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Figure I.2 Pedestrian casualty characteristics 2016 (DfT, 2017a)

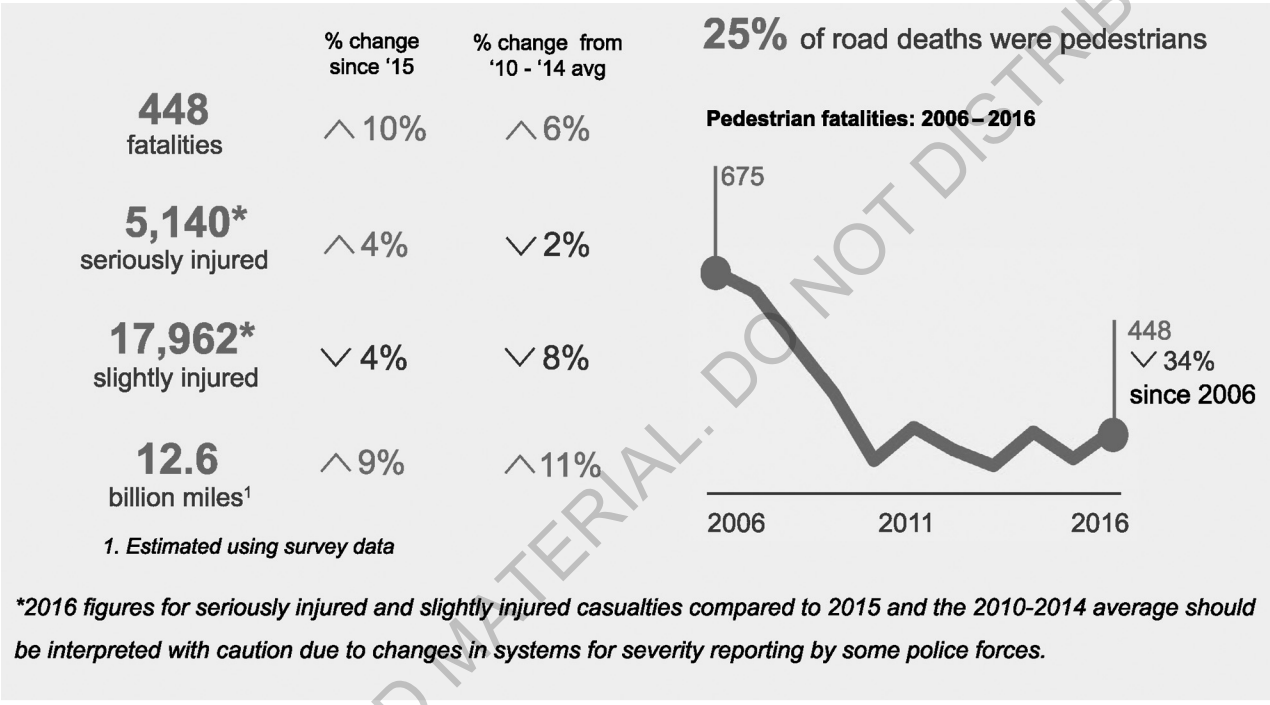
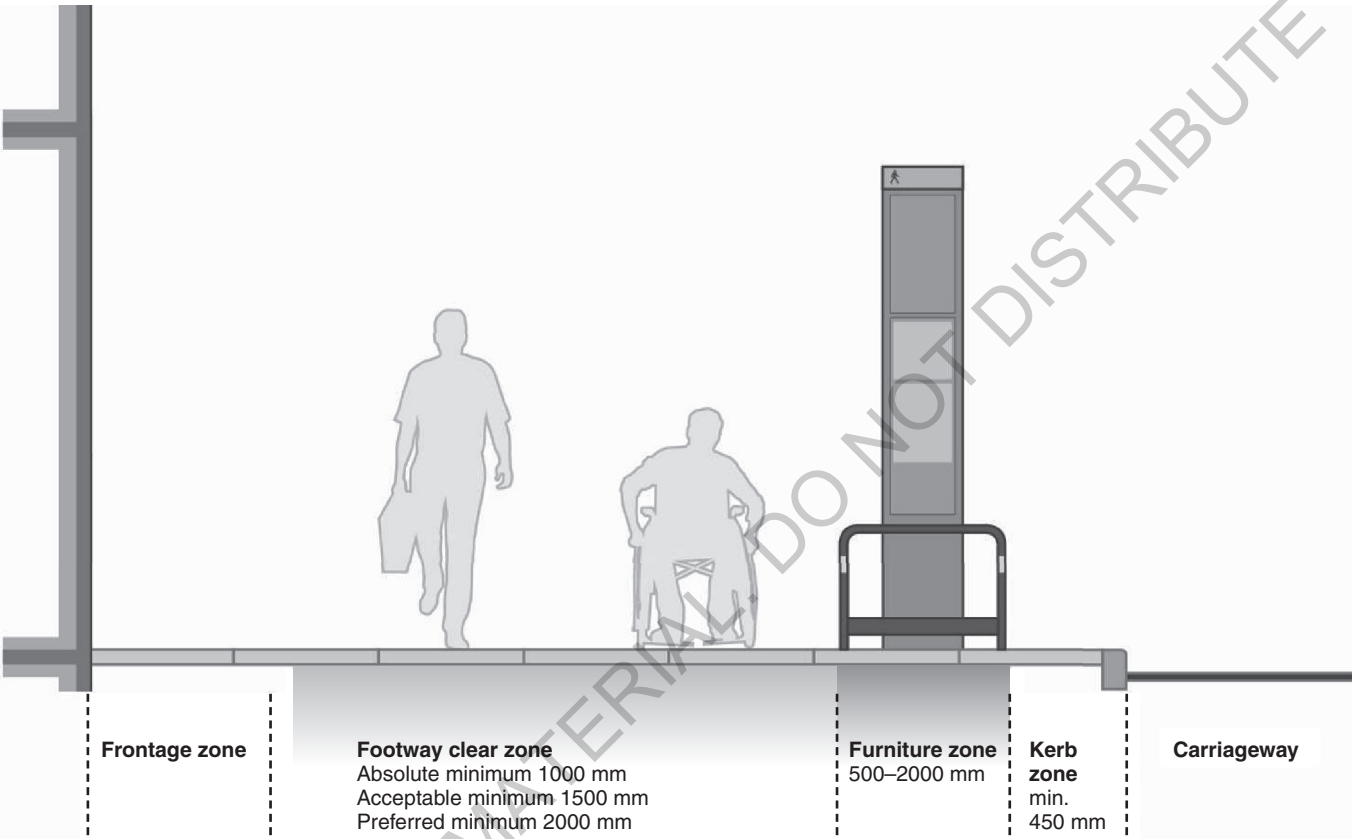


