

### 3.7 VERTICAL SHIFTS IN THE CARRIAGEWAY

#### DEFINITIONS

- **Road Hump**  
A raised portion of carriageway laid at right angles to the direction of traffic. Can have flat top integrated with the footway to assist crossing movements. Usually built from kerb to kerb, or tapered to retain drainage via existing channel.
- **Cushion**  
Raised portion of carriageway with flat top, extending over part of the carriageway width only to allow exemption for certain emergency vehicles, other large vehicles and two wheelers.
- **Plateau**  
In these guidelines the term plateau is used to describe a section of carriageway (from kerb to kerb) raised via ramps to footway height covering the whole of a junction.
- **Ramps**  
The graded or sloping sections of humps, cushions and plateaux

- **Note:** Road humps are specifically covered by The Highways (Road Humps) Regulations. Plateaux may be interpreted within the regulations as flat top humps, but cushions are not covered by regulations.

1: Limited-width cushions allow buses to pass smoothly. Herne, Germany.  
(Photo: T. Pharoah)

#### OBJECTIVES

- To improve safety by reducing vehicle speeds
- Flat top humps and plateaux can have the additional objective of allowing pedestrians and wheelchairs to cross without any change of level

#### SPEED REDUCTION RATING "A"

#### DESIGN FEATURES

Vertical shifts in the carriageway are the most effective and reliable of the speed reduction measures currently available. They may be constructed in materials different from or similar to the rest of the carriageway. A change of material may be visually useful as well as helping the speed reduction effect. Vertical shifts need to be provided at frequent intervals to ensure that any increase in speed between them is kept to a minimum. Where the carriageway is raised to footway level vertical elements such as trees and bollards may need to be provided to keep vehicles out of the pedestrian areas. Furthermore a low kerb may be required to assist people with a visual handicap. Where the road hump or plateau is constructed from kerb to kerb, satisfactory arrangements have to be made for drainage.



1

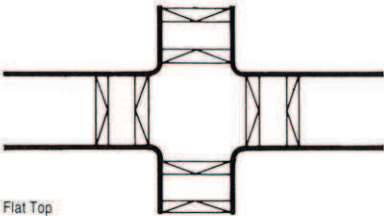
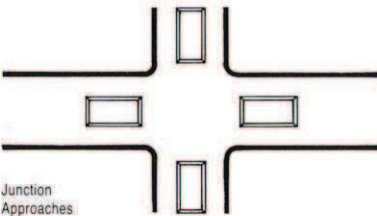
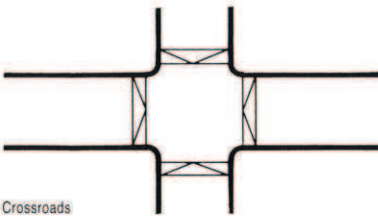
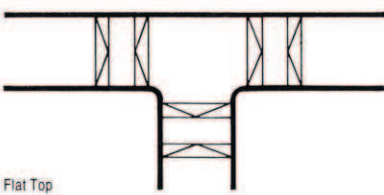
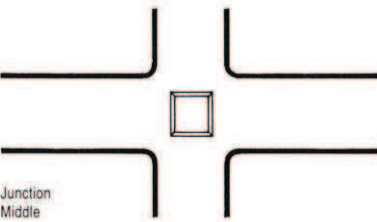
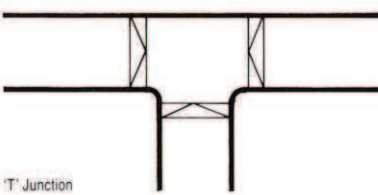
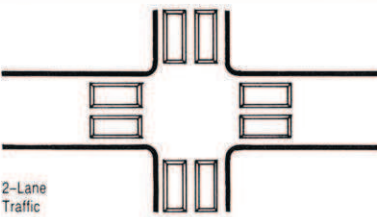





| HUMPS (ROUND AND FLAT TOP)  | CUSHIONS  | PLATEAUX   |
|---|---|--|
| <b>At Junctions</b>   |   |  |
|  <p>Flat Top</p>   |  <p>Junction Approaches</p>                        |  <p>Crossroads</p>  |
|  <p>Flat Top</p>  |  <p>Junction Middle</p>                           |  <p>T Junction</p> |
|   |  <p>2-Lane Traffic</p>                           |  |
| <b>Between Junctions</b>  |   |  |
|  <p>Round Top</p>                                      |  <p>Single Lane</p>                              |  |
|  <p>Flat Top<br/>Also Provides Pedestrian Facility</p> |  <p>2-Lane Traffic</p>                           |  |
|   |  <p>With Pedestrian Facility (dropped kerbs)</p> |  |

