Department for Transport

Traffic Advisory Leaflet 2/96
April 1996

75mm High Road Humps

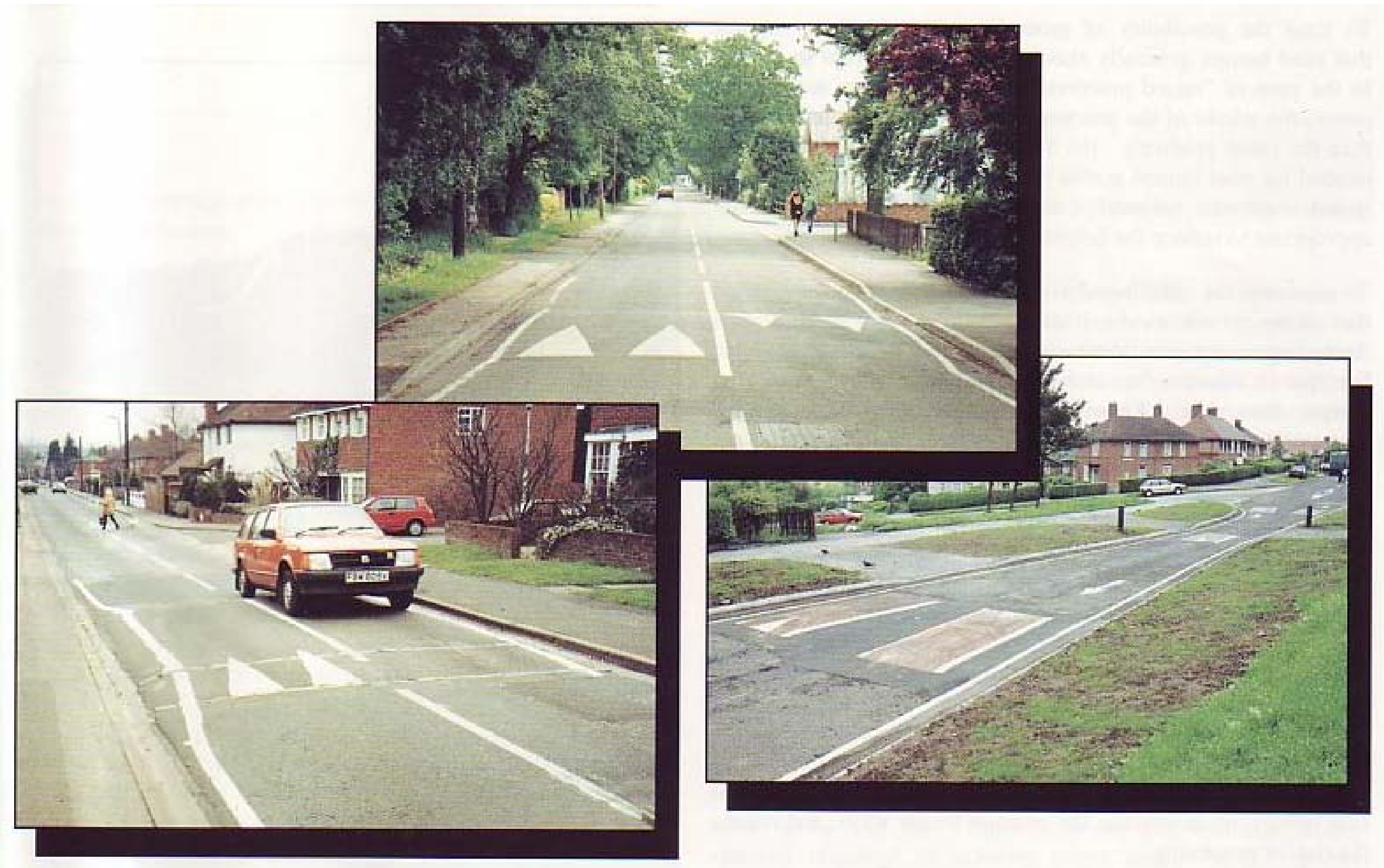
Introduction

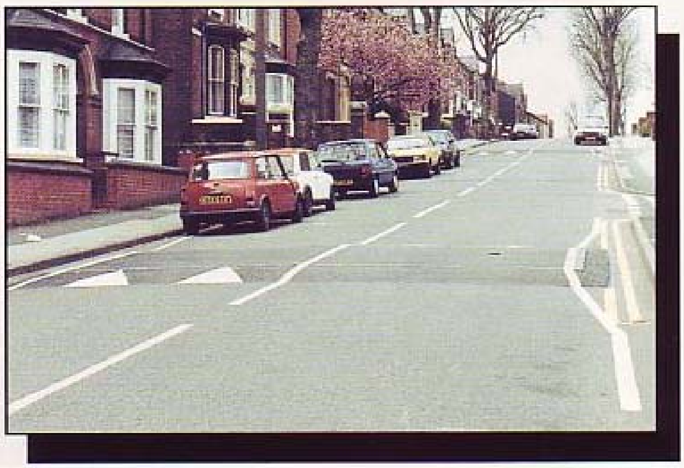
The Highway (Road Humps) Regulations 1990 and the Road Humps (Scotland) Regulations 1991 allowed considerable flexibility in the use of road humps over previous legislation. They provided for the use of both flat top and round top road humps, and permitted the height to be varied between 50mm and 100mm. The regulations resulted in a large increase in the number of road humps being installed, though these were mainly 100mm high. A consequence was the incidence of vehicles grounding on these humps.