Figure 3.1 Zones and functions within the streetscape (TfL, 2017)



3.4.1.1 Head movements

The average number of head movements, ranging from 1.18 to 2.88, made by the children did not reach the three head movements (look right, look left, look right again) that would be expected from the Green Cross Code. However, many of the pedestrians had made head movements as they approached the location on the kerb from which they crossed. Interestingly, although in most locations the children made more head movements than the adults, for the heavy traffic situation at Camberley, the adults were recorded as making an average of 3.05 head movements, compared with 2.64 for the children.

3.4.1.2 Delay time

Delay times for the children ranging from 3.7 to 7.8 s appear to be considerably greater than those for the adults, again with the exception of the heavy traffic situation at Camberley, where the delay time for adults was 9.5 s compared with 7.8 s for the children.

3.4.1.3 Green Cross Code compliance

Between 19% and 73% of pedestrians stopped at the kerb, and between 5% and 56% looked both ways at the kerb. Yet only between 0% and 5% of pedestrians observed the Code in its entirety.

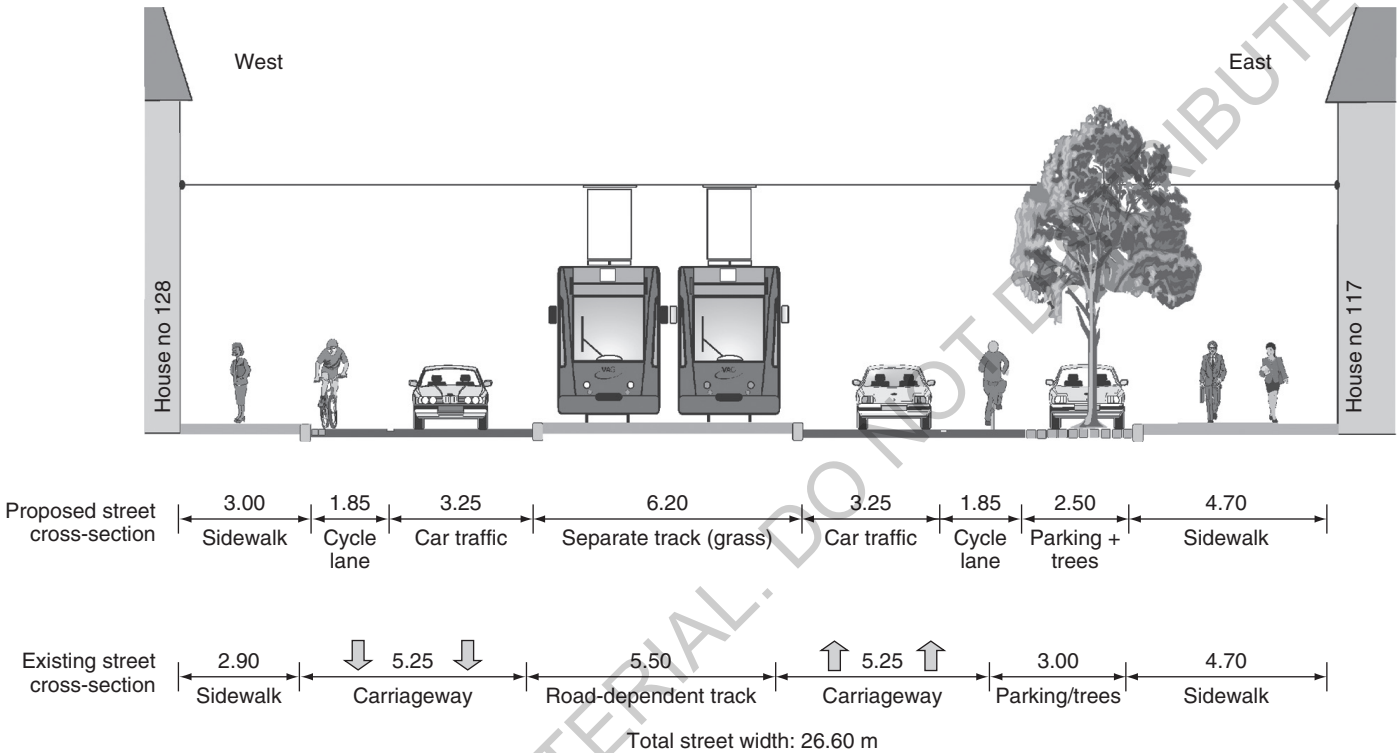
3.4.2 Pedestrians' delay related to vehicle volumes

In a study of delays to pedestrians at different types of crossing (Goldschmidt, 1977), predictive equations were developed, which linked vehicle volumes to the delays. For example, using some of the relationships developed, for a traffic volume of 500 vehicles per hour at random points on a kerbside, the mean pedestrian delay was 2.4 s. Correspondingly, approximately 40% of pedestrians delayed.

3.4.3 Age-related effects

Age-related differences in crossing behaviour were examined at three roads in busy shopping areas (Wilson and Grayson, 1980).

Figure 5.3 Example of street design cross-section (Jones *et al.*, 2007); the suggestion is to convert the central portion of the street (currently shared by trams and general traffic) to a dedicated tramway, and to add cycle lanes. The segregated tram and cycle tracks are to be accommodated in this street design section by reducing the number and width of lanes for general traffic. In this design, the 'link' status is higher than the 'place' status



Urban roads have lower design speeds and are often more congested than roads in rural areas. Generally, drivers do not expect rural standards in urban areas and the restriction of width can assist with the encouragement of low speeds, which is of safety benefit, owing to the large number of accesses and non-motorised users (NMUs), particularly those crossing the road. On urban roads, the carriageway edge treatment will generally include positive drainage and kerbs, which provide additional edge restraint and support for raised footways and verges.

