SPEED LIMITS IN THE NETHERLANDS

A detailed consideration of the situation inside and outside built-up areas

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SUMMARY

During the first international energy crisis of 1973/1974 speed limits additional to those already existing were introduced for passenger cars in the Netherlands restricting speeds to 100 km/h on motorways and other (major) national highways and 80 km/h on secondary roads outside built-up areas. The situation which has existed since then is described in this paper.
The length of the motorway network and the number of traffic accidents on these roads in the Netherlands is too low to enable a link to be established between the speed (distribution) and the risk of accidents and in this way to determine the effect of the speed limit legislation on traffic safety. The data on driving speeds show a growing number of cars which travel faster on motorways than the 100 km/h limit. It is impossible for the police to enforce the speed limit because of the mass nature of the infringements. Nevertheless, the Minister recently decided not to raise the limit to 120 km/h.

Another subject in this paper is the speed restrictions in built-up areas. In the Netherlands the speed limit in built-up areas is established at 50 km/h with two exceptions: in a "woonerf" (residential precinct), which is governed by a separate regulation, and 70 km/h on major roads in towns.
A point first brought up in pressure groups and at present one of the subjects of study for traffic safety bodies is the option of different speed limits inside built-up areas: 50 km/h on arterial roads and 20-30 km/h on all other streets and roads.
It is a known fact, this cannot be achieved merely by putting up traffic signs; physical, speed-inhibiting countermeasures are also required. Some ideas on this subject are included for discussion.

1. INTRODUCTION

It is noteworthy that the discussions in the Netherlands about traffic safety frequently relate to motorways or residential streets. Noteworthy, because only a small proportion of all traffic fatalities and injuries occur on these two types of roads. In addition it seems possible to defend the view that the benefits in safety in relation to the costs to be incurred in order to achieve these benefits on both of these types of roads will be distinctly less favourable than all other types of roads.
The speeds - or rather the speed restrictions - on both types of roads are in the centre of interest. At present, little or no attention is focused on changing the speed limits on other roads either inside or outside built-up areas.

Discussions on both types of roads have a number of features in common.
First of all, it appears that there are great differences in viewpoint both with regard to the nature of the problem and the possible solutions. For that matter, these differences are not only confined to discussions among non-experts.
A second common feature which can be mentioned is probably connected with the first one. Little generalisable knowledge is available about the effectiveness of speed-restricting measures. In addition, it has been found that the methodology of many studies and the interpretation of research results is open to criticism. In the OECD report "Speed limits outside built-up areas" (OECD, 1972) a large number of practical studies on the effect of speed limits on traffic safety are presented without any definite conclusions being drawn. In addition, in the report mentioned a relatively great deal of attention is devoted to the correct performance of these studies.

It appears that the basic principles for the approach to influencing speeds on motorways and in residential streets differ fundamentally from each other. As regards residential streets it is

assumed that influencing behaviour solely by adjusting traffic rules (e.g. maximum speed 30 km/h) will not be sufficient. The starting point here is the use of physical, speed-restricting measures which can if necessary be supported by legislation (OECD, 1979a).
On motorways, on the other hand, it is regarded as sufficient to announce statutory regulations: maximum speeds and/or recommended speeds. It is known from the literature that the acceptance of traffic rules is facilitated if the rules are expedient, intelligible, recognisable and attractive (SWOV, 1976). Large groups regard a speed restriction as unattractive and social acceptance does not appear to be very great in the Netherlands at present. The situation at the time of the energy crisis of 1973/1974 was characterised by a greater degree of social acceptance than is now the case.

This paper will outline the problems in the field of actual speeds, how speed is influenced, speed restrictions, and so on in the Netherlands. In addition to factual information (unfortunately relatively little) about the effects of the policy pursued with regard to driving behaviour this paper also contains a description of the policy pursued in the Netherlands (arguments and actions) and the present policy intentions in this field. A summary of a number of other subjects for further investigation is also presented. In conclusion, this contribution contains a number of viewpoints for discussion.

2. OUTSIDE BUILT-UP AREAS

2.1. Speed restrictions and traffic safety

Many reports have already examined in detail the relation between speed and safety. As is well-known, the important factors in the relation between speed and safety are:
- the driving speeds
- the variation of speed distribution.

The reasoning then followed with regard to the variation is:
- a reduction in the variation of the speed distribution promotes homogeneity in the traffic movement patterns;
- the greatest possible homogeneity in the traffic movement patterns leads to a reduction in a number of dangerous manoeuvres (for example overtaking) and to better predictability of these manoeuvres;
- fewer and more predictable dangerous manoeuvres, resulting in a positive effect on traffic safety.

With regard to driving speeds a relation is then made directly with collision speeds (higher driving speeds are said to lead to higher collision speeds; at higher collision speeds more energy has to be absorbed, the necessity of more energy absorption leads to greater decelerations and distortions and hence to more damage in primary and secondary collisions).
These ideas can be plotted in two graphs: one indicating the relation between the variation of speeds and the chance of accidents and one linking the seriousness of the outcome with the driving speed (Figures 1 and 2).

Cerelli (1977b) quotes a number of facts to support his assumption that the chance of an accident is a function of the type of motorway and the difference between the driving speed and the average speed on that motorway. The question is, however, under what other conditions the relationship between the chance of an accident and the variation of the speed distribution will be U-shaped. Does

that relationship also apply on non-motorways, under more or less saturated conditions, at a high percentage of heavy traffic, under varying weather conditions, and so on? How can this function be quantified and to what extent are the results of such studies transferable to the situation in other countries?

It is also not completely clear whether the two other possible relationships (between the chance of an accident - driving speeds, seriousness - and the variation of the driving speeds) actually play such a subordinate part in this whole context. It may, for example, be expected that the higher the speeds travelled, the greater the chance (and the seriousness) of accidents will be as a result of the increasing differences in acceleration time and braking distance between goods vehicles and passenger cars. Research planned and carried out on an international scale can increase our understanding of this question.

2.2. Development of driving speeds since 1974

Since February 1974 the following maximum speeds in km/h have been established in the Netherlands on roads outside built-up areas.

	Motorways	Other (major) highways	Secondary roads
Passenger cars	100 km/h	100 km/h	80 km/h
Non-articulated goods vehicles	80 km/h	80 km/h	80 km/h
Articulated goods vehicles	80 km/h	80 km/h	60 km/h

Minimum speeds have also been introduced on motorways since the date mentioned: for passenger cars 70 km/h and for goods vehicles 60 km/h.

This measure was a follow-up to a request from the Dutch government in the autumn of 1973 to voluntarily observe a maximum speed in view of the oil shortage (the first energy crisis). At the time when this decision was taken the impression existed that people adhered reasonably well to this speed restriction.

From the speed measurements which the Ministry of Roads and Waterways (Rijkswaterstaat) carries out at a number of fixed measuring points on the Dutch motorway network it has been found that the picture has changed drastically.
The most recent data available cover the period up to the end of 1978.
The following data serve to elucidate the Dutch situation: In 1978 the motorway network had a length of approximately 1,700 km and some 17 x 10^9 vehicle kilometres were travelled on these roads. In recent years, there has been an annual average of 80 fatal accidents on motorways. It is estimated that slightly less than half of all the vehicle kilometres outside built-up areas are travelled on motorways, while between 5 and 8% of all fatal accidents outside built-up areas take place on motorways.

