Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 – Design Standards and Advice

Hertfordshire

3rd Edition – Version 1 – January 2011

Contents

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 1 – Road Design Criteria

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1. Road Design Criteria

1.1. Introduction

For general guidance on the layout and design considerations of roads, reference should be made to the Design Manual for Roads & Bridges (DMRB) and Manual for Streets (MfS).

Section 2, Chapter 8: Road Hierarchy details the expected design characteristics for different categories of road.

HCC requires the use of two different approaches to highway design depending on the character and function of the road. The first is the standards based traditional design approach based on the Design Manual for Roads and Bridges. This is for use on roads where the primary function is conveyance of through-traffic or the "movement" function of the road.

The second is context-based MfS approach where the aim is to build a sense of community or to prioritise the movement of vulnerable road users such as pedestrians above the private motor vehicle or in other words, prioritise the "place" function of the street. Typically this means that MfS is applied in residential areas and areas where there is a significant "community" usage such as a high street.

HCC's policy position on the use of these two sets of design approaches is set out in Section 1, Chapter 1: Introduction, Standards and informal Consultation. It is recognised that there are no rigid rules on which design approach will apply and indeed there are significant areas of the network where a hybrid approach is most appropriate (for example some rural locations). The designer is therefore strongly advised to seek pre-application discussions about the area with HCC in order to ascertain which approach will be most appropriate.

In urban situations, MfS should generally be used where the speed limit is 30mph or less. In non-urban locations, when the 85th percentile speed is 37.5mph or less and it has significant 'place' function, then it is reasonable to apply the recommendations of MfS in terms of visibility and layout. Where adjacent sections of road follow different design codes, great care should be taken to ensure that the transition is safe and clear to all road users.

1.2. 'Gateway' Features

A 'gateway' is a combination of features at the entry of an area where roadspace is re-prioritised towards different users. They are used to give a better sense of "place". A gateway feature is essential at the entrance to a Shared Surface road or Home Zone. General guidance is given in Local Transport Note 1/07 and Traffic Advisory Leaflet 13/93.

1.3. Target Maximum Speed

The term 'Target Maximum Speed' (TMS) should not be confused with the speed limit or design speed for a particular road. The TMS is the desirable maximum speed for vehicles. At worst, the 85th percentile speed should be not greater than the TMS.

It will not be uncommon for the TMS to be less than the statutory speed limit on a road. For example, a major access road may have a speed limit of 30mph but a TMS of 25mph.

Guidance on setting speed limits is provided in HCC's Speed Management Strategy which is based on Circular 01/2006.

Photo 4.1.3.1: Entrance to a 20mph zone with raised 'gateway' feature

The TMS for different categories of road is given in Table 4.1.1.1.

To keep speeds at or below the TMS it will be necessary to introduce speed restraining features. These can take the form of horizontal deflections, such as speed control bends, chicanes and roundabouts or vertical deflections such as road humps.

It is preferable to achieve the TMS by using curving alignments, varying carriageway widths, landscape and/or different materials. These give motorists a clear indication that they are within a residential area and should drive slowly. The use of vertical deflections should be avoided, but in some situations they may be the most appropriate means of reducing vehicle speeds.

The maximum distances between speed restraints, for different categories of road, are given in Table 4.1.1.1.

Guidance on speed restraint is given in MfS and advice on traffic calming measures is provided in Local Transport Note 1/07.

Speed control in the form of road humps or traffic calming, where installed on public highway, shall conform to the Highways (Road Humps) Regulations and the Highways (Traffic Calming) Regulations.

The lighting and signing requirements for individual features are reduced if they are contained within a 20mph zone. Guidance is given in Circular 5/99.

1.4. Forward Visibility

The minimum forward visibility is related to the stopping sight distance for the speed of the road. See Table 4.1.1.1. The forward visibility is measured in both the horizontal and vertical planes. For visibility at junctions see Section 4, Chapter 2: Junctions.

