

Summary:

Effects of a painted median on lateral position and speed

A comparison between two treatments on E6 in Norway

This study investigated the effects of a 1 m wide painted median on driver behaviour. Two types of painted medians were investigated. The first consists of transverse 1 m long lines with 1.5 m distance between them. The second consists of two longitudinal lines 1 m apart. Speed change was measured for the latter treatment, and a speed decrease of 2,7 km/h was found. Both types of painted medians resulted in increased separation between opposing traffic streams, by 60 to 72 cm, compared to a conventional centreline.

Background

On roads that are too narrow to allow construction of a median barrier, other measures are desired in order to decrease the risk of frontal crashes. The risk can be reduced by measures resulting in lower driving speeds and/or increased separation distance between opposing traffic streams. Previous studies have shown that driving speeds can be reduced by decreasing the lane width, either by widening the centreline into a painted median, or by moving the edge-lines farther from the edge, or both.

This study investigated two different painted median treatments on two sections of the E6 trunk road in Norway, in the counties of Oppland and Østfold.

The road sections

The sections will be referred to here as Road 1 and Road 2. Both roads were 10 m wide, and the lanes were 3.5 m (from the centre of the road to the centre of the edgeline). The shoulders were 1.5 m wide (from the centre of the edgeline to the edge of the pavement) before the medians were painted, and 1.0 m afterwards. The repainted sections were 8,8 km and 17,6 km for Road 1 and Road 2, respectively.

On Road 1 the painted median consisted of two 20 cm wide rumble lines (profiled lines), with a c-c distance of 1 m. On no-passing zones the rumble lines

were continuous, and there were milled-in rumble strips in the area between the two lines. On sections where passing was not prohibited, the lines were broken, in accordance with the guidelines for conventional centrelines (which are always yellow in Norway), with 3 m long lines and 9 m long spaces between them.

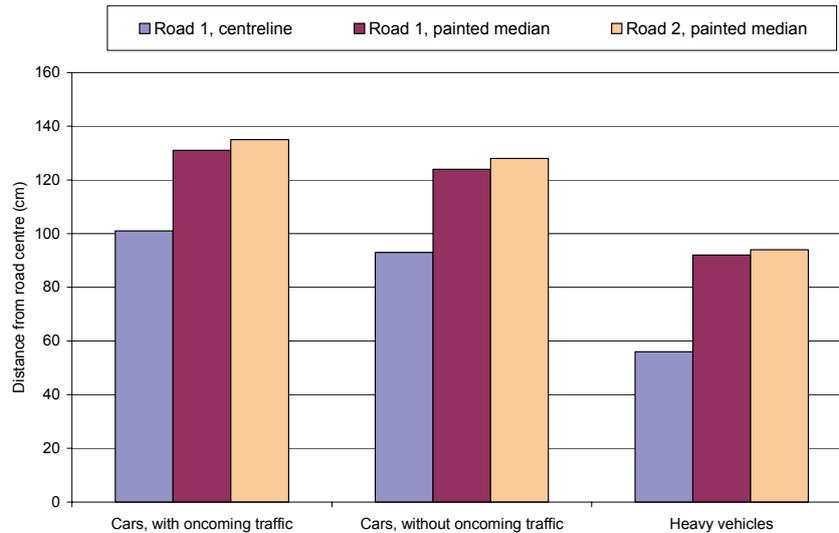
The median on Road 2 consisted of 1 m long and 10 cm wide transverse green stripes with a distance of 1.5 m between them. This median was added to the conventional standard centreline. The same type and colour of marking had been used previously in Denmark, and there seems to be no other rationale given for choosing the green colour.

Method

Speed data were taken from permanent measurement points, and mean speeds before and after the painting of the median were compared.

The lateral position of vehicles was measured on the basis of digital video recordings. For each vehicle lateral position was recorded as distance in cm from the centre of the road to the left-side mirror. On the basis of the time and direction information it was possible to investigate whether the presence of oncoming cars had any effect on the lateral position. All video recordings were taken during daytime, between 11 am and 2.15 pm; i.e. outside rush hours. For Road 1 the 'before' recording lasted 43 minutes and comprised 723 vehicles, and the 'after' recording lasted 117 minutes and comprised 1876 vehicles. On Road 2 the traffic was recorded for 83 minutes and comprised 2108 vehicles.