Speed measurements show that on motorways vehicle drivers are increasingly failing to observe the speed limits in force (Figure 3).
While the 85-percentile value for passenger cars at the start of 1974 was about 105 km/h, this value had gradually increased to just above 120 km/h by the end of 1978. The average speed for passenger cars increased from around 90 km/h to 105 km/h. The percentage of drivers of passenger cars travelling above the legal limit increased from 15 - 40% to 50 - 70% in 1978, depending on the measuring point. No data are available with regard to the variation of the speeds per measuring point.
In the case of goods vehicles an increase in the infringements of the limits can also be observed. At the start of 1974 the 85-percentile value was around 85 km/h, in 1978 this had increased to approximately 95 km/h. The average speed of goods vehicles increased

from 75 km/h in 1974 to 85 km/h in 1978. In 1974 15 - 60% of goods vehicles travelled faster than the legal limit of 80 km/h and in 1978 this figure was 50 - 85%.

On other (major) highways and on secondary roads which are under the Ministry of Roads and Waterways no increase in driving speeds was observed between the years 1974 and 1978. The 85-percentile value, the average speed and the variation in the speeds, remained more or less constant both for passenger cars and for goods vehicles (Figures 4 and 5).
It must, however, be pointed out that between 10 and 30% of passenger cars exceed the legal limits on national highways (100 km/h) while this percentage on secondary roads (limit 80 km/h) is between 40 and 75%.
For goods vehicles these percentages are considerably higher here. On other (major) highways between 40 and 80% of goods vehicles exceed the limit in force while on secondary roads the figure is between 20 and 50% for non-articulated goods vehicles (80 km/h) and between 80 and 100% for articulated goods vehicles (60 km/h).

From the considerable variation in the percentages which has just been mentioned it can already be seen that the driving speeds and the extent of infringement of the legal limits are of a distinctly localised character, even in the case of motorways. From these data it might be deduced that the introduction of speed limits has, in fact, led to a reduction in the actual speeds on motorways but not on the other important roads outside built-up areas. Nationally representative data on speed from the years prior to 1973, which are needed to prove this assumption, are unfortunately not available.

The idea that the introduction of maximum speeds has led to a reduction of driving speeds on motorways but not on the other (major) highways is confirmed by the results of two small-scale speed measurement surveys.
On motorways, the 85-percentile value for traffic (that is, passenger cars and goods vehicles together) was already 117 km/h in 1969

(SWOV, 1974). On single carriage-way roads (this term comprises other (major) highways and secondary roads) the 85-percentile value in 1969 was just below 100 km/h. A comparison of the measurements from 1969 with measurements from November/December 1973 leads to the conclusion that driving speeds on motorways at the end of 1973 were slower than in 1969 (SWOV, 1974).
If the introduction of maximum speeds on motorways together with the appeal to drive more slowly did have any effect on reducing speed - and it appears that this assumption can be supported by factual data - then that effect was of a temporary nature.

2.3. Speed limits and their enforcement

An important factor in speed limits is the starting point of being able to influence people's behaviour with regard to speed effectively and permanently by generally applicable measures governing speed.
In the Netherlands, motorways are designed for a speed of 120 km/h for passenger cars, while the present speed limit in force is 100 km/h. Since the "desired" speed is higher than the legal limit, it is not surprising that road users exceed the legal maximum speed in vast numbers. It is known from the behavioural sciences that methods of influencing human behaviour are less effective when they are not supported by situational factors. In addition, the (objective and subjective) risk of punishment in the event of infringement does not appear to be high enough.
The willingness to observe speed limits on motorways has declined in recent years. The traffic regulation on speed limits, such as it at present exists in the Netherlands, is not taken seriously and, viewed in terms of time, less and less accepted.
A question which still remains unanswered is what would have happened with regard to driving speeds if no legal limits had been introduced. And after that comes the question of how "bad" it is that the present limits are exceeded to this extent.

Police supervision can be an effective countermeasure of enforcing the statutory limits, but the question here is if, in view of the present mass nature of the infringements, something like this is really feasible.
The following rough estimate can be made with regard to the present situation in the Netherlands. 40×10^9 vehicle kilometres with an average trip length of 20 km are effected outside built-up areas in the Netherlands each year. That means 2×10^9 trips per year. If a speeding offence occurs in half of these trips (assuming that this offence is committed or not during the whole trip) and assuming a 1 in 500 chance of being caught (this seems to be too much on the optimistic side to be really effective), then this means that 2×10^6 offences must be recorded and be processed both by the police and the legal authorities. It is estimated that only a fraction of this total can be achieved.

A general intensification of enforcement by the police of such a nature as to create an effective chance of motorists being caught for all offences (effective in the sense of having a speed-reducing effect) does not appear to be feasible in the Netherlands under the present circumstances. It is possible to think of "specified" forms of increasing the chance of catching offenders. For example, only the very highest driving speeds could be included in enforcement or offences could be reported at specific ("unsafe") locations or on "unsafe" roads.

2.4. Raising existing limits

Only a part of car drivers will allow their speed behaviour to be influenced by any rise in the level of the limits. An essential feature in the choice for raising the limits is the expectation of what will happen with the actual driving speeds.
Presumably, an increase in speed will occur among a section of the drivers who now travel at speeds slightly above the legal limit. Part of the drivers who now travel at speeds below the limit will not allow themselves to be influenced, while an other part will.

It is expected that the variation in the speed distribution will therefore increase. The inclusion of goods vehicles in this reasoning strengthens the conclusion while, as already mentioned, it can be assumed that an increased variation will lead to more accidents.

The ideas in the Netherlands about raising the limit for the time being aim at increasing the limits for passenger cars only on motorways from 100 km/h to 120 km/h. The point is that there drivers can travel faster "undisturbed". With regard to the "repercussions" there are arguments both pro and con and these repercussions could sometimes be considerably greater than the effects on the motorways themselves.
The present situation of mass speeding offences on major highways outside built-up areas and the fact that the government "is doing nothing about it" might lead road users to think that "it doesn't really matter" whether you observe speed limits, also on roads inside built-up areas and on the other roads outside built-up areas either, or even more generally, whether you observe (traffic) legislation at all. An increase in speed on these roads could increase the risk of accidents (slow traffic!). This argument would favour an increase in the limit on motorways. But from the fact that in the period 1974 to 1978 (for which data are available) no increase in driving speeds is observable on secondary roads and from the fact that the speeds at each measuring point vary so widely, it might be concluded that the extent of the repercussions is low and that there are other factors which influence driving speeds such as road, traffic and surrounding features.

A Swedish study (Nilsson, 1977) shows that the average speeds increased by between 6 and 8 km/h when the limit was increased from 90 km/h to 110 km/h on motorways. If we assume that in the Netherlands, too, an increase in the limit would have the effect of increasing speed on the motorways and not on other roads, then the difference in actual driving speeds between both categories of roads therefore increases. A driver on a motorway will then approach,

say, roads in built-up areas at a higher speed than at present and sometimes be less, or at least less quickly, inclined to adapt his speed. Another possibility is that an increase in the limit on motorways will also lead to an increase in speed on other roads. The road user might think that the arguments which were formerly used to arrive at speed restrictions "obviously" are not valid anymore - neither on motorways, nor on other roads. These arguments are precisely against an increase in the limit.

