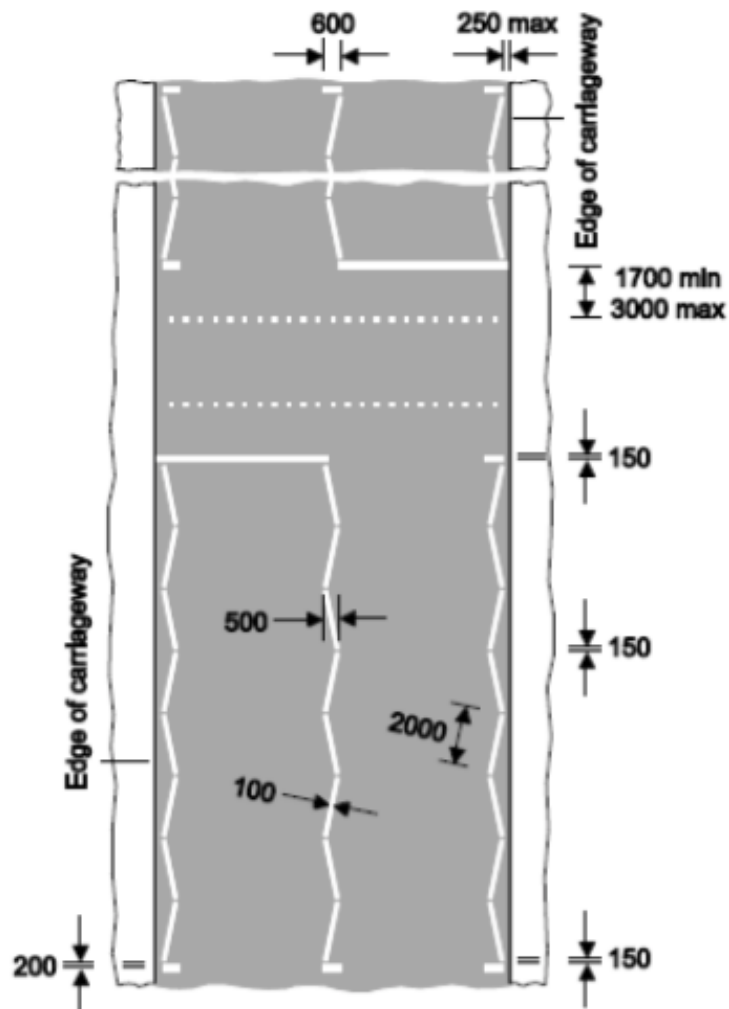


## DS.308 Zig-zag line markings

Rev.	Status	Created by	Date	Approved by	Date
A	Final	D.Farnham	19.01.12	D.Waters	08.02.12
B	Final	D.Farnham	10.11.13	D.Waters	14.11.13
C	Final	G Lake	24.06.19	D Foden	24.06.19



## 1 Introduction

### 1.1 Notes

- a. This standard explains requirements about the use and design of 'controlled area' road markings at Stand Alone Controlled Crossings. Controlled area markings are sometimes known as 'zig-zag' markings.
- b. See the SSDM webpages at [www.southwark.gov.uk/ssdm](http://www.southwark.gov.uk/ssdm) about the design of streets and spaces.

### 1.2 Discussion

- a. Lines of zig-zag markings are used to define 'controlled areas' on the approach and exit from Stand Alone Controlled Crossings. These are zebra, pelican, puffin, toucan or equestrian Controlled Crossings that do not form part of a Signalised Junction arrangement.
- b. Most vehicles in most circumstances may not stop (except where directed to by the traffic signals or required to do so in order to allow pedestrians to cross the zebra), wait, load, or overtake within the 'controlled area' defined by the lines of zig-zag markings.
- c. See Appendix A for further discussion.

## 2 Requirements

### 2.1 Arrangement of zig-zag lines

#### 2.1.1 General

- a. As per the requirements of the Pedestrian Crossing Regulations 1997, where Stand Alone Controlled Crossings are provided then, in order to define their 'controlled areas', lines assembled from zig-zag marks must be located within the carriageway, both upstream and down-stream from them, along both:
  - i. either edge of the carriageway
  - ii. the centre of the carriageway (though see 'b')

For zebra crossings this arrangement is stipulated within diagram 1 of schedule 1 of the Pedestrian Crossing Regulations 1997. For pelican, puffin, toucan and equestrian crossings it is stipulated in diagram 1 of part 4 of the same Regulations for two way streets and diagram 4 for one way streets. These basic arrangements are varied somewhat in the sub-sections of this design standard that follow in order to respond to the presence of Traffic Islands.

