Experiences from the United States and Abroad

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Opening Europe's First High Speed HOV Facility on Route A1 in Amsterdam

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Good morning ladies and gentlemen. It is a pleasure to be here to talk about Europe's first HOV lane on Highway A1 near Amsterdam. I would like to start by explaining the operation and the design of the HOV lane and then Aad de Winter will discuss the incident management system and the initial experience with the HOV lane. The HOV lane was opened in October 1993. More details are provided in the paper we have prepared for this conference.

For those of you who are not familiar with the geography of Europe, the Netherlands is located in the northwest part of the continent. This area has a very high population density. The Netherlands is about 200 kilometers from north to south and 150 kilometers from the east to the west. About 15.5 million people live in the Netherlands. There are about 5.5 million cars and 15 million bicycles.

The Netherlands has a highway system of about 2000 kilometers. The region between Amsterdam, Utrecht, Rotterdam, and The Hague is called the Randstad. About six million people live and work in this area. This means that the population density in the Randstad is twice as high as in the rest of the Netherlands. This high population density is reflected in the number of cars using the highways in the Randstad and in the number of traffic jams which occur every day.

The HOV lane is located east of Amsterdam on Highway A1 between Highway A9 south of Amsterdam and Highway A6 in the east. The HOV lane is located in the central reservation of Highway A1 and in the morning peak-period it can be used by carpoolers from the residential areas in the center of the Netherlands to Amsterdam. In the evening, the lane can be used in the opposite direction by all traffic.

I would like to briefly explain the operational objectives of the facility. More and more emphasis is being given to the reduction of the negative effects of road traffic like air pollution, fuel consumption, and noise pollution in the Netherlands. One of the measures taken to address this is to promote carpooling and public transport. This can be achieved by giving them a time-advantage over other traffic. In the area where the HOV lane was built, design of a reversible lane had already started. In order to accommodate the desired time-advantage, the reversible lane was changed into an HOV lane in the morning peak-period. In the evening peak-period, it was not necessary to make it an HOV lane.

The HOV lane was designed as a reversible flow lane because of the difference in traffic volumes in the two directions. The lane is eight kilometers long. At the east end of the HOV lane where Highway A1 joins with Highway A6, a special HOV flyover lane was designed. The HOV lane is open for HOV 3+ carpools, buses, and also motorbikes. The HOV 3+ designation was chosen due to the expected growth in the number of carpools if an HOV 2+ requirement was used. The HOV lane is open to carpoolers from 5:30 A.M. to 10:00 A.M. in the morning. In the evening, the lane is open to all traffic from 3:00 P.M. to 7:00 P.M.

I would briefly like to describe the design of the HOV lane. The HOV lane is located in the central reservation of Highway A1. Between the barriers, the available width is 5.85 meters. There is one 3 meter wide traffic lane with narrow shoulders of 1.3 meters on either side. Pullouts are designed for enforcement and for emergency parking at several locations along the HOV lane.

Ingress and egress is provided only at the ends of the HOV lane; there are no entrances and exits along the lane. The design of the entrances and exits required special attention to prevent drivers from entering the HOV lane when this is not allowed. Gates made with a breakaway provision are used to visually block the entrance.

Also, the entrances are protected with a moveable steel barrier on wheels. This steel barrier physically seals the entrance completely. When not in use, it is integrated in the concrete barrier.

One of the most expensive parts of the project was the

flyover ramp. This flyover was built to allow carpoolers driving on Highway A6 to enter the HOV lane on Highway A1 towards Amsterdam. The flyover has one lane and is open only in the morning peak-period.

It was too expensive to build a second flyover for the return trip, so carpoolers with a destination along Highway A6 have to use the normal lanes of Highway A1 and use the normal interchange to Highway A6. In the evening, the reversible lane can only be used by cars with a destination along Highway A1 through use of the ad-grade HOV slip ramps at the entrance and exit points. In order to reach the entrances, drivers have to make a clear filtering move from the left hand lane.

The exits of the HOV lane are designed as additional lanes to the highway. This lane becomes the fourth lane of the highway. After about one kilometer, the number of lanes again is reduced to three.

In the morning peak-period, carpoolers are able to use a three kilometer long extended ingress lane. This so-called approach lane was built to prevent carpoolers from joining a traffic jam before they could reach the entrance to the HOV lane on the east side of Highway A1. The approach lane is only separated from the main carriageway by rubber marker posts.

As a support medium for the HOV lane, park-and-ride facilities were built at interchanges on Highways A1 and A6 prior to the start of the HOV lane. A total of eight carpool-parking areas were built. On the highway and the feeder roads, drivers are guided to these areas by traffic signs. The carpool parking areas have parking spaces for about twenty-five cars. In addition, the lots contain bus stops, bicycle parking facilities, and a public telephone.

Additional information is being distributed within the region to promote carpooling. Brochures are used to inform drivers not only about the benefits of carpooling but also about ways to organize a carpool.

Finally, I would like to talk about the signing and pavement markings used in the Netherlands as compared to the situation in the United States and Canada. We do not use road markings like the diamond sign used in the United States and Canada on HOV lanes. To inform drivers about what HOV stands for, information sign postings were positioned prior to the approach lanes. In the Highway Code in the Netherlands, there is no carpool sign available.

To insure the legal validity of the HOV lane, we were forced to use a somewhat complex solution for the time being. The lane had to be closed for all traffic with the exception of carpool 3+ and buses. When the HOV lane is open for traffic, the signpost shows "Carpool 3+" and the destination Amsterdam. When the lane is not open, the signpost for the HOV lane is changed into neutral gray, and drivers are not given any information about the HOV lane outside the operating hours.