DIAGRAM 3.7.1 VERTICAL SHIFTS



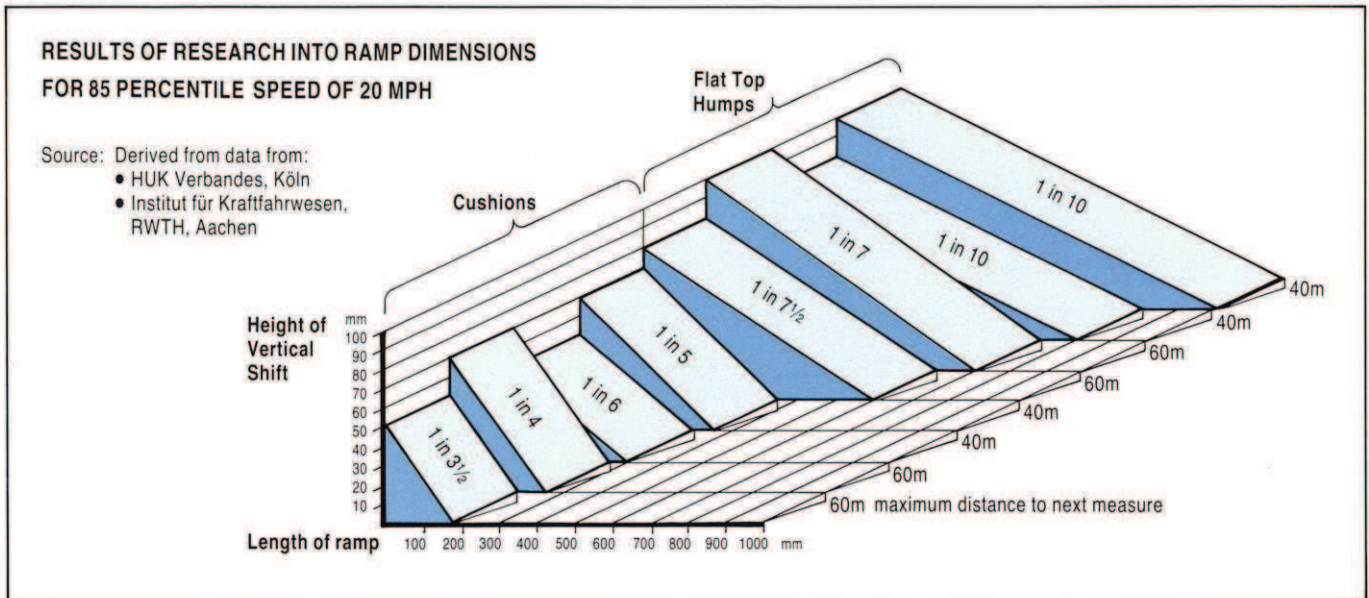


DIAGRAM 3.7.2

The provision of road humps has to comply with The Highways (Road Humps) Regulations and it should be noted that road humps must be located along a road so that they are always preceded by a speed reducing feature. See also the Department of Transport Circular Roads 3/90 and Traffic Advisory Leaflet 2/90.

#### APPLICATION

Vertical shifts are necessary wherever excessive speed has to be prevented. They have been used mainly within "living" areas, namely in slow speed "Woonerf" type schemes, and in 20 mph zones. Shifts with less severe dimensions have been used successfully on 30 mph roads and on bus routes. Flat top humps are more useful than

round top humps at places where pedestrians cross.

Cushions are easy to install and are designed not to affect certain emergency vehicles, other large vehicles and two wheelers but at the present time they are not covered by regulations.