- b. If the carriageway width is  $\leq 6000\text{mm}$  then the Regulations permit the central line of zig-zag marks as '2.1.1.a.ii.' to be replaced with a diagram 1004 'warning line' (see standard DS.307). This replacement should always be made whenever it is a possibility.

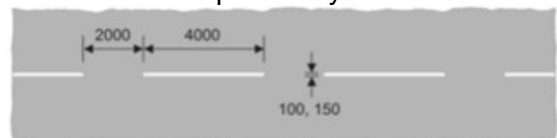


Diagram 1004: Vehicular traffic should not cross or straddle the line unless it is safe to do so and when the line is used to indicate a cycle lane, motor vehicles should not enter that lane (longitudinal marking).

- c. See standard DS.303 about the proximity of pedestrian crossing stop lines to the crossing area. This will determine the point from which each line of zig-zag marks commences.

#### 2.1.2 Through Crossings

##### Zebra crossings

- a. If a Traffic Island is provided as part of a Through Crossing arrangement then line arrangements should be as per diagram 1 (see below) of schedule 1 of the Pedestrian Crossing Regulations 1997 (e.g. just the same as were there no Traffic Island). However, the central line of zig-zag marks should be inclined to one side of the Traffic Island.

*NOTE: Statutes do not allow for the centre line to be doubled up (e.g. inclining a separate line to each side of the Traffic Island). However, if a Traffic Island is of a substantial width (e.g. > 2.5m) or if it extends for the entire controlled area, the crossings to either*

side can be assumed to be separate and within their own distinct carriageways. As such the usual arrangement of 3 lines of zig-zag marks (one to each side and one to centre) should generally be provided to each of these carriageways. An exception is where the carriageway to either side is a single lane width only such that the providing a central line of zig-zag marks within this would be confusing for road users.