1.5. Carriageway Width

Highway engineering requirements need not be taken as the starting point to determine carriageway widths and layout design. Demands generated by the arrangement of buildings and requirements for pedestrian access should be considered first. As a result space between kerbs can vary in width provided the minimum track width required to accommodate the movement of vehicles is achieved. In most circumstances there is no need for this tracking zone for vehicles to be separately defined.

The carriageway width or tracking zone of any road should be appropriate to the size of vehicle and traffic volumes that will be encountered and should take account of whether on-street parking is anticipated.

The carriageway width must not restrict the necessary access of refuse collection vehicles, buses and emergency service vehicles.

Where necessary, allowance must be made for the additional space required for the swept path of turning vehicles. Widening of the carriageway on small radius curves may be required to allow easy access for larger vehicles.

Additional width may be required in a side road at a junction with a higher category road. This is to allow for the safe entry and exit of traffic from the side road, without causing an unnecessary obstruction or hazard on the major road.

The minimum carriageway widths for different categories of road are given in Table 4.1.1.1.

1.6. Road Curvature

1.6.1. Horizontal Curvature

The horizontal curvature of the road is related to the speed of traffic. The layout should restrain speeds to the desired TMS. Access requirements for emergency vehicles, buses and refuse collection vehicles may have a bearing on the choice of radius.

Visibility requirements may also dictate the radius of curve that can be used. These are set out in MfS and TD9 as appropriate.

On small radius curves, the application of superelevation may be required to avoid severe adverse camber that may cause discomfort, particularly to users of passenger transport vehicles. The use of superelevation should be avoided if it is likely to encourage inappropriate speeds around a bend.

For road categories Local Distributor and below, the minimum horizontal curvature is given in Table 4.1.1.1. For Secondary Distributor and higher category roads, the curvatures are given in TD9.

1.6.2. Reverse Curves

Reverse curves occur when a right-hand bend is followed by a left-hand bend, or vice versa. Reverse curves must be separated by a straight section of road. The minimum length of straight required for different categories of road is given in Table 4.1.1.1.

1.6.3. Transition Curves

Transition curves are used to provide a smooth transition between curves of different radius. Transition curves will be required on Secondary Distributor roads and higher category roads. The transitions should be designed in accordance with TD9. Local Distributor and lower categories of road do not require transition curves.

1.6.4. Vertical Curvature

The vertical curvature is governed by the need to provide a smooth alignment, driver comfort and visibility requirements. The minimum radius of vertical curve for different categories of road is given in Table 4.1.1.1.

1.7. Crossfall & Superelevation

The crossfall of the road is governed by the need to remove water from the running surface of the road to the drainage channels and should be 2.5%. The carriageway cross section should generally be cambered, with the high point at the centreline.

Footways and verges should generally drain onto the carriageway, with a crossfall of 2.5%.

On Local Distributor and higher category roads the application of superelevation may be required on tight radii to avoid adverse camber, where this might lead to loss of control accidents, particularly in wet or icy conditions. Guidance on the application of superelevation is given in the DMRB and TD9 as appropriate.

1.8. Gradients

The minimum longitudinal gradient is governed by the need to provide adequate drainage of the road surface. The maximum gradient is reliant on factors such as increased braking distances downhill, problems for HGV's or buses travelling uphill and ease of movement for pedestrians and cyclists. The longitudinal gradient should be greater than 1% and where possible should not exceed 5%.

1.9. Clearances

Horizontal clearances are measured from the nearest edge of the running lane to the particular obstacle in question.

Vertical clearances are taken from the highest point on the running lane to the lowest point on the overhanging obstacle. The lowest point on the obstacle shall be measured at any point that is over the carriageway or within a horizontal distance of 500mm of the carriageway. For Secondary Distributor and higher category roads, clearances will be in accordance with TD27.

