

# **Narrow cross sections without centre line markings – “2 minus 1” rural road**

## **Road user behaviour study Summary Note**

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### The redesign of the rural test road

A 7.3 km long section of a two-lane municipality rural road with centre line markings has been redesigned by introduction of the new "2-1"(two minus one) cross section profile.

The paved road width varies between 5.0 m – 6.5 m. The side areas are covered by grass or gravel. The road is a bit curvy. The annually daily traffic was about 2500 vehicles with 8-10 % trucks/busses.



*Figure 1: Before situation. Two lane rural road with centre line marking*



*Figure 2: After situation. One central driving lane*

In the new "2-1"- profile the centre line marking has been deleted. The redesigned road have only one central driving lane – 3.5m width – marked by 0.30m wide intermittent edge lines leaving an area of 0,85m width in both sides for cyclists and for cars to use in meeting situations (Figure 2)

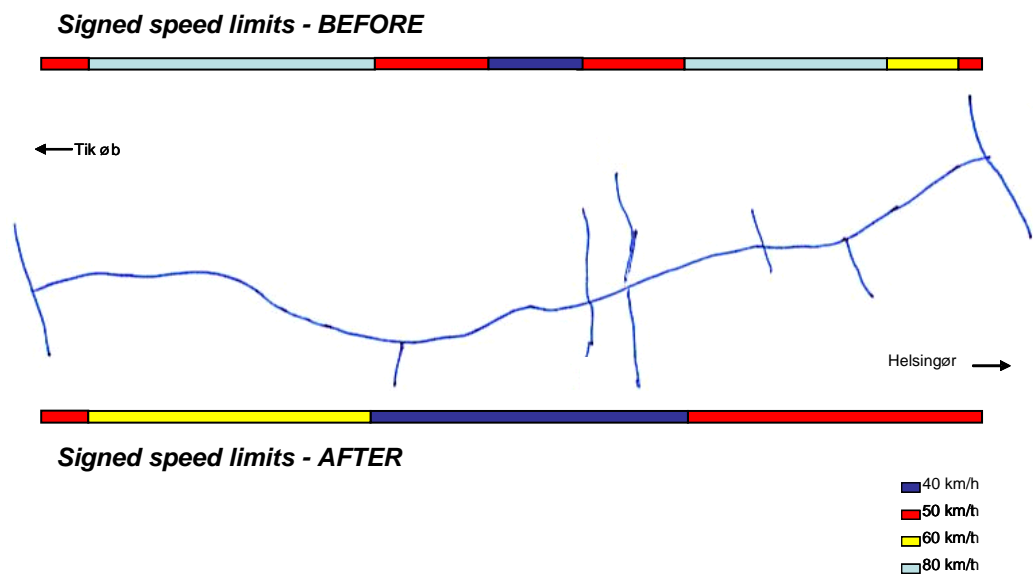
In curves where stop sight distance is too short for the "2-1"-solution the profile has remained as a two lane rural road with centre line marking (Figure 3).



Figure3: Centre line marking is remained in curves when "stop sight distance" is too short.

### Signed speed limits

The new-profiled road is divided in three road sections with signed speed limits on 40km/h, 50km/h and 60km/h.



**Edge lines are related to signed speed limit**

The length and spacing of the intermittent edge lines are longer the higher speed limit:

Signed speed limit	Length of spacing
60 km/h	2m – 2m – 2m – 2m -
50 km/h	1m – 1m – 1m - 1m -
40 km/h	½ m - ½ m - ½ m - ½ m -

**Speed reducers**

The new "2-1"- profile is supplemented by 12 speed reducers - designed as 16 m long narrowings edged by side islands (see Figure 4).



*Figure 4: Speed reducer*

**Evaluation programme**

Registration of road user behaviour was carried out during autumn 2004. The evaluations include studies of:

- Speed
- Driver behaviour in meeting situations on road sections with signed speed limits of 40, 50 and 60km/h.
- Driver behaviour in meeting situations at speed reducers



- Driver behaviour in transition zone between "2-1"-profile to ordinary two-lane cross profile marked by centre lines.
- Driver behaviour at intersections



Figure 5: In meeting situations drivers give way to on-coming cars by crossing the intermittent edge line a little bit as intended.

**The evaluation results (Lund & Herrstedt 2005) show:**

- Speed limits are still exceeded and mean speeds are still too high compared to the signed speed limits.

Speed limit	Mean Speed	85%-fractiles
40 km/h	53 – 57 km/h	63 – 68 km/h
50 km/h	60 – 65 km/h	69 – 76 km/h
60 km/h	69 – 70 km/h	78 – 81 km/h

On road sections with signed speed limit 50 km/h the mean speed is 60 km/h to 65 km/h and 85%-fractiles are 69 km/h to 76 km/h after implementation of the new profile. On road sections with signed speed limit 40 km/h the mean speed is 53 km/h to 57 km/h and 85%-fractiles are 63 km/h to 68 km/h after the implementation. On road sections with signed

speed limit 60 km/h the mean speed is 69 km/h to 70 km/h and 85%-fractiles are 78 km/h to 81 km/h after implementation of the new profile.

It is concluded that the concept has not been as effective as intended

- The drivers seem to behave as intended in meeting situations on road sections. Drivers give way to the on-coming drivers by changing the lateral position to the right and in some cases the right wheels are crossing the intermittent edge line a little bit as intended. On-coming traffic pass in both directions without problems even though the "2 minus 1" road has only one central driving lane (see figure 5)
- Mostly the meeting situations at speed reducers are handled without problems. The drivers seem to interact and adapt speed when approaching a narrowing letting the first arrival pass first. Problems are observed though in 5-10 % of the observed situations. It is not always quite clear to the drivers who should be the first to pass the narrowing. (see figure 4). In some cases both drivers stop and wait for each other to pass. In other cases one of the drivers continue without slowing down "forcing" the on-coming driver to give way. Accidents are observed in the narrowed speed reducers because of this confusion among drivers. A simple solution to this minor problem could be a sign telling the drivers who should go first.
- No conflicts have been observed in the transition zones where road profile changes from "2-1" to the ordinary two-lane cross profile. Drivers seem to follow the road markings as intended.
- At intersections drivers still stop at the stop line as intended. The apprehension for drivers not to stop before reaching the intermittent edge line on the crossing road seems to be unfounded.
- Repeated AFTER registrations on speed (July 2005) and "meeting behaviour" (June 2006) confirm the conclusions described above.

The evaluation results summarised above are expected to be supplemented by an accident analysis after the end of 2007.

## References

Belinda la Cour Lund & Lene Herrstedt: *Evaluering af Gurrevej – Adfærdsundersøgelse. Marts 2005.* [www.trafitec.dk](http://www.trafitec.dk)

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