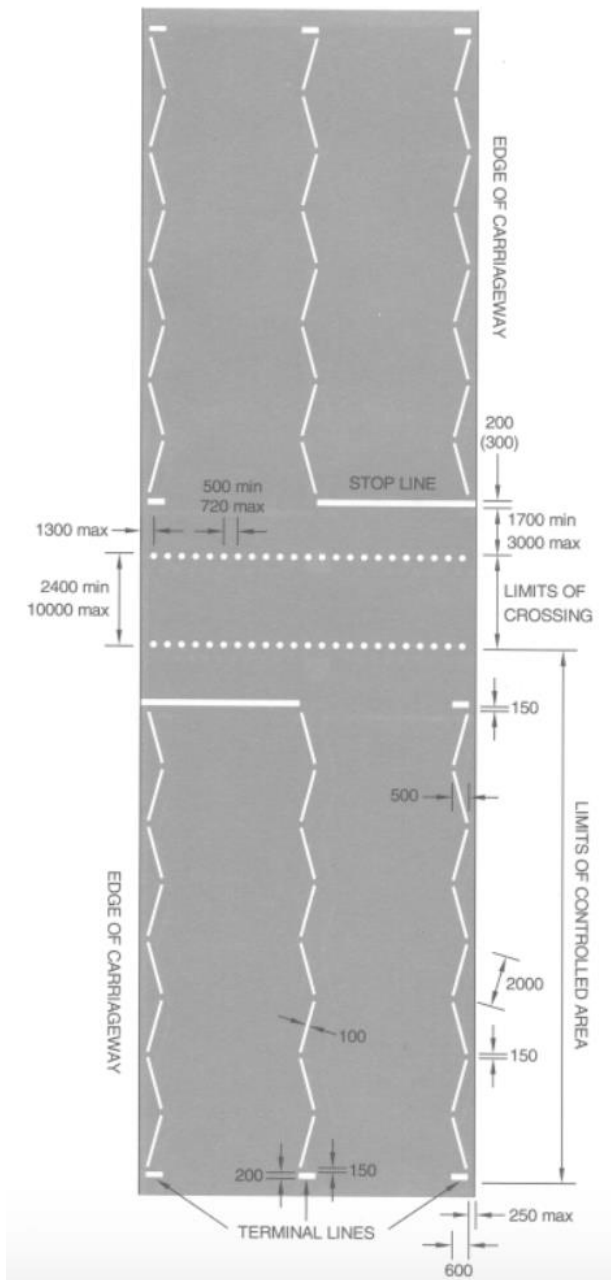


Diagram 1 Pedestrian Crossing Regulations 1997

Pelican, Puffin, Toucan and Equestrian crossings

- b. Line arrangements should be as per
  - i. diagram 2 of schedule 4 of the Pedestrian Crossing Regulations 1997 for two-way streets (below).

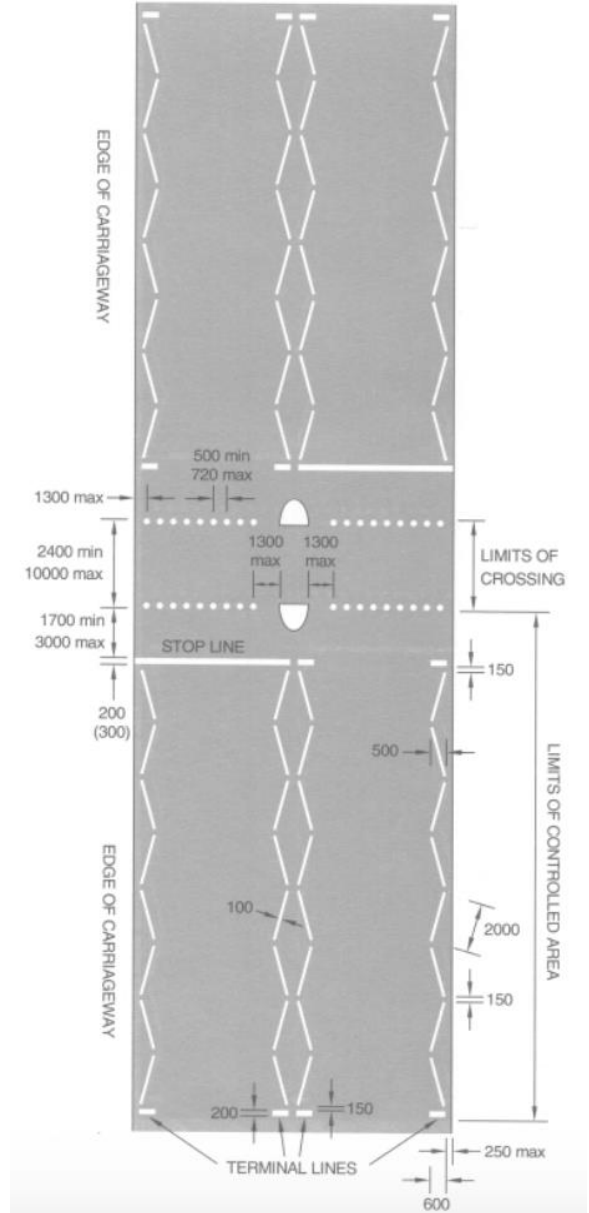


Diagram 2 Pedestrian Crossing Regulations 1997.

- ii. diagram 5 of schedule 4 of the Pedestrian Crossing Regulations 1997 (below) for one-way streets (see note).

**NOTE:** The above both involve providing two central lines of zig-zag marks – one aligned to each side of the island. However, whilst it is permitted as an option within the Regulations, it is a local requirement of the Highway Authority that hatch or chevron markings to

diagram 1040 or 1041 should not be located between these two central lines. See standard DS.309 for further details on this point.

road markings between the centre lines as per standard DS.309 requirements.