2.5. Government policy since 1978

The development of the actual behaviour with regard to speed on motorways gave rise to a discussion in the Second Chamber of the Netherlands Parliament in 1978. The Minister concerned promised to set up an offical working group. This Working Group was given the assignment of carrying out a study on the level of the general speed limits which could be regarded as optimum for the various categories of roads and the various categories of vehicles.
The Working Group tried to investigate the influence of a number of factors which play an important part in the problem of general speed limits, namely traffic safety, throughflow, travelling time, the nature of the road network, the nature of the vehicles on the road, driving speeds, enforcement and energy saving (Werkgroep Snelheidslimieten, 1980).
The Institute for Road Safety Research SWOV was asked to draw up a working document in which the factors mentioned would be dealt with. In this, SWOV stated that "it is not readily possible to indicate the effect on traffic safety of the speed limits either qualitatively or quantitatively."
The Working Group came to the conclusion that an increase in the general limits then in force would have a negative effect on traffic safety, driving speeds and energy saving as compared with speed limits which were properly observed. A positive effect might be expected on throughflow and travelling time. To this, the Working Group added the warning that even these expectations which were so carefully formulated must be interpreted with caution.

In June 1981 the Minister of Transport and Waterways addressed himself to the Second Chamber in a letter about the subject of speed limits outside built-up areas. In it, the Minister confined himself to a judgement about speed limits on motorways. His conclusion was:
"In my judgement an increase in the existing speed limit of 100 km/h on motorways is not desirable because it would damage the credibility of the traffic-safety policy which has been pursued with good results since 1973. An increase in this limit would also not be advantageous to the credibility of the energy policy." (Tweede Kamer, 1981).

Before publishing his viewpoint, the Minister consultated two advisory bodies. The general trend in the reactions, according to the Minister, was that it was recognised that a speed limit of 100 km/h is in the interest of traffic safety, but that in view of the extent of the infringement at present an increase in the limit was advocated.

In spite of these advices, the Minister arrived at the aforemenoned, different conclusion. Two reasons are put forward for this:
1. In the Dutch situation it has not been determined (or cannot be determined) whether a speed-restricting influence is also exerted by the limit on those who exceed the limit of 100 km/h. This means that no reliable prognosis can be offered as regards the effect of limit increase on drivers, who keep the limit at present, neither on those who do exceed the present limit. It is therefore certainly not impossible that an increase in the limit would have the effect of increasing the actual speeds both on motorways and on other roads.
2. "From the viewpoint of publicity it will be difficult to make it clear and acceptable that traffic safety is not greatly disadvantaged by an increase." The public will find it difficult to understand why the unrefuted arguments which applied on the introduction and continuation of the present limits, namely energy saving and traffic safety, should now no longer apply.

In addition, the Minister regarded it as desirable to pay closer attention to the observance of the speed limits. In this respect he had in mind the following:
"1. By means of specific information to increase drivers' motivation to moderate their driving speeds. Arguments lie not only in the field of traffic safety and energy saving in general, but there are also personal interests (financial consequenses, little time gained by high speeds, effect on health).
2. Further automation of enforcement by the police.
3. Simplification of the procedure for dealing with confirmed offences."

2.6. Detailed examination of government policy since 1978

In discussions about speed limits on roads outside built-up areas in the Netherlands use seems to be made of two main types of arguments, namely: views based on people's own experience and wishes and the safeguarding of interests.
Various statements, both in speech and in writing, show that the same considerations can lead to various, and sometimes opposing, conclusions.

In making his ultimate decision it is likely that four important factors played a part in influencing the Minister:
1. The divided advices which emerged during the formulation of the policy.
2. A clear parliamentary majority which declared itself against an increase in the speed limit through a series of statements.
3. The supporters of an increase in the speed limit find themselves in a position where they have to demonstrate (in hard quantitative terms) that an increase in the limit will have no harmful consequences, in which respect considerations in the field of traffic safety and energy consumption - which are the most important aspects in the Netherlands - seem to argue against an increase.
4. It is expected that neither the supporters nor the opponents of an increase in the limit will be able to use hard arguments

(based on Dutch research) in the near future. It is expected that the supporters of an increase in the limit will have a more difficult task than their opponents.

Although no recent data of satisfactory quality about this are available, there are at present indications that the extent of the infringements of the limit has been decreasing lately. This will probably be connected with the petrol price increase which took place in the recent past. If the impression is correct that the extent and the rapidity of these price increases have an effect on drivers' behaviour with regard to speed then, in addition, increasing use of public transport and a standstill in the development of car traffic may be expected. No causal relationship has yet been established in the Netherlands, but this idea is worth closer study.

3. INSIDE BUILT-UP AREAS

3.1. Maximum speed in residential streets

In the Netherlands, a number of action and pressure groups have recently combined to form a committee which calls itself "50 is too much". This committee is endeavouring to change the present legislation - in other words, a law that lays down a generally applicable maximum speed of 50 km/h. Limited exceptions are possible to this. A local administration can permit a maximum speed of 70 km/h on roads which appear suitable for this. A second exception is the "woonerf" (residential precinct) where vehicular traffic may only travel at a walking pace.
In all other streets 50 km/h is permitted, and, according to the committee, this speed is often too high, certainly in residential streets. In situations regularly encountered in Dutch towns and villages, with two rows of parked cars on both sides of the street and parallel to the road axis, children can suddenly run on to the street between two cars. A driver travelling at 50 km/h is then quite often no longer able to stop in time. Prior to making an emergency manoeuvre, a lower speed also offers the possibility of devoting more time to every part of the task of information gathering.

Finally, a lower collision speed means less serious accidents. Researchers at the University of Birmingham have come to the conclusion that in the case of pedestrians who are run over by cars with a collision speed above 30 km/h the injury is generally extremely serious or fatal. There is however a considerable variation in research results as a consequence of differences in the type of collision and in personal and vehicle characteristics (Ashton & Mackay, 1979).

It seems worthwile to investigate whether in built-up areas (a mixture of traffic, crossings) it is not only the variation in speed distribution which seems to be related with the chance of

accidents, but whether this chance is also connected with the (theoretical) encounter chances between road users and the chance that these encounters will lead to an accident. The chance of an encounter is connected with traffic intensities and speeds and the chance of an accident - given a chance of encounter - is related with a great many factors, one of which is speed. Few results are known of fundamental safety studies on the relation between speed and accidents for the situation inside built-up areas, particularly in residential zones.

In addition to this, nowadays the way in which traffic is experienced plays a part in traffic-safety policy. Here, it does not so much seem to be the average speed of traffic that plays a part in that experience, but rather the occasional car that drives very fast. This speed of the traffic on arterial roads is judged by road users, but in the residential districts it is judged by the residents.
In this connection, the question arises as to whether an 85-percentile value, which is usual, should not be replaced by, for example, a 95 or 99-percentile value as a "criterion for the speed" of the traffic.

