Topic III "Winter Road Issues and Traffic Safety in Urban Areas"

Conclusions
by
G. VAN HEYSTRAETEN (Belgium) – Chairman of Topic III

Ladies and gentlemen,

The Paper Review Panel for topic III composed of myself as chairman and Mr Riedl from Austria and Mr Prevot from Belgium selected twelve papers for oral presentation in the afternoon of 29th January and seven papers for the poster session on 30th January.

These nineteen papers originated from seven countries: Japan (10), Finland (3), Sweden (2), Denmark (1), Iceland (1), Germany (1) and China (1).

They could be grouped under three main headings:

A. Management and Countermeasures:	8 papers
B. Friction and Traffic Safety:	6 papers
C. Safety for Pedestrians and Cyclists:	5 papers

Chiefly the following information and conclusions can be drawn from the eight papers presented under heading III/A.

From the five Japanese contributions we remember that:

- the snow-flowing (melting) gutters introduced in Hokkaido 25 years ago are now in operation in over 30 areas. They enable advanced city planning without considering snow, and the advantages from the environmental standpoint are worth noting;
- snow removal on residential streets in the city of Sapporo is conducted through a snow removal partnership jointly supported by the city and the residents;
- the measures taken by the Metropolitan Expressway against snow damage in the Tokyo area constantly develop, with weather information and forecasts as essential considerations;
- aerial photograph and winter road condition surveys hold out many possibilities for investigating winter traffic situations, as demonstrated by a case study in the Sapporo urban area;
- road users in Hokkaido attach great importance to comfortable stopovers. "Resting", "rest room" and "weather information" are the primary functions of these facilities in wintry periods.

The German contribution considers that traditional winter maintenance in cities needs to be reviewed as a result of changing requirements and expectations. The usual division into the three pillars of the service, that is, the salt spreading network, gritting and snow removal, no longer meets the higher demands of road users and the requirements for environmental protection; nor can road safety be adequately maintained by this traditional approach. Winter maintenance in big cities is expected to provide a level far above the statutory requirements.

However, this is extremely constrained by the financial and human resources available.

On the other hand, the implementation of the latest research findings offers a good chance of providing more effective, environment-friendly and economical winter maintenance. New findings have been made as regards the effect of skidproofing, the differentiated application of salt spreading and not gritting at all to a large extent, the effects of removing snow increasingly with mechanical means, as well as the introduction of a specific road condition and weather information system that includes its own skid warning system. By implementing these findings, it has been possible to redefine the objectives for differentiated winter maintenance in cities :

The Finnish contribution "Cool Town – Winter in the City" presents a futuristic view on a new style of living in winter periods.

The Chinese contribution compares the nature of traffic in summer and winter in the city of Harbin in northern China, featuring the increased use of public transport in winter. The authors advocate an increased offer of public transport in winter, which would help to reduce both congestion and energy consumption.

The following information was provided under heading III/B "Friction and Traffic Safety".

A study by VTT in Finland revealed that the effects of winter maintenance on traffic safety are not unambiguous. Several observations indicate that winter road maintenance enhancement is worthwhile in Finland:

- the risks of winter road conditions are manifold as compared to summer road conditions;
- road conditions at accident locations were exceptionally slippery in 21 % of fatal collision accidents and 39 % of fatal run-off-road accidents (where the winter road conditions were one cause of the accident).

On the other hand, several factors indicate that the enhancement of winter maintenance should be designed carefully before it is applied in Finland:

- personal injury and fatality risks in wintertime are currently at the same level as in summertime;
- enhancing traffic enforcement (especially monitoring defective tyres and overspeed) can have more effect on safety than enhancing winter maintenance;
- drivers decrease their speeds in slippery-looking conditions by 4 to 7 km/h, which is as big an effect as a speed limit decrease of 20 km/h under normal conditions;
- daily personal injury accident rates in summer and in winter are identical.

A study was performed in the city of Sapporo to examine how different winter road surface management levels affect skid number, driving behaviour, and the relationship between skid number and driving behaviour.

In Denmark, an attempt has been made to quantify the effect of hydrohalite (sodium chloride dihydrate) formation on tyre-pavement friction. Hydrohalite can be formed as small slippery islands on the road under certain winter conditions (low temperature, high salt concentration).

A study made in Iceland to estimate the safety benefits of studded tyres came to the conclusion that ways should be sought to limit the use of studded tyres in the urban Reykjavik area.
Though providing more grip under icy and snowy conditions, studded tyres may be worse than non-studded tyres under good conditions. The study also showed that behaviour is a much greater factor than equipment. To maintain accessibility during winter, the rest of the country, which is mainly rural, should not impose restrictions.