Aad de Winter, Netherlands Ministry of Transport, Public Works and Water Management

I would like to talk about incident management, time and cost benefits, and the initial use of the HOV lane. As with other road infrastructure, it is unavoidable that traffic incidents, such as breakdowns and accidents, will occur on the HOV lane. Reports of incident occurrence may be received by automatic or visual detection. An adequate procedure is needed to help with this effort.

A stationary vehicle on the lane will be detected by the S.O.S., which stands for Speed Observation System. The S.O.S. is linked to a closed circuit video camera network. The camera closest to the incident is activated automatically upon detection. Visual detection can be done by police, road-service patrols, road users, and by video in the Traffic Control Centre. The video system for visual monitoring consists of twenty-three cameras and is linked to the S.O.S. All these systems are remotely controlled and monitored from the Control Center. Every report which is received is passed on to the Control Centre as the central point of dispatch.

In the case of a breakdown or accident on the HOV lane, the occupants should remain in their vehicles; walking across the HOV lane or main carriageway is not allowed, out of concern for road safety. A sign on the barrier tells drivers to stay in their car in a breakdown, because the vehicle will be detected automatically. In case of breakdown or accident, the entrance to the HOV lane is immediately sealed off. This is to prevent the lane from filling and risking the chance of other accidents occurring. This measure also enables emergency services to work more safely on the lane.

Two emergency vehicles (tow trucks) are constantly on call while the HOV lane is open. One emergency vehicle is intended for towing vehicles away from the lane when minor accidents occur. The other emergency vehicle is equipped with a crane with a long reach and can be

deployed to lift vehicles over the barrier and out of the lane when more serious accidents occur. In this case, the traffic lane furthest to the left of one of the main carriageways is cleared of traffic.

Construction started on the HOV lane in September 1991. The HOV lane was opened to traffic on October 27, 1993. The total cost of the project was approximately $30 million, of which $6 million was directly attributable to the HOV lane. The other $24 million would have been spent regardless of construction of the reversible lane. The extra $6 million included the modification of the reversible lane into an HOV lane, the construction of the flyover, and the approach facilities for carpoolers.

In general, it can be contended that the HOV lane has lived up to the expectations formulated prior to construction. In November, the first whole month after the opening, about 1,000 vehicles per morning period used the HOV lane. In the following months, the volume increased, to an average of 1,200 vehicles in April. Eighty-three percent of the vehicles using the HOV lane during the morning period are passenger cars; thirteen percent are motor bikes, and five percent are buses.

The total number of people making use of the HOV lane during the peak morning rush hour (except for motorcyclists) is at approximately 1,700. The performance of a normal traffic lane in Holland is approximately 2,400 people per hour. If the observed growth increases, within two years, the HOV lane performance will be considerably higher than that of a normal traffic lane.

The journey time for drivers on the main carriageway during the morning period is about thirty to fifty minutes. This is ten to thirty minutes more than for carpoolers in the HOV lane. In November 1992, eleven months prior to the opening of the HOV lane, the A1 was number one on the National Jam-chart. In November 1993, the A1 dropped to fourth place. The total length of the traffic jam rose in December on the A1. The total duration, however, was reduced by twenty percent, and in the Jam-chart it dropped one place.

In the first four months after opening, six accidents occurred. In all cases, the damage was limited to superficial damage. In three of the cases, a barrier was hit. The other collisions were bumper-to-bumper collisions caused by slippery road surfaces or the lack of clarity about the route.

The majority of drivers on the main carriageway have indicated that the HOV lane has no negative influence on road safety. During the first four months of operation, the lane was closely monitored by the police. The number of violations in this period remained relatively low, much less than one percent. Later, the level of police monitoring was slowly scaled down, which led to a slight rise in the number of violations to about one percent on the days the monitoring took place.

A few months prior to the opening of the HOV lane, there was a certain amount of attention from the media. This attention was primarily of a slightly negative nature. In the months after the opening, there were further negative reports in the media. They focused on the following points:

- Traffic jams would occur due to a short weaving section near the exit in the west.

- Traffic jams would be longer than before.

- The lane would not be used—the so-called empty lane syndrome.

The most important lesson to be gained from this is that communication on this type of project can be a crucial factor. It appears to be almost impossible to refute negative publicity, even if it is based on patent untruths. The government has little or no opportunity to present its standpoint when negative publicity has already started. I have gathered some headlines of Dutch newspapers. I think maybe a few of them will be difficult for you to read, but you must believe me when I say that they are not all that positive.

After opening, an apparently empty HOV lane led to a discussion in the media and even in the Parliament about opting for a two-plus occupancy rate. This call was so strong that the Minister found it necessary to initiate an extra study into a possible change to two-plus occupancy.

The first results of this study show that the HOV lane has lived up to expectations. The design and layout are sufficiently obvious and recognizable to the road users and there has been no negative influence on road safety. I have noted the transit performance, which already approaches that of a normal traffic lane. In addition, there is a clear increase in the utilization of the lane in the busiest morning rush hours.

The HOV lane has led to a lessening of traffic jam problems in the morning rush hours, as well as the evening rush hours. Despite the empty lane syndrome, decreasing the occupancy to two plus can only offer solace over the very short term.

It was a pleasure and honour for us to present the first results of the Highway A1 HOV lane to you. Thank you for your attention.