3.2. Investigation of driving speeds

In investigation and tackling high driving speeds in residential streets the way in which the objectives are formulated is very important. In this respect the following three remarks.
1. As a rule, the aim is not to reduce speeds at a limited number of places but on all the streets in an entire area. Of course there are places that require special attention, such as crossing facilities near an old people's home or the exit of a school, but this is not enough. Certainly not where accidents occur in scattered fashion over a wide area and there are no concentrations of accidents.
2. In what way is a speed (distribution) determined over an entire zone inside a built-up area? Possibilities which come to mind are

measurements at a number of locations determined by random sampling or measurements made by a floating car.
Precisely in the case of measurements in residential streets one can envisage a large number of practical problems: the influence of the measurement (presence of a measuring vehicle, counting axis, etc.) on the driving speed and the inability, for practical reasons, to take measurements at the places included in the random sample. In the Netherlands experience is at present being acquired with various measuring methods.
3. The formulation of objectives in this field is unusual in the Netherlands. Studies relating to the effect of speed-restricting countermeasures are generally confined to comparing driving speeds before and after the implementation work around the site where the measures have been taken. In view of the foregoing it appears better to take as the criterion the 95-percentile point measured over a number of measuring points determined by random sampling.

As a rule, restricting speeds in the residential environment is not an end but a means. What matters are the accidents and noise nuisance associated with higher speeds and, in addition, the way in which the residents and road users experience traffic. Speed-restricting countermeasures should also be evaluated on the basis of these indicators. Another aspect which must therefore also be investigated is the extent to which, for example, a reduction in the number of accidents and injured is the result of a reduction of speed. It would appear that statistical research into accidents in the form of a before and after study is very difficult to carry out for this purpose. Behavioural studies can offer a solution here.

One of the results of introducing speed-inhibiting countermeasures is expected to be that non-destinating traffic will use other streets, if possible. After the desirability of a particular traffic pattern has been indicated it is necessary to determine by research how this has developed in practice.

With regard to these problems, too, it is advantageous to develop a standard methodology for the studies mentioned here in order to facilitate international comparability of research and the interpretation of research results.

3.3. Implementation of speed-restricting countermeasures

It has already been mentioned that methods of influencing are more successful if they are supported by situational factors. In the Netherlands, this led to physical countermeasures being taken in the residential environment at the end of the sixties in order to bring about a reduction in speed. Putting up a sign indicating a maximum speed of, say, 30 km/h was regarded as an ineffective countermeasure. Such considerations, together with ideas about making the residential environment more attractive, led to the "woonerf" concept.

To this it can be added that the most recent development in ideas, in addition to the "woonerf" concept, aims at making other designs possible. The following comments on this.
In taking physical countermeasures to restrict speed it is possible to start from two philosophies:
1. One can install facilities in such a way that from the physical viewpoint it is scarcely, or even no longer, possible to drive faster than an indicated speed. This leads to the frequent application of such rigid countermeasures that no single type of vehicle can travel comfortably through a district at a speed higher than that indicated.
2. One can make it clear by the design of the streets that activities other than fast driving take precedence (for example, playing) and, in addition, devote special attention to a number of locations where high speeds are emphatically undesirable (school exit).

The "woonerf" conception, in which a speed-inhibiting facility is required every 50 m, is based on the idea that the road user wishes a speed higher than, say, 30 km/h and that the layout of the streets must make a higher speed impossible.

As far as conditions in the Netherlands are concerned, taking the first idea as the starting point has proved to lead to inflexible and expensive solutions (in terms of construction and maintenance). The discussions in the Netherlands and also in the foreign literature on speed-restricting countermeasures appear to confine themselves to speed bumps. It must be emphasised that there are still more possibilities such as narrowing roads, shifting the road axis and adapting the road pavement.
The second idea offers the possibility for more flexible designs, but in addition its effects with regard to speed behaviour are less certain. Urban designers and politicians appear increasingly to be concluding a pact with each other and opting for the second approach. Opting for an approach according to the second philosophy also means that attention must be paid to increasing the intrinsic motivation of the road users to observe a lower speed than their "desired speed".

A comparison of the two approaches has not yet been made.

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FIGURES

Figure 1. Accident involvement rate by speed deviation (relative to lowest point on curve). Source: Cerelli (1977b).

Figure 2. Injury involvement rate by speed (relative to value at 80 mph). Source: Cerelli (1977b).

Figure 3A. Development of speeds on motorways. Passenger cars, 1974-1978. Source: Rijkswaterstaat.

Figure 3B. Development of speeds on motorways. Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.

Figure 4A. Development of speeds on other (major) national highways. Passenger cars, 1974-1978. Source: Rijkswaterstaat.

Figure 4B. Development of speeds on other (major) national highways. Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.

Figure 5A. Development of speeds on secondary roads. Passenger cars, 1974-1978. Source: Rijkswaterstaat.

Figure 5B. Development of speeds on secondary roads. Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.