The size and extent of typical features above ground that may need to be accommodated in the verge and central reserve of an urban road are illustrated in Figure 5.4. The possible need for future features above and below ground should be considered and the design made accordingly. A balance should be struck between safety, environmental impact, cost, construction feasibility, operation and maintenance.

5.2.4 Non-motorised users (NMUs)

It is essential that design organisations integrate facilities for NMUs in the design at an early stage so design organisations must understand the highway environment, in relation to the

Figure 5.4 Typical features to be accommodated in the cross-section (DfT, 2005a)

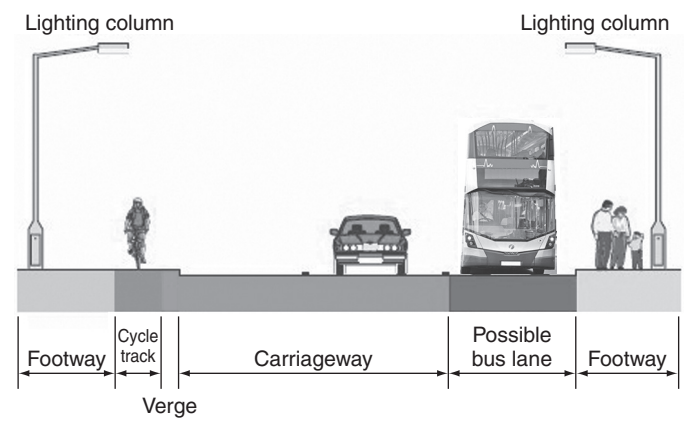


Figure 8.7 Layout of a location for pedestrians to cross (DfT, 2005)