## 2.2 Number of zig-zag marks per line

*NOTE: In the following, the term Mark Unit Length refers to the total longitudinal distance of the laid mark measured along the carriageway, as opposed to measured along the length of the dash line (which is always laid at an angle).*

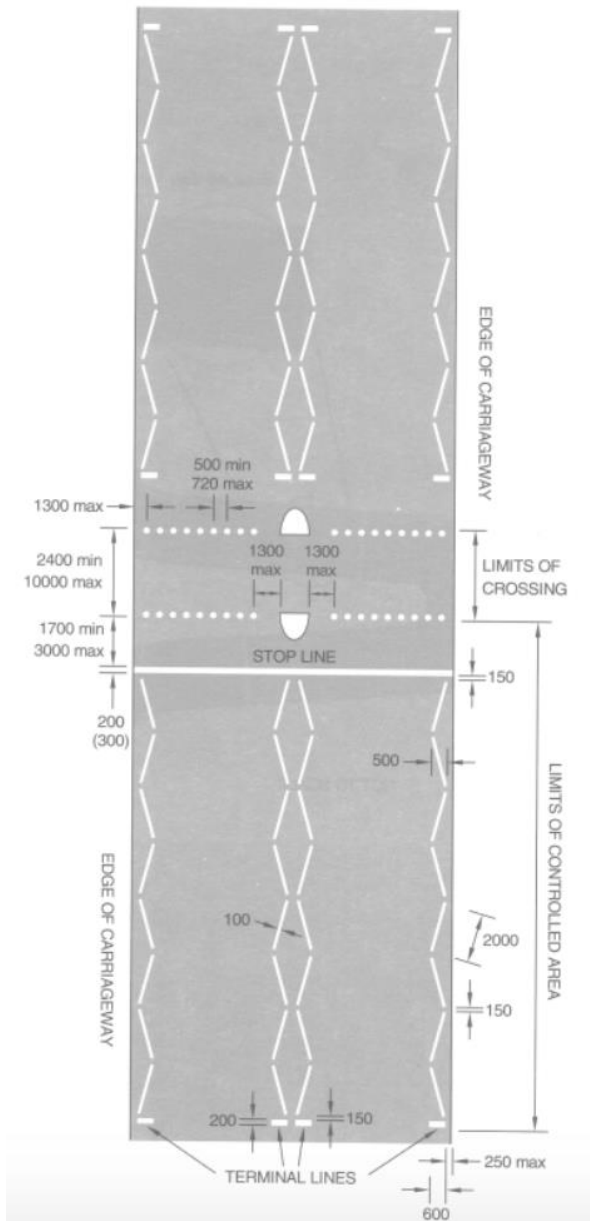


Diagram 5 Pedestrian Crossings Regulations 1997.

### 2.1.3 Split Crossings

#### Zebra crossings

- a. Line arrangements should be as per '2.1.2.a'.

#### Pelican, Puffin, Toucan and Equestrian crossings

- b. Line arrangements will be determined on a case specific basis with approving officers. The key concern will be avoiding the use of chevron or hatched

Speed limit of road	Number of marks		
	Approach line	Exit line	Centre line
20mph	4 marks	2 marks	As per the lesser of the approach or exit lines
30mph	8 marks	4 marks	

Table 1 - Summary of standard requirements for number of marks in different lines

### 2.2.1 Road Safety Audits and review of number of marks in Quality Audits

- a. Notwithstanding requirements elsewhere in this sub-section for
  - i. the number of marks within 'controlled area' lines
  - ii. the Mark Unit Length of individual such marks

if any Stand Alone Controlled Crossing is introduced or amended by proposals, then the acceptability of its arrangement should be identified as a Point Of Enquiry within the Audit Brief for any Road Safety Audit that is undertaken. Following receipt of the Audit Report, the number of marks and Mark Unit Lengths with related 'controlled areas' should always be reviewed to understand any identified potential safety issues and to consider whether either

- iii. these should be increased to address the potential issues
- iv. other changes to the design proposals should be made to the same ends

Normally that review will take place as part of a following Quality Audit.

### 2.2.2 Approach side to crossing

- a. On 30 mph streets

- i. 8 zig-zag marks should be used
- ii. the Mark Unit Length for each should be 2000mm

The number of marks and Mark Unit Length may be increased or decreased if sufficient safety grounds for doing so can be demonstrated. Normally this will be by reference to potential problems identified in a Road Safety Audit (see section 2.2.1) and it being agreed that there is no alternative means of reasonably addressing these. Approving officers also have discretion to instruct an increased or decreased number of marks or Mark Unit Length on the same grounds.