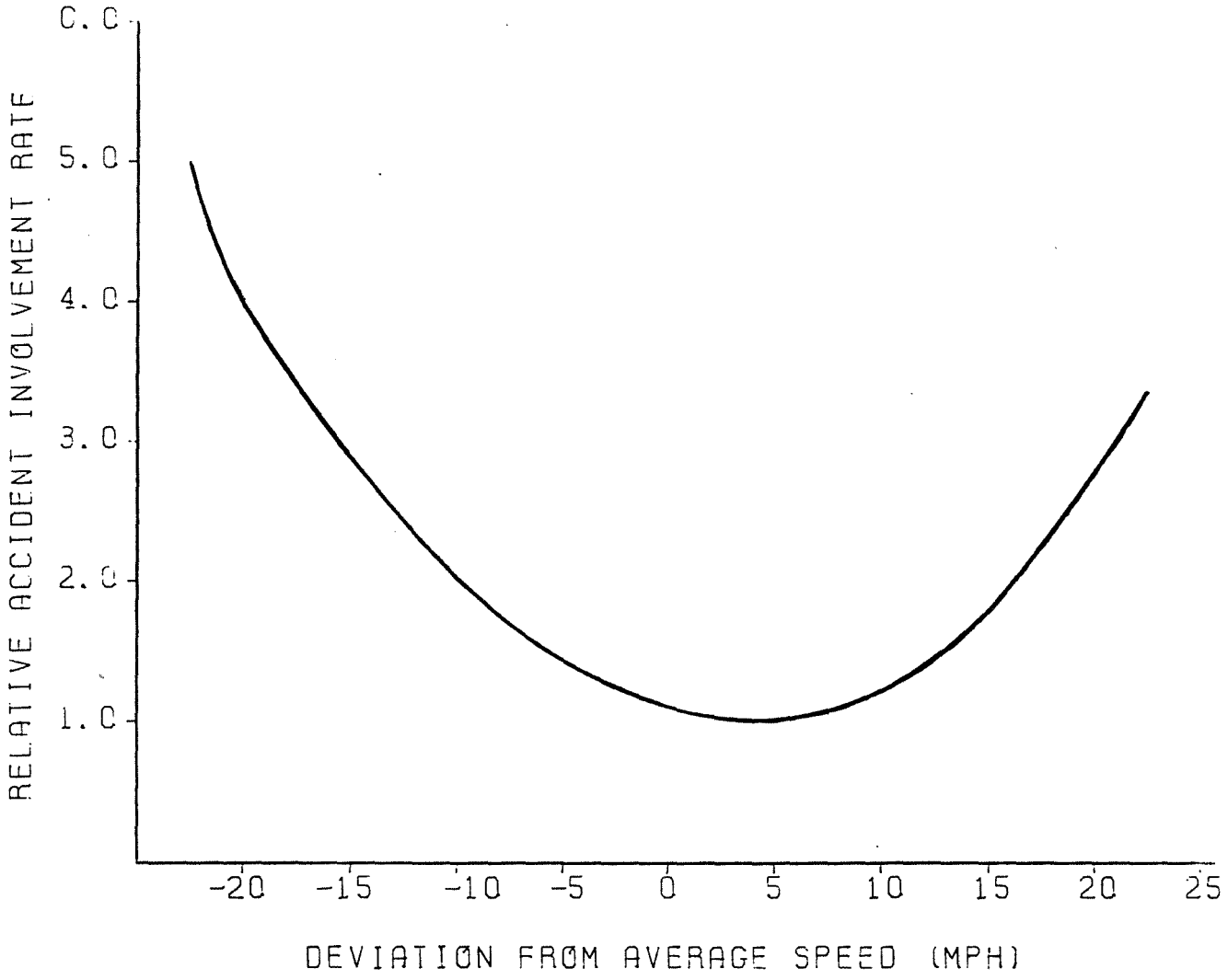

Figure 1. Accident involvement rate by speed deviation (relative to lowest point on curve). Source: Cerelli (1977b).

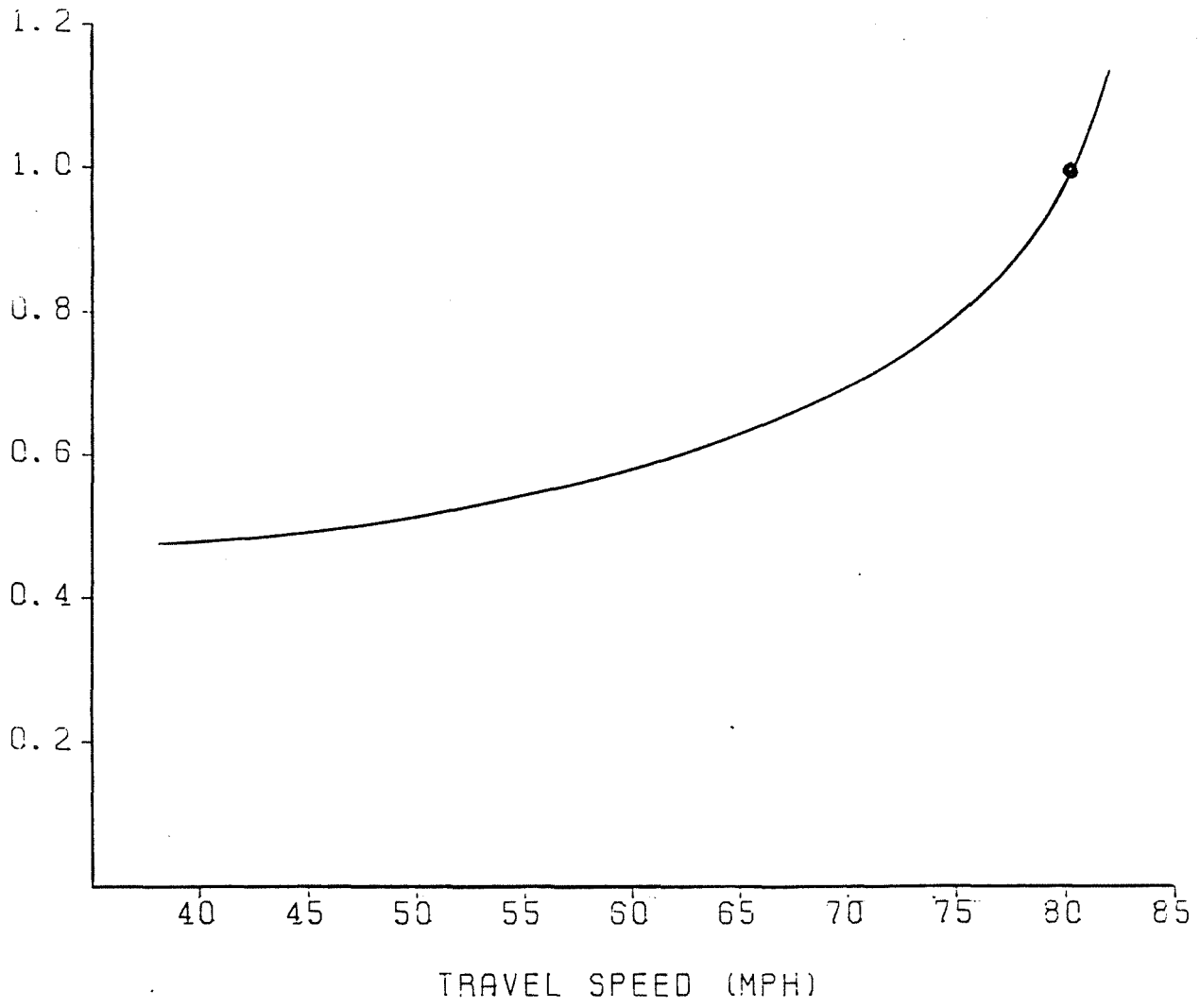

Figure 2. Injury involvement rate by speed (relative to value at 80 mph). Source: Cerelli (1977b).