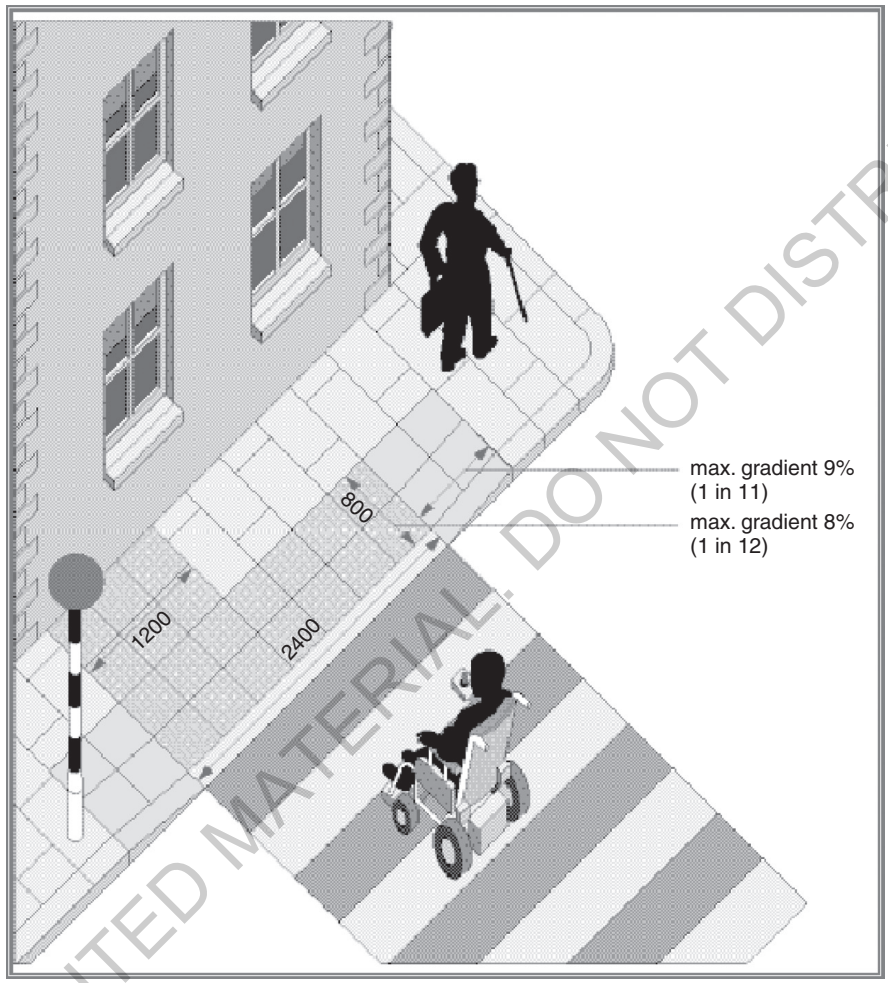


Figure 8.8 Plan of a typical concrete crossover (HA, 2010)

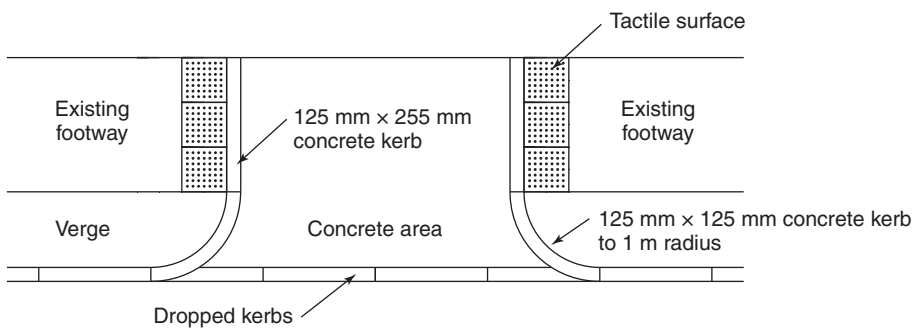
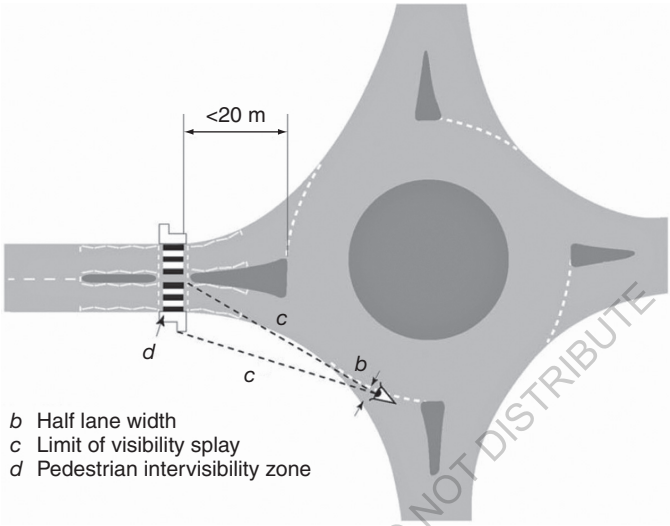


Figure 9.5 Visibility required at entry to pedestrian crossing at next exit (DfT, 2007a)



(DfT, 2004), TD 9/93 (DfT, 2002) and the *Traffic Signs Manual* (DfT, 2003b, Chapter 4) address many of these matters.

NOTE
As described in Chapter 6, this consideration of drivers' intervisibility does not address the pedestrians' need to see an approaching vehicle at an adequate distance to enable a safe crossing, compounded by the Highway Code*'s advice to drivers to look to their right for vehicles as they approach the roundabout.*

In comparison with design in the UK, an example of a roundabout in Holland is shown in Figure 9.6. Provision for pedestrians and cyclists is clearly shown, emphasising desire line continuity and non-motorised user priority.

9.8. Summary

Key features of roundabouts as they apply to pedestrians have been outlined in this chapter. Although designed primarily with motor vehicle traffic capacity and safety in mind, various methods of accommodating non-motorised users, including pedestrians, are also addressed.

Problems for pedestrians, however, remain, in terms of necessary deviation from desire lines and lack of consideration of pedestrians' visibility requirements. These matters should be addressed in the analysis stage to ensure that pedestrians are accommodated to the maximum extent possible.