A Swedish report defines a basic matrix with nine different weather situations classified according to temperature, air humidity, and melted precipitation. This matrix was used to present the number of days of each weather situation, the traffic volume, average speed for cars and lorries with trailers respectively, and salt consumption on the E20 European Highway outside Mariestad in midwestern Sweden. This matrix was also used to present accident statistics from seven counties in central Sweden.

A Japanese study proposes methods of investigating and analysing data on the following:

1. accidents resulting in injury or death (based on on-site accident reports);
2. accidents involving property damage, and near-miss incidents (based on TAAMS images);
3. traffic disturbances (based on videotaped images).

It examines the validity of these analysis methods. Moreover, the influence of frozen road surfaces on traffic accidents in winter is examined by TAAMS images in this study.

The TAAMS investigation system comprises a video camera, a sound detector and discriminator, and a VTR image memory. It automatically records images taken by a camera installed on the street. At normal times, images are temporarily stored digitally in memory before being overwritten. When a sound input through a microphone is determined to be the special sound of either an accident or a near miss, the system stores the image data for the preceding and following five seconds, converts it to analogue signals and records it on the VTR.

Five papers were presented under the third and final heading (III/C), that is, safety for pedestrians and cyclists.

The first paper, from Sweden, advocates a reduction in passenger car traffic in urban areas by increasing bicycle use, also in wintertime. Since distance seems to be more important for modal choice during winter than in summer, the critical distance at which one can hope to transfer some of the car trips to the bicycle is shortened from 5 km in summer to about 3 km in winter. Improved winter maintenance of cycle tracks could lead to more winter cyclists.

Winter maintenance methods used on cycle tracks today are often adapted to the prevailing conditions on motor traffic roads. Consequently, they are not necessarily the best methods for bicycle traffic. The results presented from a field study show that a test method using front-mounted brooms for snow clearance and brine for de-icing provided a higher maintenance service level than methods normally used on cycle tracks, particularly in regions with major ice formation problems.

The same concern is expressed in the Finnish paper. A survey conducted in various city areas has revealed major differences in winter maintenance levels. The reasons for the variation in standards are deviating quality targets and practices.

To raise the level of maintenance, quality targets should be standardized in each of the city areas, more data should be gathered on pedestrian and cyclist traffic, areal contracting should be arranged, precise maintenance should be developed, and the standard of pedestrian and bicycle route maintenance should be consciously raised on the accident-prone routes of the city centres, either by transferring the responsibility for maintenance from the property owners to the municipality or by stepping up supervision. The same paper also gives a survey of falls suffered by pedestrians and cyclists in Finland and estimates that the average cost of one fall is about 6.000 €.

Pedestrian behaviour on crosswalks at junctions in winter was studied in the centre of Sapporo City, including an experimental walkway with a variable gradient. When pedestrians walk on an icy surface, their walking speed and way of walking are considerably changed by an increase in crossfall. When the combined slope is approximately 8 to 9 % and the crossfall exceeds the gradient, the likelihood of difficult walking conditions increases to a particularly great degree for pedestrians, especially the elderly. Improving winter walkway conditions for the elderly is one of major issues of road management policies in Japan, where the proportion of elderly people is increasing.

A survey conducted in areas with less snowfall in Hokkaido has shown that there is no distinctive difference between autumn and winter in people’s choice of means of transportation. Research will continue in other areas with more snowfall to see if the conclusion is different and, if so, to help develop a comprehensive winter transportation system.

Another Japanese paper presented the results of a study into overtaking behaviour on slippery two-lane roads as well as an overtaking model that was developed. Vehicle acceleration was calculated by using both the tyre-road friction coefficient and the driving performance curve. Vehicle length, driver reaction time and ascending gradient were incorporated in the model.

It was assumed that drivers make errors in perceiving the speed of oncoming vehicles and passing sight distance (psd); that is why a model for aborting overtaking manoeuvres was developed as well. This model defines the safe distance to abort. The ratio of this safe distance to psd was defined as the aborting safety ratio.

The following conclusions were drawn. The length of the overtaken vehicle, the speed of the overtaking vehicle and the tyre-road friction coefficient have a significant effect on psd, but the ascending gradient has no such effect. The speed of the overtaking vehicle and the tyre-road friction coefficient surface have a significant effect on the aborting safety ratio, but the ascending gradient and the length of the overtaken vehicle have no such effect.

Ladies and gentlemen, this concludes my report on the technical session on topic III held on 29th January.