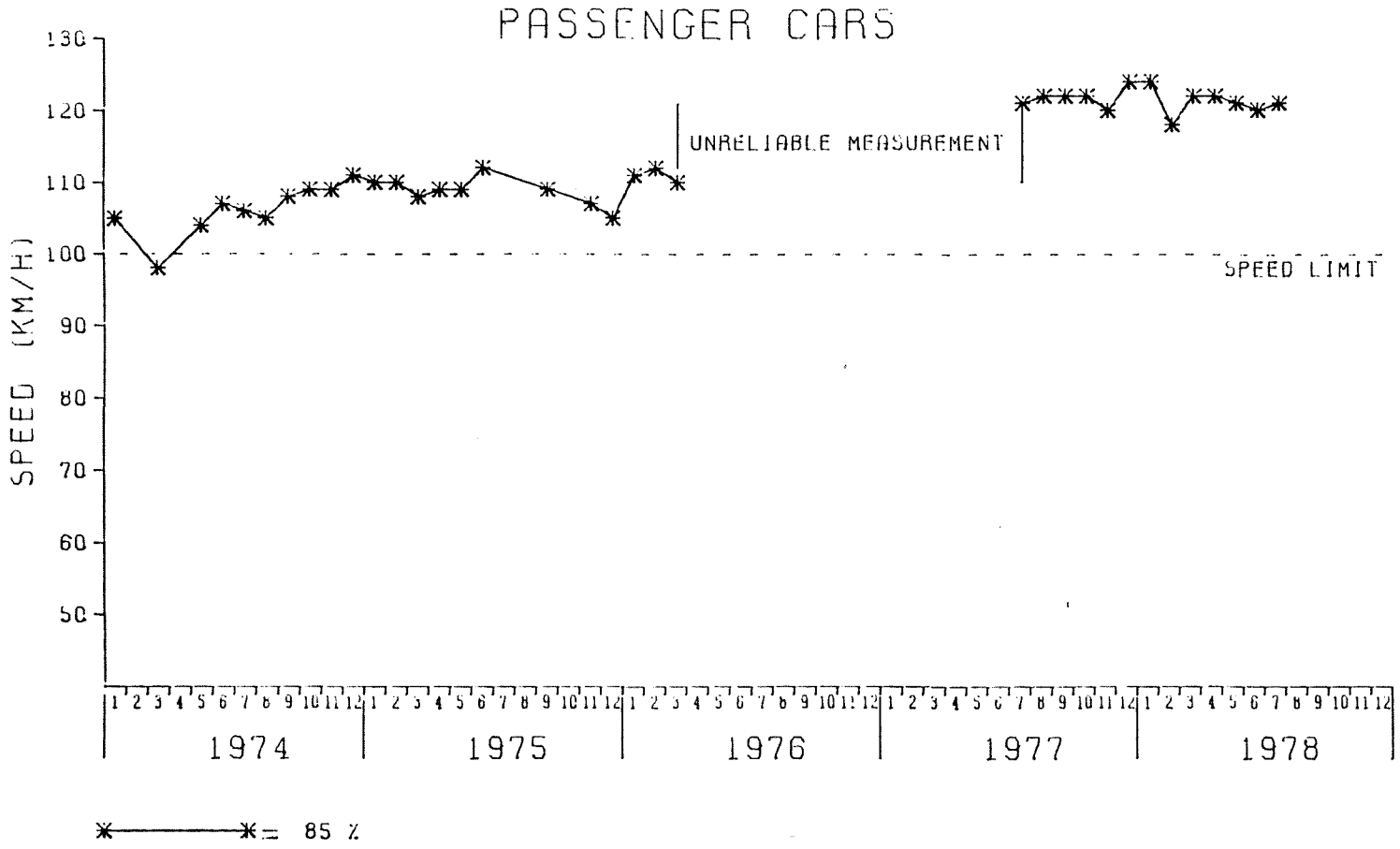

Figure 3A. Development of speeds on motorways. Passenger cars, 1974-1978. Source: Rijkswaterstaat.

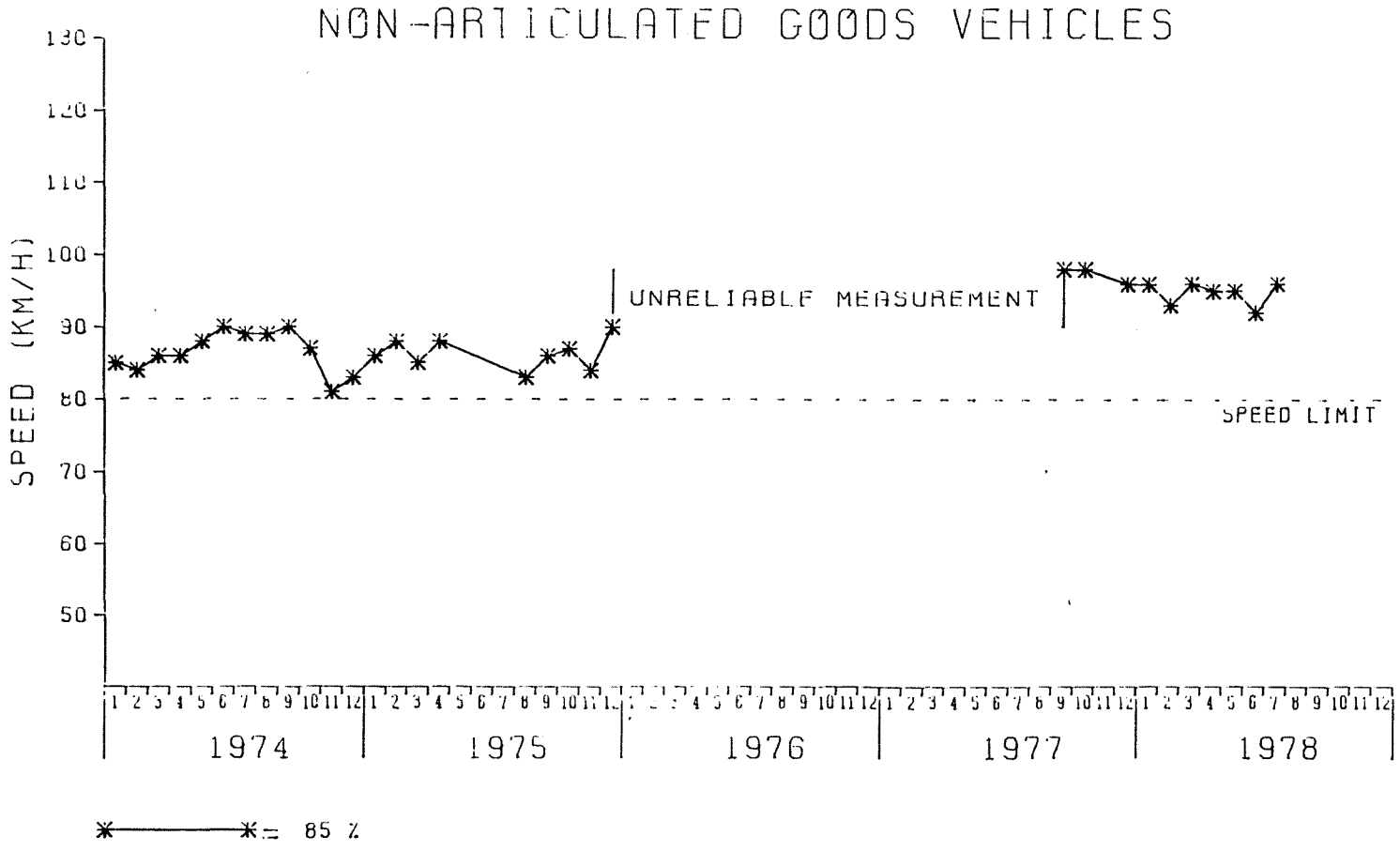

Figure 3B. Development of speeds on motorways. Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.

