a deteriorated condition be replaced in-kind? When would it be appropriate to restore obsolete hardware to something less than full standards but better than the existing design?

2. Accidents at Hazardous Locations

Problems arise when accidents occur at locations that have a history or reputation as being hazardous.

a. When citizens make complaints about a "hazardous" roadway, what is the best way to handle these complaints, in light of possible future legal cases due to accidents at those locations?

b. Should highway agencies do periodic inventories of highway locations that need safety improvements? How should these be documented? What language should be used?

c. What is a reasonable time period in which to upgrade these locations?

d. To what extent is lack of funding an excuse for delaying improvements? How should this be documented?

3. Failure to Follow Design Manuals

Problems arise when highway agencies do not follow their own manuals; for example, by not installing a median barrier as soon as it is warranted to the manual.

a. How should manuals and other policy guidelines be written to minimize problems?

b. If a highway agency has insufficient funds, for example, to do maintenance work mandated in a maintenance manual, how should this be documented, both at the state agency level and at the local maintenance station level?

c. How often should manuals be reviewed and updated?

d. How often should design, construction, operations, and maintenance people be given refresher training on agency standard specifications, plans, manuals, procedures, test methods, etc.? How critical is training in the prevention of legal problems? What type of training is most useful?

4. Problems of Communication

Problems arise because of lack of communication between the engineering and legal divisions of highway agency.

a. What forms of communication would be useful other than that occurring on individual legal cases?

b. Would a permanent joint committee of engineers and attorneys have any value?

c. Would it be helpful if the legal division prepared an annual report summarizing the types of engineering problems they had encountered in legal cases the previous year?

d. Many cases are similar and require a collection of the same set of reports, standards, movies, etc., by the enigneer for the attorney. Is there value in preparing a standardized basic packet of information for common types of legal cases to reduce engineering time and insure completeness of coverage? Should agencies prepare, for example, a "history of median barrier" which includes all previous standard plans and specifications, and describes changes in design, warrants, etc., through the years? Is there a reason why attorneys would prefer not to have these histories or information packets in existence?

e. What are the pros and cons of having engineers and/or attorneys who specialize in certain types of cases?

Sometimes attorneys and engineers do not realize pertinent information is available, either within their own agency or from other states. For example, many agencies are unaware of edge-of-pavement dropoff tests the California Department of Transportation did 10 years ago, or the ones done recently at the Texas Transportation Institue.

a. Would there be value in having a specialized information service related to highway safety design and tort liability cases?

b. Would a new TRB committee or a permanent subcommittee of TRB A2A04 be helpful in keeping highway agencies informed of current research and other information sources?

c. Could one or more transportation libraries compile automated bibliographies on selected highway safety subjects that were directed toward enigneer and attorney users?

d. Would it be useful to have a periodical in which highway safety cases were reported briefly in simple language? Does such a periodical exist now?

e. What training classes should agency attorneys provide agency engineers and vice versa?

5. Need for Vegetation Control

How can problems of reduced sight distance, large trees in the clear zone, and grass and/or ground cover around breakaway sign and luminaire supports be minimized?

6. Maintenance of Safety Features

Agencies are reluctant to adopt rigid inspection procedures and schedules could be cause for liability. Further, limited manpower and resources often preclude the feasibility of regularly scheduled inspections. How can routine maintenance be achieved in a timely manner? When is operational maintenance justified over preventative maintenance, if at all?

7. Roadside Features Not Controlled by Highway Agency

Where roadside features contrary to good safety practice are required or mandated by "others", how do we protect ourselves or assign the responsibility? Such things as utility poles, trees, monuments, etc., should be considered. What about "safety" easements to control hazards near the travel way but not in the right-of-way?

8. Pavement Surface and Edge Discontinuities

Pavement surface and pavement edge discontinuties (potholes, edge dropoffs, dips, bumps, etc.) continue to be alleged causes of many accidents. Recent studies have provided insight on this problem, but questions still remain. The basic question is when and how should corrective measures be taken?

APPENDIX B - LIST OF ATTENDEES

ADAMS, Donald R., Oregon Department of Transportation
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BISHOP, Ralph W., California Department of Transportation
BRYDEN, James E., New York State Department of Transportation
CAMPBELL, Fred, California Department of Transportation
CARNEY, John F., III, Vanderbilt University
COLEMAN, Roland, Deputy Attorney, Los Angeles, California
CORY, George L., California Department of Transportation
DEFEA, Robert J., California Department of Transportation
DENMAN, Owen S., Energy Absorption Systems
DEWELL, D. Kent, City of San Jose, California
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HENRY, David H., California Department of Transportation
HICKEY, William, Louisiana Department of Transportation and Development
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