

fore, trade-offs are necessary between wet-weather countermeasures and other reasonable demands for improving mobility, safety, and convenience. Thus the cost-effectiveness of measures that reduce the hazards that wet pavements present is extremely important.

In proper cost-effectiveness analysis, maintenance expenditures and the lifetime of the design or measure under consideration are taken into account. Unfortunately, this cannot always be done because government agencies must operate within a given budget and are compelled to go with the lowest bidder. Therefore, the engineering specifications for pavements must anticipate low surface courses and the length of time they will retain their skid-resistant properties over the expected life of the pavements or of the surface courses themselves. It is difficult to justify resurfacing or retexturing if the pavement is still in perfectly acceptable condition while dry. Citizens, who face an ever-increasing tax burden, will show little appreciation for such resurfacing, except of course when the situation has become so bad that skidding accidents occur with deadly regularity every time it rains.

On the other hand, quite different constraints govern the design decisions of manufacturers of vehicles and components. Fortunately, the industry is now promoting safety features, at least for those improvements such as tread designs or steering geometries that do not increase vehicle or vehicle maintenance cost significantly. An improvement such as antilock brakes, however, that requires a large cost increment may have to be introduced by governmental mandate not so much because of inherent industry resistance as because of the buyer's unwillingness to foot the bill.

Some of these difficulties are caused by the inability or the unwillingness of engineers and researchers to go before the public to promote the improvements that they know can be made. The public might then insist on

having those improvements made and thus encourage the allocation of the necessary funds for upgrading pavements and roadways and to add safety features to vehicles even though prices would be increased.

That we do not have all the answers yet, and certainly not the best answers, is evident from the suggestions for further research and development made by the three subcommittees. Despite the energy shortage, highway traffic is not going to decrease in the foreseeable future. Therefore, the wet-weather problems are not going to become any less pressing than they are now. Thus, our work must go on. The conference showed in a convincing manner both where we are and what we still must do. Great strides have been made since the First International Skid Prevention Conference. By the time the third conference is held, let us strive to see that all the remedies for wet-weather accidents that were presented at this conference are in full use all over the world and that we have the answers to the remaining questions and problems.

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Closing Remarks

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During the Second International Conference on Skid Prevention, we received many high-quality contributions that merit both study and reflection. Three important directions of research figured prominently in both contributions and discussions. The first deals with certain legal aspects about accidents on wet pavements, the second concerns international standardization, and the third touches on the strategy adopted by authorities responsible for reducing the number and the seriousness of those accidents.

With regard to the first point regarding skidding accidents on wet surfaces, highway engineers in some countries appear to be more and more preoccupied by the evolution of liability incurred either by contractors, civil servants privately, or highway administrations. In its report in 1975, the Committee on Slipperiness and Evenness of the Permanent International Association of Road Congresses dedicated a special chapter to this difficult and delicate subject. Without wanting to be involved in judicial problems that are outside its scope and that can vary moreover with differences in the general legislation of each country, the committee restricted its

activity to outlining certain technical aspects liable to enlighten the judgments of courts.

Its point of view could be sketched like this: A skidding accident on a wet road is a complex phenomenon involving the strong interaction of many factors, the main ones being

1. Driver behavior,
2. The vehicle and its components (notably tires and suspension systems),
3. The road and its environment (and not only the pavement condition), and
4. Bad weather.

In most skidding accidents all of these factors are more or less involved, and to recognize the main factor is not easy. In other words, skid resistance is not an intrinsic property of the pavement. One cannot easily say categorically that a pavement is "abnormally slippery" and that the surface course cannot be maintained economically in a condition such that skidding is not possible. The estimation of liabilities is therefore a delicate

task that, in some way, involves a system analysis. All countries should seek to maintain a dialogue with the aim of comparing the legal roles and implications as well as the jurisprudence they adopt on this important question.

With regard to the second point, the Committee on Slipperiness and Evenness also made recommendations in 1975 concerning the specifications for standard tires fitted to full-scale skid-measuring devices. This beginning toward standard implementation was aimed at facilitating the comparison of results obtained with different machines and also to overcoming the problem of manufacturing test tires in small quantities. During the coming years increasing international standardization, for example, of measuring devices and their corresponding test methods, will undoubtedly be desirable.

With regard to the third point, a comparison of the strategies and the methods used in different countries to reduce skidding accidents on wet pavements will be of great interest. Included in these strategies are

1. Preventive action through systematic control testing using measuring devices that give a high measurement density,
2. Analysis of accident records to detect skidding black spots, and
3. Various measures such as signing, resurfacing or specific surface treatment, and alignment improve-

ment on dangerous sections of the roadway.

In developing strategies, one must not forget that the road is not the only factor involved. It was of great merit to the Second International Skid Prevention Conference that the other partners, who have an important part to play in road safety, were brought in, especially the representatives of the automobile and tire manufacturers.

Finally, the Conference Program Committee had the wisdom to bring human factors to the forefront, particularly those that control driver behavior. In fact, it will serve little purpose to improve highway networks, tires, and vehicles to advance friction potential (friction supply) if at the same time friction demand continues to grow indefinitely. Since friction demand depends essentially on driver behavior, its importance in the international strategies to be adopted will require more research on driver behavior and new efforts by public authorities to improve the education and the information given to vehicle drivers.

The interesting contributions, the competence of the participants, and the pertinent exchange of views at the Second International Skid Prevention Conference all will open the way for new progress in the subject of road safety and for the pursuit and the strengthening of international cooperation in this field.