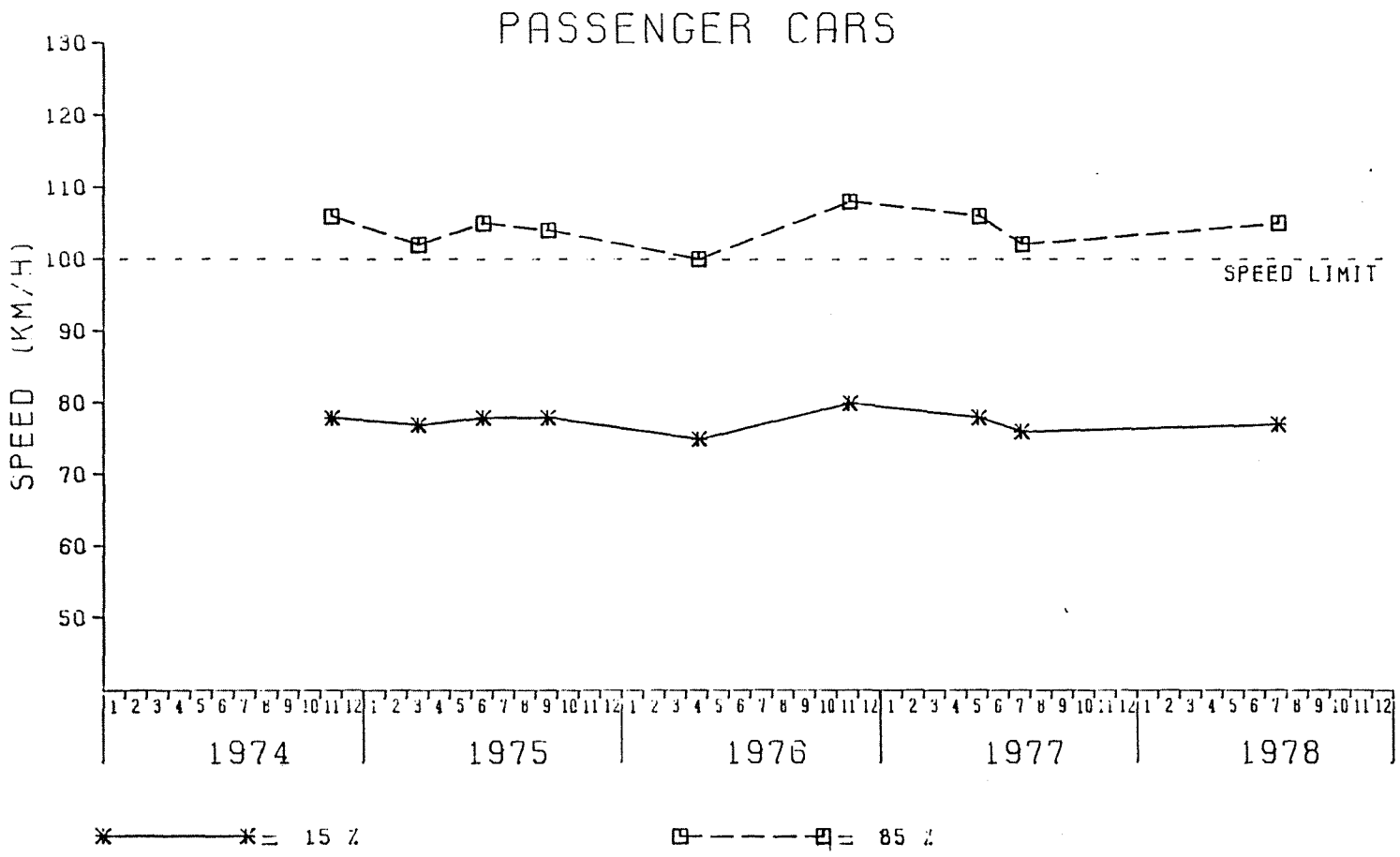

Figure 4A. Development of speeds on other (major) national highways.
Passenger cars, 1974-1978. Source: Rijkswaterstaat.

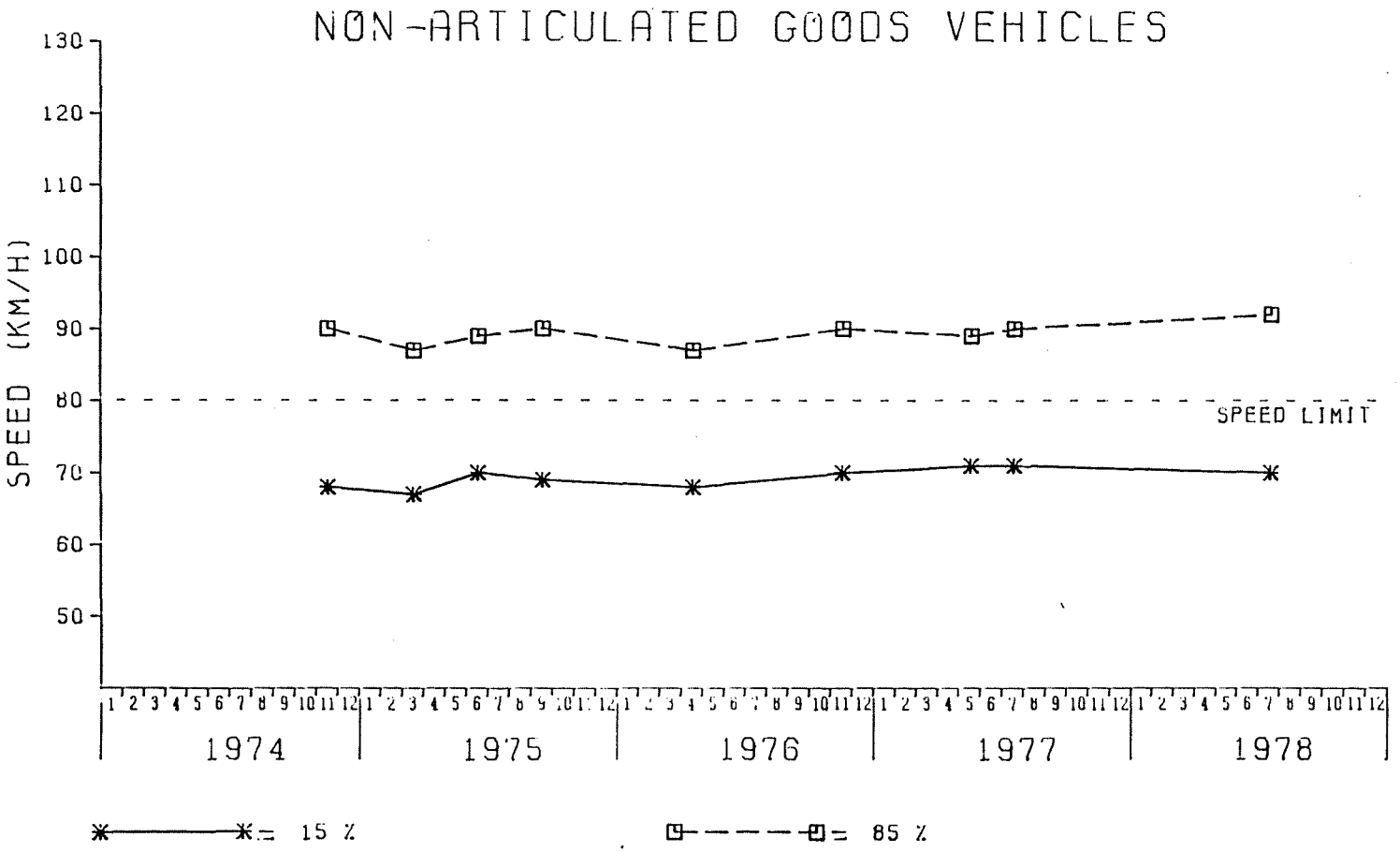

Figure 4B. Development of speeds on other (major) national highways.
Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.

