

Traffic Advisory Leaflet 2/97 February 1997



Traffic calming on major roads -A49, Craven Arms, Shropshire

Introduction

This leaflet describes the impact of a comprehensive set of traffic calming measures supporting a change of speed limit from 40 mph to 30 mph. The measures were installed on the A49 trunk road in the village of Craven Arms in Shropshire. Monitoring was carried out by the Transport Research Laboratory (TRL), on behalf of the Driver Information and Traffic Management Division of the Department of Transport. Installation of the measures was completed in May 1995. Mean and 85th percentile speeds fell by around 9 mph at the gateways and over 10 mph in the centre of the village.



Background

The Village Speed Control Working Group (VISP) study (see Traffic Advisory Leaflet 1/94) concluded that simple traffic calming measures could offer an interim solution.

However, large reductions in speeds in villages on major roads could only be achieved through comprehensive schemes. As a follow up to the VISP study, the Department commissioned TRL to monitor and report on more comprehensive schemes installed in villages on major roads, particularly trunk roads. The criteria for each scheme studied has been that traffic flows should be greater than 8000 vehicles per day, and heavy goods vehicles should form at least 10 percent of the flow. The object of the study is to see if schemes can be designed which reduce the 85th percentile speed of vehicles to no more than the actual speed limit through each community. Craven Arms is one of the villages under study.



The Scheme

Prior to the scheme being implemented, the speed limit through Craven Arms was 40 mph. The 85th percentile speed at the entrances to the village were then around 48 mph, with night-time values in excess of 50 mph. Within the village, the 85th percentile speeds of light vehicles ranged from 33 mph to 44 mph depending on location, and those for heavy vehicles from 32 mph to 40 mph. Two way traffic flows were around 9000 veh/day, with heavy goods vehicles comprising around 16% of the flow.

The proposal was to reduce the speed limit through the village to 30 mph, and support this with appropriate traffic calming measures.



Although speed cushions had not previously been used on trunk roads, they appeared to be an appropriate measure to control speeds in the centre of the village. Speed reducing measures were needed in advance of the cushions to comply with the Highways (Road Hump) Regulations 1990, then applicable. Special authorisation was also necessary because of the trunk road status of the road. Shropshire County Council Consultancy Service(now part of the Babtie Group) designed the scheme, on behalf of the Midlands Network Management Division of the Highways Agency. They proposed the introduction of four mini roundabouts to provide the necessary speed reducing features in advance of the speed cushions. The central islands of the mini roundabouts were deliberately laid so that they were flush with the carriageway, rather than domed. This was to limit any excessive vehicle body rattle or ground vibrations, if large vehicles drove over the centre. The disadvantage was that vehicles tended to run over the islands rather

than around them. The two-lane approaches to allow a separate lane for right turning traffic also seemed to encourage the centre island to be driven over.

Based on previous studies carried out by TRL, narrow speed cushions were used. They were felt to be the most appropriate type to avoid the generation of excessive body rattle and ground-borne vibrations. Dimensions chosen for the cushions were: height 60mm; length 3.5m; width 1.5m; side ramp gradients 1:4; onramp gradient 1:8; off-ramp gradients 1:10. They were of a contrasting colour.

Outside the centre of the village other features were employed. The gateway treatment was particularly important, as this would be the first indication to drivers of a change in character of the road through the village. Based on the experience gained through the VISP study, the gateway had to be conspicuous. It was also felt that there should be some advance warning of the speed limit. For this purpose speed limit count down marker signs were used. These were located on both sides of the carriageway at 150m, 100m and 50m in advance of the gateway. The signs required special authorisation. No advantages were found in comparison with the spacing normally adopted for these types of signs, which is 300 yds, 200 yds and 100 yds.



The gateway itself consisted of "Dragon's Teeth" markings (first used at Crimond in Grampian, Scotland, as part of the VISP study). They were followed by a "30 mph" roundel marking, which required special authorisation, on a red background. The red background extended across the full width of the carriageway, though the roundel was located only on the approach lane. The vertical element of the gateway was formed from the 30 mph speed limit sign above the Craven Arms village sign. The combination of all these elements formed a very distinctive gateway.

Between the gateway and the village centre a repeated form of the horizontal element at the gateway was used. This had speed limit roundel markings on both lanes of the carriageway, placed on a red background strip. Between the repeat roundel markings there was centre hatching in-filled with a red surface. Central refuges were used to assist pedestrians to cross in some locations. The centre hatching in conjunction with the speed limit roundel patches created a visual form of horizontal deflection along the carriageway, acting as a further form of speed control.

A high standard of workmanship, which is important for visual acceptability, was achieved for all the measures installed. The cost of the scheme was £80,000.



Results

Speeds

For inbound traffic at both gateways, the measures resulted in speed reductions of some 9 mph. However, the mean and 85th percentile speeds were still above the revised speed limit, at 33 mph and 39 mph, respectively. It is not possible to say whether any particular element of the gateway was more effective than any other, as all the measures were installed at one time. Work on trying to differentiate between particular features is planned for the future. However, the "Dragonís Teeth" were inconspicuous from a distance, indicating that they had little value in giving advance warning to drivers. The speed limit roundel on the red background could be seen from some distance away. Residents considered the countdown signs to be very effective, but again it was not possible to measure the extent.

In the outbound direction, speed reductions at the gateways were less. They were about 7 mph and 8 mph to 9 mph, for the mean and 85th percentile speeds respectively.