#### DIMENSIONS

The dimensions and profile of the change in level of vertical shifts depend mainly on the target maximum speed and have to be chosen accordingly. For a given target speed, effectiveness depends on three factors:-

- Height of shift
- Gradient of ramp or profile of slope
- Distance between measures

2: Road humps at Duke Street, Totnes reduce speeds in a residential area. (Photo: Devon County Council)

3: Flat top humps in Burnthouse Lane, Exeter allow pedestrians to cross at a point where vehicle speeds are at their lowest. (Photo: Devon County Council)

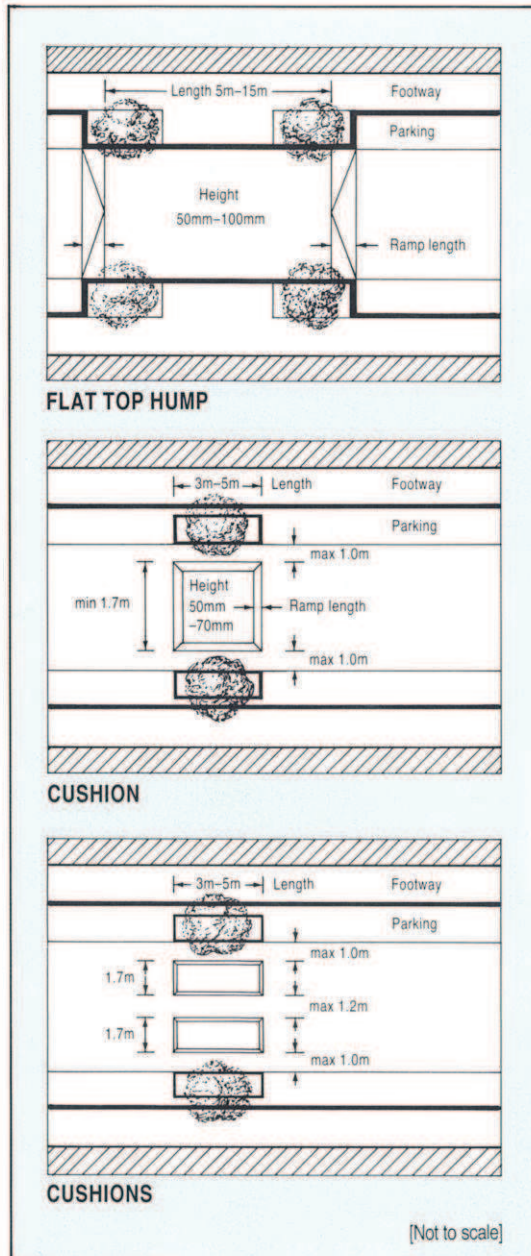


DIAGRAM 3.7.3 APPLICATION OF FLAT TOP HUMPS AND CUSHIONS



2



3

Diagram 3.7.2 shows the results of some research into the relationship between these three factors to achieve an 85 percentile traffic speed of 20 mph.

To achieve an 85 percentile traffic speed of 10 mph, more severe shifts are required and maximum distance between measures should be 30m.

To achieve an 85 percentile traffic speed of 30 mph (e.g. for "mixed priority" streets), less severe ramps with dimensions of 80mm or 100mm (height) by 2m or 2.5m (length) are recommended. The resulting ramp gradient of 1:25 has been found to be



effective in trials in Denmark and Germany. However, Dutch guidelines recommend a more gentle ramp gradient of 1:40 with a 120mm ramp height. (It should be noted that the maximum height permitted under The Highways (Road Humps) Regulations is 100mm.)

#### SUPPORTING MEASURES

Vertical shifts have a poor visual effect and require combination with supporting measures to reinforce the intended driving behaviour, and to convey to drivers the “calm” atmosphere of the street. In the absence of supporting measures they may be resented by drivers and disliked by residents. Moreover, it appears that for a given target speed, vertical shifts need to be more severe when the character of the street is unchanged. Particularly effective supporting measures include carriageway narrowings and the inclusion of vertical features such as trees and street lighting.

#### POSITIVE FACTORS

- Best in terms of speed reduction effectiveness, including virtual elimination of “reckless” high speeds
- Easy installation which does not require repaving or reconstruction of the street
- Applicable to most street locations
- Cushions can provide exemption for certain emergency vehicles, other large vehicles and two wheelers and do not interfere with drainage

#### NEGATIVE FACTORS

- Vertical shifts do not by themselves contribute to change of character or environmental improvement and some designs are regarded as unsightly
- Road humps do not discriminate between classes of vehicle and can be unpopular with bus operators
- Flat top humps and plateaux need careful design for people with a visual handicap, and may require partial reconstruction of the street
- In the case of cushions high speed motorcycles could still cause problems as they are able to avoid the vertical shift