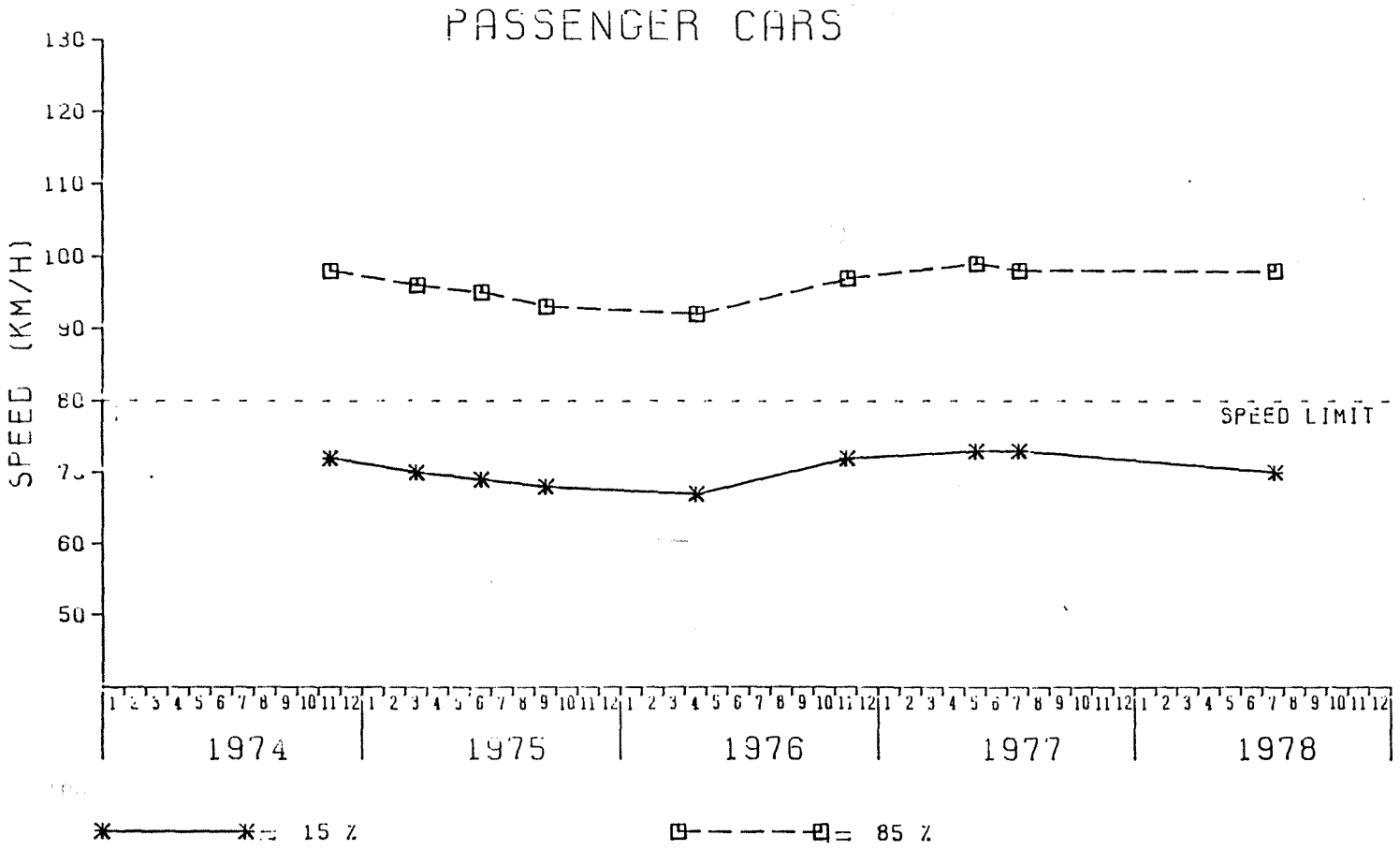

Figure 5A. Development of speeds on secondary roads. Passenger cars, 1974-1978. Source: Rijkswaterstaat.

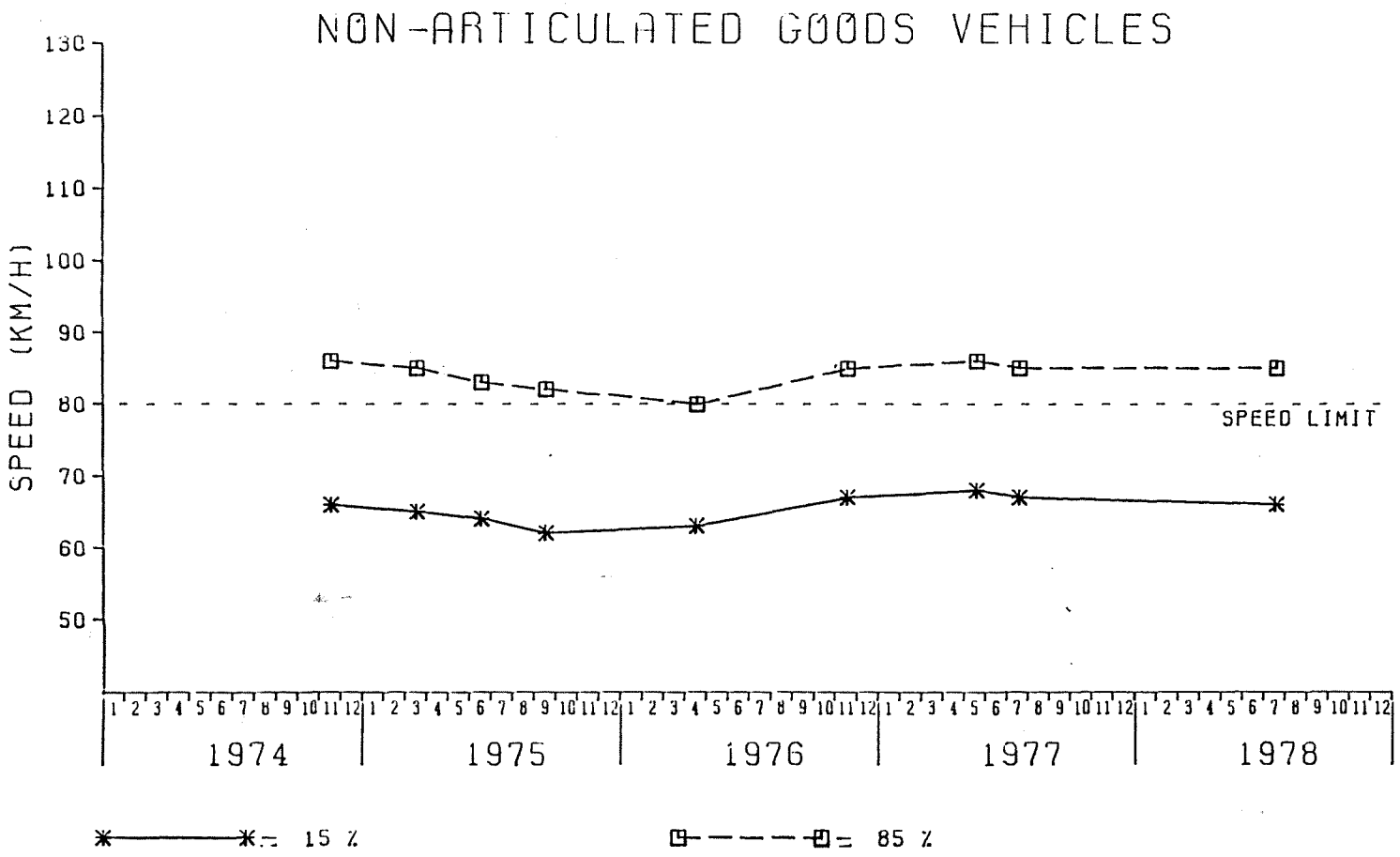

Figure 5B. Development of speeds on secondary roads. Non-articulated goods vehicles, 1974-1978. Source: Rijkswaterstaat.