For Road 1, before vs. after comparisons of both speed and lateral position were carried out. The median on Road 2 was already painted when the study started, so it was not possible to do a before vs. after analysis. The 'before' data on lateral position for Road 1 were therefore used as reference also for Road 2.



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Lateral position of cars (with and without oncoming traffic) and heavy vehicles on roads with different types of painted median. Distance from road centre to left-side rearview mirror.

Results and conclusions

Speed data for Road 1 were analysed for a 10-week period following painting of the new median and were compared to data for the corresponding weeks of the previous year. By using the previous year as reference rather than the period immediately preceding implementation of the new median, a better control of ambient conditions and traffic composition was achieved. This was particularly important because the median was painted just at the beginning of the summer holidays, and there was a considerable increase in traffic volume compared to the preceding period. The available data from the measurement point consisted of mean speeds and number of vehicles in each direction, for consecutive one-hour periods. The hourly mean speeds were weighted by number of vehicles and averaged for the whole 10-week period, separately for each direction of travel. The number of vehicle speed measurements making up the data for the four combinations of time periods and driving directions varied between 347 000 and 381 000. The average speed was reduced by 2.7 km/h after painting of the median.

The average distance from the road centre to the left side mirror was computed separately for cars with and without oncoming traffic. Oncoming traffic was defined as the presence of vehicle(s) in the opposing lane within less than 3 seconds before or after the time when a car crossed the measurement line. The lateral

position was also computed separately for heavy vehicles. For cars, the mean distance from the centre of the road to the left side mirror was 30 cm larger with the 1 m painted median than with a centreline. And for heavy vehicles the distance increased by 36 cm. Furthermore, cars drive slightly farther from the road centre when there is opposing traffic, both with a centreline and with a painted median. The difference in lateral position between the two different types of painted medians is very small, varying between 2 and 5 cm for the different vehicle categories and conditions.

The results show clearly that increasing the separation between the lanes on a two-lane rural road by painting a 1 m wide median, results in reduced driving speeds, even if there is no reduction in the width of the road or the visual driving lanes. This is probably due to the fact that the lateral displacement caused by the median implies driving closer to the edge of the road, and the consequent reduction of the safety margin is likely to be experienced by the driver as an increased difficulty of the driving task.

The lateral displacement of the vehicles is a little smaller than the increase in the width of the median. Whereas the lane is moved 50 cm to the right, the lateral position of the vehicles changed by 30 – 36 cm. This seems to imply a compromise between encroaching on the median and driving too close to the edge. The total increase in separation between opposing traffic streams is in the order of 60 – 72 cm

(i.e., twice the displacement of each traffic stream), which means a substantial increase in the safety margin regarding frontal crashes. Especially in combination with the rumbling effect of the lines, as well as with milled-in rumble strips like on Road 1, the increased lateral separation is likely to have a substantial safety effect. This assumption needs, however, to be verified by accident studies, in order to enable precise predictions of safety effects.

There are some limitations of this study that may have implications for the generality of the results.

First, speed and lateral position were measured at separate points. Since driving speed may possibly influence lateral position, speed variations should be controlled in order to study the “pure” effect on lateral position.

Second, it would have been interesting to see the effect of a painted median without moving the edge-

line; in other words, what would happen if the painted median resulted in a reduced lane width.

Third, each treatment was studied only at one single site. It would have strengthened the conclusions if effects in the same order of magnitude could be found on other sites as well.

Fourth, conceivably drivers could adapt to such treatments over time, so that the effects could differ between regular and occasional drivers on the sections. This could not be investigated in the present study.

In spite of the limited scope of this study it can be concluded that purely visual measures are effective in order to influence driving behaviour both in terms of speed and lateral position, and may thereby constitute a cost-effective measure to increase safety on low-volume roads.