The Transport Research Laboratory (TRL) on behalf of the Driver Information and Traffic Management Division (DITM) of the Department of Transport (DOT), were commissioned to investigate grounding problems. In a separate, but related study, TRL compared the effects on speed reduction between lower height (75mm) and full height (100mm) road humps.

The investigations revealed that use of road humps with a height of 75mm would substantially lessen the likelihood of grounding. Additionally, when compared with 100mm high humps, little or no erosion in speed reduction resulted, and providing suitable spacing was employed, 75mm high humps would be applicable in 20mph zones.

The purpose of this leaflet is to highlight the findings of the studies.





Grounding

UK legislation for vehicle construction does not require a minimum clearance to be provided between the underside of a vehicle and the carriageway surface. Some sports cars, for example, have unladen ground clearances as little as 100mm to 120mm. When fully laden, ground clearances are approximately 30mm lower. Limousines of the type used for weddings and funerals can have an unladen ground clearance of around 100mm, and when fully laden the clearance can be down to 75mm. As most limousines have a longer wheel base, they can almost straddle and standard 3.7m long round top hump, and the shortest length flat top humps.

Other studies have shown that longitudinal straddling also occurs with short length speed cushions. In these cases normal wheelbase cars can be affected as well.

To limit the possibility of grounding, investigations suggest that road humps generally should not exceed 75mm in height. In the case of "raised junctions" (where a flat top road hump covers the whole of the junction area) the height is less critical than the ramp gradients. (In Scotland, special authorisation is needed for road humps across junctions.) In the case of narrow speed cushions (around 1.6m wide, or less) it can be appropriate to reduce the height to 65mm.

To minimise the likelihood of grounding, it is recommended that ramp gradients for full width flat top road humps (including raised junctions) should not be steeper than 1:10. For speed cushions, the on/off ramps should not generally be steeper than 1:8. There are proprietary cushion designs incorporating curved ramps, with gradients which overall are steeper than 1:8. Little information is available on the grounding effects of curved ramp speed cushions, and it may be advisable to seek the views of the particular manufacturers of these devices.

The plateau length of flat top humps can also influence whether grounding will occur or not. Where longer wheel base vehicles (such as limousines) are likely to operate, it is suggested that the minimum plateau length should be 4m. For buses, a minimum plateau length of 6m is preferred by bus operators. In the case of speed cushions, a minimum plateau length of 1.8m or an overall minimum length of 3m, should prevent most cars being able to straddle the cushion length ways, and reduce the risk of grounding.

There have been examples of caravans and trailers grounding on humps. Using lower height humps (75mm or 50mm) can generally obviate such problems. However, on some occasions grounding has arisen because the "jockey" wheel on the towing arm has not been properly adjusted, or the caravan/trailer is incorrectly loaded. This can result in the jockey wheel or the towing arm coming into contact with the humps.

Humps on inclines

The main concern with humps on inclines, particularly for heavy vehicles, is that vehicles travelling uphill can encounter an "actual gradient" of 1 in 5 or greater when traversing the humps. Grounding can also occur. Buses can be particularly vulnerable, with the front of the vehicle grounding on the plateau when going downhill, and the rear when going uphill. Investigations by various local authorities suggest that appropriate "uphill" ramp gradients are 1:15 for inclines of about 1:10, with shallower ramp gradients (up to 1:35) for steeper inclines. "Downhill" ramp gradients of 1:10 to 1:13 appear to be satisfactory. The "uphill" ramp, is defined as the first ramp met when a vehicle is moving uphill, and the "downhill" ramp is the first ramp met when a vehicle is going downhill.

Comparison of 75mm and 100mm standard road humps

Information on some 88 road hump schemes was collected by TRL. The majority of these schemes have 75mm high road humps, but some 100mm high road humps with shallow gradients were also included.

A variety of materials had been used for the construction of the road humps, including asphalt, block paviours, pre-cast concrete, and recycled rubber.

Ramp gradients for the 75mm flat top humps were generally 1:10 to 1:15. Some were shallower, the shallowest being 1:25. The plateau lengths varied from 2.5m to 25m.

The round top humps were a standard 3.7m long.