Between the central part of the village and the gateways, where repeated speed roundel markings were used, overall speed reductions, also of around 9 mph, were obtained. For light vehicles, mean and 85th percentile speeds were around 33 mph, and 37 mph, respectively. For heavy goods vehicles the equivalent speeds were 29 mph and 33 mph, respectively. Placing the roundels in pairs on a distinctively coloured background, made them more conspicuous, and has undoubtedly contributed to maintaining the reduction in speed measured in these locations.

The mini roundabout and speed cushion system, in the centre part of the village straddling the A49, was particularly successful in reducing speeds to the speed limit or below. At the northern end of the system, the speeds for light vehicles were reduced by more than 7 mph. Mean and 85th percentile speeds of 26 mph and 30 mph, respectively, were obtained. The equivalent speeds for heavy goods vehicles were 24 mph, and around 28 mph. In the southern part of the centre of the village, speed reductions of around 10 mph were achieved. These brought mean and 85th percentile speeds for light vehicles down to 18 mph, and 22 mph, respectively. The equivalent speeds for heavy goods vehicles were 17 mph, and 20 mph.



Over the whole length of the village the measures resulted in the mean journey time being increased by 31 seconds in the northbound direction and 24 seconds southbound.

Noise

For light vehicles, substantial reductions in vehicle noise of 9.5 dB(A) were achieved at the cushion locations. At the gateways, maximum noise levels for light vehicles were reduced by about 4 dB(A). For heavy vehicles, maximum levels of vehicle noise were also reduced, reductions varying from about 5 dB(A) to 8 dB(A), with about a 3 dB(A) reduction at the gateways.



Traffic noise in the daytime (0600hrs to midnight) adjacent to the speed cushions fell by over 3dB(A). This was not as much as expected, given the change in vehicle noise measurements. It seems possible that the mini roundabout, near to where the measurement was taken, generated some intrusive noise.

Away from the physically traffic calmed areas, the reduction in overall traffic noise was about 2 dB(A), reflecting the reduction in speeds achieved.

Night-time (midnight to 0600hrs) noise levels were generally found to be unaffected.

Although the results indicate an overall decrease in noise, the measured reductions did not agree with the perceptions of some of the residents interviewed. This may be due to the fact that whilst noise has been reduced, the character of the sound may have altered, causing residents to be more sensitive to it. As a result of these findings further work is being undertaken to investigate perceptions of noise.

Ground-borne Vibrations

There was concern that, because of the relatively high numbers of heavy goods vehicles, ground-borne vibrations (see TA Leaflet 12/96) might be generated at the speed cushions.

Monitoring showed that ground-borne vertical vibrations in building structures were increased. Even so, the measurements were still below the mean threshold level for human perception.

It was also found that where heavy vehicles clipped the cushion (that is did not fully straddle it) vibration levels were 50% higher. This points to the need for careful location, so that as far as possible drivers are encouraged to straddle the cushions.

The public opinion survey revealed that the general perception of residents was that vibration had increased. However, this may have been more the result of airborne vibration (due to low frequency noise from vehicle engines and exhausts) rather than ground-borne vibrations.



Public Opinion Survey

Although reductions in speed and noise were obtained, the survey revealed that only 39% of those interviewed were satisfied with the scheme.

About 67% thought the countdown signs, gateway markings, and repeated red patches were useful. However, the mini-roundabouts came in for criticism, particularly with regard to priority, and drivers not giving way. Doming the central island and single lane approaches might have overcome some of this criticism, but possibly at the expense of increased noise.

Some 40% of those interviewed thought the speed cushions and centre hatch markings were of little value.

Accidents

A total of 23 accidents (5 involving serious injury) had been recorded on the A49 within the village in the five years prior to the measures being installed. Because of the short period since installation of the scheme it is too early to analyse any changes that might have occurred. Results will be included in the final report on all the schemes monitored under the study, due to be produced in 1998.



Conclusions

The Craven Arms scheme was successful in reducing vehicle speeds near to or below the speed limit. This endorses the VISP study findings, that comprehensive measures are required to bring about significant erosion of speed levels. It also indicates that vertical deflections in the form of speed cushions can be effective in controlling vehicle speeds on main roads with 30 mph speed limits. However, the negative reaction from some residents suggests that it would be helpful to have further insights into their perceptions of the "success" or otherwise of such schemes. With increasing emphasis being placed on environmental matters, there is also a need to determine how "nuisance factors", particularly in terms of noise and vibrations, can be more accurately determined. Further investigations into these matters are being undertaken.

The Highways (Road Humps) Regulations 1996 now allow greater flexibility in the use of road humps, and might offer benefits in the design of the scheme, particularly in terms of the mini-roundabouts. However care would have to be exercised, particularly on main roads, to ensure that there were adequate speed reducing features installed in advance of any vertical deflections.

The Road Humps (Scotland) Regulations 1990 are currently being reviewed to allow a similar flexibility in the use of humps.

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References

Highways (Road Humps) Regulations 1996 (SI 1996/1483)

TRL Report 212 - Traffic calming on major roads: The A49 Trunk Road at Craven Arms, Shropshire

TA Leaflet 12/96, Road Humps and Groundborne Vibrations

TA Leaflet 4/94, Speed Cushions TA Leaflet 1/94, VISP - A Summary (The Village Speed Control Working Group) TRL Project Report 85 - Speed Reduction in 24 Villages: Details from the VISP Study Highways (Road Humps) Regulations 1996 (SI 1996/1483)

Highways (Road Humps) Regulations 1990 (SI 1990/703 1990/1500) Rescinded



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