- b. On 20mph streets
  - i. 4 zig-zag marks should be used
  - ii. the Mark Unit Length for each may be reduced from 2000mm to 1500mm if required

The number may be increased or decreased if sufficient safety grounds for doing so can be demonstrated. Normally this will be by reference to potential problems identified in a Road Safety Audit and it being agreed that there is no alternative means of reasonably addressing these. Approving officers also have discretion to instruct an increased number of marks on the same grounds.

*NOTE: The reduction as per '2.2.2.b' from the statutory norm of 8 marks is on the grounds of the 'character' of the road given the lower speed limit. In addition it is considered that the provision of long extents of zig-zags can create a highway dominated character within roads - which may negatively influence road user behaviour. This is in direction opposition to the character within the road that the Highway Authority wishes to achieve in most instances wherein vehicle users are more accepting and courteous of pedestrians informally crossing roads owing to a reduction in the number of traffic signs that create the impression that this is the domain of vehicles only.*

### 2.2.3 Exit side to crossing

- a. The number of marks used to lines of zig-zags on the exit side of a crossing should be
  - i. 2 on 20mph streets
  - ii. 4 on 30mph streets

However, the number may be increased by if sufficient safety grounds for doing so can be demonstrated. Normally this will be by reference to potential problems identified in a Road Safety Audit and it being agreed that there is no alternative means of reasonably addressing these. Approving officers also have discretion to instruct an increased number of marks on the same grounds.

*NOTE: The reduction as per 'a' from the statutory norm of 8 marks is on the grounds of both character and layout as only seldom do safety risks within the road that would effect users of crossings or those passing through them exist on the exit side. Meanwhile the provision of long extents of zig-zags can create a highway dominated character within roads which may negatively influence road user behaviour.*

### 2.2.4 Centre line

- a. The number of marks used for central lines of zig-zags should match that of whichever is the shorter of the approach or the exit lines. However, a greater number than this may be used if sufficient safety grounds for doing so can be demonstrated. Normally this will be by reference to potential problems identified in a Road Safety Audit and it being agreed that there is no alternative means of reasonably addressing these. Approving officers also have discretion to instruct an increased number of marks on the same grounds.

*NOTE: The potential reduction as per '2.2.3.a' from the statutory norm of 8 marks is on the grounds of character as the provision of long extents of zig-zags can create a highway dominated character within roads which may negatively influence road user behaviour.*

### 2.2.5 In vicinity to side road junctions

- a. If a Stand Alone Controlled Crossing is located immediately beyond or preceding a side road junction (or arm feeding into a roundabout) then the number of marks within the line of zig-zags provided at the edge of carriageway on the approach or exit should be reduced down to the minimum (see note 1) required to line the entire near-side kerb back to the side road junction mouth. Where reduced down to the absolute minimum of 2 marks, these marks may overlap with the side road junction mouth itself should the crossing be so close that they cannot reasonably be located beyond the junction mouth. All of this paragraph is subject to
- i. the Mark Unit Length for each mark being 1500mm. This may be reduced to 1000mm by level 1 departure
  - ii. the position of the far side of the side road carriageway where it joins the main road or circulatory being beyond that point that would be reached by the typical number of marks at the typical Mark Unit Length (as stated in the paragraphs in this sub-section).

*NOTE 1: The minimum number of lines should be not less than 2 nor more than the typical number for that circumstances stated in the paragraphs of this sub-section that follow.*

*NOTE 2: The reduction as per '2.2.5.a' from the statutory norm of 8 marks is on the grounds of layout of the road. The Highway Authority does not recognise any benefit in extending markings across side roads as it is unlikely that vehicles will choose to wait or load there. Meanwhile, the provision of long extents of zig-zags can create a highway dominated character within roads which may negatively influence road user behaviour. This is in direction opposition to the character within the road that the Highway Authority wishes to achieve in most instances wherein vehicle users are more accepting and courteous of pedestrians informally crossing roads owing to a reduction in the number of traffic signs that create the impression that this is the domain of vehicles only.*

- b. If approach or exit zig-zag lines are extended across the total width of a side road, and a give-way line is used across this, then no diagram 1009 'edge of carriageway' markings should be provided with the give-way line (see note). An exception to this is if the side road exists at a cross road intersection wherein these markings may be retained by level 1 departure.