Effects on buses

75mm high road humps generally create less discomfort for bus occupants than 100mm, high humps, and using shallower gradients will also help to reduce this further. However, the shallower the gradient the less the speed reduction. Trials by local authorities indicate that 1:15 gradients were noticeably more comfortable than 1:10 ramps, but little further gain was obtained with gradients between 1:15 to 1:20. It would appear, therefore that 1:15 would be a suitable compromise to obtain reasonable speed reduction without excessive discomfort.

Speed measurements

The overall average mean speeds found for vehicles crossing 75mm high humps were similar to the speeds for vehicles crossing 100mm high humps.

Speeds at flat top humps

The mean crossing speeds for 75mm flat top humps with gradients of 1:10 to 1:15 were between 10mph to 15mph with an overall average of 12.8mph. Previous studies had shown that the average speed across a 100mm high flat top hump, equipped with similar ramps, was 13.6mph.

The results did not show any relationship between mean traffic speed and ramp gradient within the range 1:10 to 1:15. However, higher speeds did occur with gradients of 1:20 or less. This suggests that ramp gradients of 1:15 or more are generally required at 75mm humps to obtain mean hump crossing speeds under 16mph.

The effect of the plateau length on mean speeds over the humps was minimal. The mean speeds at humps with plateau lengths of 6m to 6.5m were 1 mph faster than plateau lengths of 2.5m to 3m.

Speeds at round top humps

Mean crossing speeds for 75mm high round top humps were between 12 to 18mph, with an overall average of 14.7mph. The overall 85th percentile speed was 19mph. Previous studies of 100mm high round top humps found an overall average mean speed of 13.8mph.

Speeds between humps

Installing 75mm humps reduced mean and 85th percentile speeds between the humps by an average of about 10mph. The overall average mean speed between 75mm high humps, with ramp gradients of 1:10 to 1:15, was 20mph. The overall average 85th percentile speed was 25mph.

Mean speeds along a road before the humps are installed, and hump spacings after installation, were found to have more effect on mean "after" between-hump speeds than hump type and hump height (over the height range 75mm to 100mm). For the same longitudinal spacing, speeds between 75mm high humps (flat or round top) were around 1 to 2mph higher than speeds between 100mm high humps.

Humps spacing and "before" speeds

The "before" speed is very significant in determining resultant speeds after the humps have been installed. The higher this is the higher the after speed will be. Table 1 shows the estimated hump spacing required to achieve target mean "after" speeds between humps. This, for example, indicates that for sites with "before" speeds of 30mph, 75mm high humps with a spacing of 60m will reduce speeds between humps to below 20mph. These results represent average values, and exact target mean "after" speeds are unlikely to be achieved because of site to site variations.

TABLE 1 - ESTIMATED HUMPS SPACINGS TO ACHIEVE MEAN "AFTER" SPEEDS

	HUMP SPACING (METRES)						
	20	40	60	80	100	120	140
MEAN "BEFORE" SPEEDS	MEAN BETWEEN HUMPS "AFTER" SPEEDS						
20	13	14	15	16	18	19	20
25	15	16	17	18	20	21	22
30	17	18	19	20	22	23	24
35	19	20	21	22	24	25	26

Effects on noise and emissions

Whilst the primary purpose of road hump schemes will be to reduce speeds, and hence accidents, the environmental effects of such schemes should also be taken into account. In order to limit adverse noise or excessive emissions, the objective should be to discourage harsh acceleration and deceleration, and encourage smooth traffic flow. This may be achieved by minimising the "speed difference". "Speed difference" is defined as the difference between the mean speed at the hump, and the mean speed between humps. The closer the spacing, the smaller the "speed difference" is. For example, spacing in the region of 50m to 60m will generally result in a "speed difference" of around 5mph. Round top 75mm high humps appear to result in speeds of 2mph higher at the hump than 75mm high flat top humps using gradients between 1:10 to 1:15. Therefore, for a given hump spacing, round top humps have a smaller speed difference. The benefits of reducing possible adverse environmental effects need to be balanced against the public acceptability of providing a larger number of humps, and the cost of providing these. Trials in York suggest that the number of humps is less important than the degree of discomfort encountered.

"Upstands" on hump ramps

Upstands at the foot of hump ramps, however small, should be avoided as they can cause an unnecessary "jolt" to vehicle occupants, and discomfort (and possible danger) to cyclists. They may also result in an increase in noise.

Technical Enquiries

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References

Highways (Road Humps) Regulations 1990

The Road Humps (Scotland) Regulations 1990

TRL Project Report 186 - Traffic Calming - Road hump schemes using 75mm high humps

The Grounding of Vehicles on Road Humps - David C Webster, Traffic Engineering and Control July/August 1993

TR Project Report 18 - Road Humps for Controlling Vehicle Speeds

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TRL Report 174 - The Environmental Assessment of Traffic Management Schemes: A literature review

TRL Report 182 - Traffic Calming - Four Schemes on Distributor Roads

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