*NOTE: The zig-zags are likely to provide sufficient definition of the edge of carriageway themselves.*

### 2.3 Introduction of waiting restrictions where number of marks reduced from the statutory norm of 8

- a. If the number of marks used in a line is reduced from the statutory norm of 8 then Waiting Restrictions that are enforceable at any time should be introduced to that length of carriageway beyond the zig-zags for the distance that the full 8 marks would have extended. Exceptions to this include
- i. to lengths that are occupied by side road junctions. No such restrictions are required.
  - ii. on the exit side of the Controlled Crossing. Parking bays may be permitted within the length by level 1 departure. However, this should always be reviewed further to the findings of any Road Safety Audit of the proposals (see section 2.2.1).

### 2.4 Location of zig-zag markings in relation to road humps

- a. Designers should note that statutory requirements within the Highways (Road Humps) Regulations 1999 about the location of Stand-Alone Controlled Crossings on Road Humps are not applicable within Greater London.

*NOTE: Section 90 of the Highways Act 1980 provides that those Regulations only apply outside of London.*

## Appendix A - Further discussion

### 1 Background

- a. The main Regulatory requirements for the use of zig-zag markings can be found in
  - i. The Pedestrian Crossing Regulations 1997. These relate to zebra, puffin and pelican crossings. Schedules to these Regulations set out in extensive detail how lines of zig-zag marks may be arranged for each type of crossing.
  - ii. The Traffic Signs Regulations and General Directions (TSRGD). These introduce prescribed traffic signs for use with toucan and equestrian crossings (as well as a few minor road markings for use with other types of crossings) and, by cross reference, apply many of the requirements of the Pedestrian Crossing Regulations 1997 to these. See diagram 1001.5 and direction 49 in particular.
- b. The Pedestrian Crossing Regulations 1997 provide the baulk of Regulatory requirements (see note). These require that a minimum of 8 marks are provided within each line as standard (with each zig or zag being one mark) and a maximum of 18. However, where the Traffic Authority (Southwark Council in Southwark except on TRLN routes) is satisfied by reason of the 'layout' or 'character' of any roads in the vicinity of a controlled crossing that it would be impracticable to meet these requirements, then the Regulations permit the number of lines to be reduced to a minimum of 2. They also permit a variety of other variations to the orientation of the crossing and the distance at which stop lines are located. However, the Regulations are clear that the grounds of 'layout' and 'character' apply only to the road itself and not to adjoining land or premises.

*NOTE: The Secretary of State for Transport has indicated their intention to consolidate requirements into the TSRGD by future*

*revision. This is not expected to occur until 2015.*

- c. It is *not* the purpose of zig-zag lines to provide visual warning to motorists that they are approaching a crossing but rather to define an area in which they should not park or overtake (unless instructed to do so by signals). Prevention of parking is seen as important to safety as vehicles parked too close to crossings may obscure views for other drivers of pedestrians about to cross the road. Pedestrians will often attempt to cross in the vicinity of controlled crossings (rather than directly on them) so sight lines need to be maintained for some distance.
- d. In recent years, some designers have questioned the visual impact of zig-zag lines and the need for such long lengths in urban areas where vehicles speeds are typically much lower. This has resulted in the use of lines with less than the standard 8 marks in some schemes.
- e. In respect to the visual impact of the lines, three arguments are generally extended.
  - i. The first is that the lines are simply ugly and spoil the view. Many designers would agree that zig-zags are amongst the most defacing road markings.
  - ii. The second is that the excessive length of the lines creates too much 'visual noise' for drivers and may lead to the marks being lost amongst the background of the many other signs and road markings often found on streets. This may lead to the important message they are intended to convey being undermined. Reducing the length of lines might help make them appear more distinct by allowing a greater gap to be opened up between these and other road markings. Proponents of this argument point to the fact that the DfT themselves encourage strict minimisation of signs and road markings for these reasons. However, greater distinction of zig-zag lines could of course also be achieved by reducing the unnecessary use of other road

- markings in their vicinity.
- iii. The third is the most nuanced and takes in aspects of the other two. This is that the lines may actually contribute to less attentive and considerate driving due to the physiological impact they have on street users. This is a very complex argument and takes in aspects of how the visual noise created by lines masks drivers awareness of people, place and architecture, as well as how they might lead drivers to feel a sense of priority and segregation from these other aspects of streets. A simple means of illustrating the reasoning sometimes used by proponents of this argument is to ask

- why someone might drive differently on a busy urban motorway compared to on a route through a pretty cobbled European square?
- what it is about these two environments that would lead them to do so?

Whilst there is a growing body of research<sup>1</sup> to support aspects of this argument, it is still not complete and some aspects are contested<sup>2</sup>.

- f. From a traffic speed perspective, some designers point to the fact that statutory requirements for the lengths of zig-zag lines were drawn up before use of 20mph restrictions became widespread. In Southwark, 30mph streets are becoming the exception rather than the rule. The suggestion is that at reduced

speeds, stopping distances are decreased and that the length of zig-zag lines could therefore be similarly reduced down from the standard 8 towards the statutory minimum of 2. The statutory grounds for doing so would be the 'character' of the road as a 20mph street. Issues related to visibility of pedestrians who may be about to cross in the vicinity of the crossing point could be addressed by other design measures. Annual road casualty statistics for Greater London<sup>3</sup> provide some further context. On the one hand, statistics show that, whilst pedestrian casualties within 50m of a controlled crossing are unfortunately common, reported incidents within the area in which zig-zags would likely be used are much lower. This suggests that zig-zags may provide important safety benefits. However, it is also reasoned that this local reduction could be down to the use of pedestrian guard rails alongside controlled areas (which until very recently was typical). On the other hand, casualty statistics show that nearly all reported casualties involving pedestrians occur on roads with a speed limit of 30mph or greater. This suggests that the length of zig zags might not be of such concern on 20mph roads.

## 2 Current Approach

- a. As Highway and Traffic Authority for most roads in Southwark, the Council considers that there is a case for reducing the number of marks used in lines of zig-zags beneath the Regulatory norm of 8 on 20mph streets. It also considers that reductions could be justified in some other circumstances too on account of the overall layout of the road. Particular circumstances include
- i. where crossings are very close to side roads. There seems little apparent benefit from extending lines across side road junctions given that vehicles will not park in front of these
  - ii. on the exit side of crossings. It seems sensible to permit some reduction in

<sup>1</sup> See for instance; Department for Transport, (2009) Local Transport Note 3/08 Mixed Priority Routes; Kennedy et al., (2005) Psychological traffic calming - TRL641; Gibbard et al., (2004) The effect of road narrowings on cyclists - TRL621; Basford et al., (2002) Driver's perceptions of cyclists; Countryside Agency, (2005) Mini Guide to Rural Road safety and Traffic Calming; Wiltshire County Council, (2004) White line carriageway markings; Jameson et al., (2008) Road safety report no.100 – Interaction between speed choice and road environment; York, I. et al., (2007) The Manual for Streets – Evidence and Research – TRL661; TRL (2011) Infrastructure and Cyclist Safety – TRL Report PPR 580.

<sup>2</sup> See for instance Moody, S. and Melia, S. (2011) Shared space - implications of recent research for transport policy. Transport Policy . ISSN 0967-070X (Submitted).

<sup>3</sup> Transport for London, (2010) Pedestrian casualties in Greater London.



the length of lines once drivers are beyond the crossing.

- b. However, because of the potential safety implications, reductions need to be implemented with care. A key concern for designers are independent Road Safety Audits of proposals. These are conducted to consider whether proposals are safe, identifying issues that designers may need to revisit. However, auditors will not comment on whether proposals are 'overly safe'. This means that auditors are very unlikely to consider whether the extent of zig-zag lines should be reduced – only whether they should be increased. Because of this the Highway Authority considers it appropriate to start from the position of using less than 8 marks in some situations. The safety of using this reduced number can then be tested through the Road Safety Audit. The Audit Team will be asked to expressly provide their comments on the safety of the proposals in the vicinity of the crossing. The number of marks used will be reviewed after the audit to consider whether this needs to be increased or if other methods should be introduced to address any safety issues noted by the Audit Team.