For Local Distributor and lower category roads, the following horizontal clearances apply:

- Lamp column = 800mm
- Other obstructions = 500mm

Where vehicle overhang is a factor, such as at the end of parking bays and adjacent to turning areas, the clearance to all obstructions shall be at least 800mm. Care must be taken when siting obstacles, such as sign posts and lamp columns, to avoid reducing the effective width of a footway or footpath to below 1.2m.

The headroom to structures over the highway, such as bridges, lamp columns or archways, should be at least 5.3m. Structures over access roads to car parks or shared areas may be lower. Assessment should be made on a case-by-case basis.

The headroom to any obstacle within 450mm of a right of way shall be at least:

- 2.3m over a footway or footpath
- 2.4m over a cycle track
- 3.7m over a bridleway

The headroom to a structure must be maintained over any carriageway, verge or footway that a vehicle may over-run.

If security, garage or gate facilities are provided on residential premises, they shall be sited at least 6m from the highway boundary or back of footway as appropriate. This is to avoid waiting vehicles obstructing traffic and pedestrians on the road and footway passing the site. This may be reduced to 5.5m if the gates or doors open inwards or are in the form of a roller.

1.10. Turning Spaces

Turning spaces shall be designed to cater for the largest vehicle likely to be encountered, which for most residential roads is likely to be a refuse vehicle. In commercial development the standards recommended in Designing for Deliveries shall be used.

1.11. Industrial , Commercial or Service Roads

Any road likely to be used by large vehicles must be designed to accommodate such vehicles. This might include roads serving industrial estates, offices, retail outlets or leisure facilities.

Access roads may be culs-de-sac or loop roads, however in general loop roads are preferred.

Where a cul-de-sac is used it should not normally exceed 200m in length. If it does exceed this length, a full turning facility should be provided every 200m. Connected networks are preferred to the use of culs-de-sac layouts. Long culs-de-sac should be avoided.

If security or gate facilities are provided at accesses where long vehicles are expected, they shall be sited at least 20m from the highway boundary. This is to avoid waiting vehicles obstructing traffic on the road passing the site.

The SSD's required for HGV's and buses are considerably longer than those stated in MfS and are more in accordance with those stated in DMRB.

There is a need to ensure that all roads, irrespective of class or classification, which have a high bus frequency or significant HGV usage (defined by a percentage of total traffic flow and/or Road Hierarchy designation) should have an appropriate SSD requirement to accord with DMRB rather than the recommendations contained in MfS to allow HGV's and buses to slow and stop safely.

1.12. Road Pavement Construction

New roads should be of a flexible bituminous construction, or have a bituminous base with block paved surfacing.

Where the sub-grade underneath the carriageway is frost susceptible, such as chalk or silt, the overall depth of construction shall be at least 450mm. This can be achieved by increasing the depth of sub-base or providing a capping layer.

A typical cross section is shown in Figure 4.1.12.1 at the end of this chapter.

The elements of the road pavement construction are:

- Sub-grade (or capping if laid) - This is the foundation on which the road construction is built;
- Sub-base - Is a layer of granular material that is laid on the formation;
- Base- Is a layer of bituminous material laid on the sub-base. Base material with an aggregate size greater than 28mm is not acceptable;
- Binder Course - is laid on the base. With certain materials it is possible to combine the binder course and base layers;
- Surface course - provides the running surface of the carriageway. In certain circumstances, block paving is used instead of bituminous surfacing and binder course.

1.12.1. Formation

Also refer to Section 5, Chapter 7: Earthworks (Series 600).

The formation level of the road is at the top of the sub-grade (or capping layer if laid) and is the base on which the structural elements of the carriageway are laid.

The formation should be protected from deterioration caused by weather and vehicle tracking. Where the CBR of the sub-grade is low, a capping layer may be necessary to improve its performance.

1.12.2. Capping

Also refer to Section 5, Chapter 7: Earthworks (Series 600).

A capping layer, minimum thickness 600mm, will be required when the CBR of the sub-grade is less than 2.5%. The capping layer will replace the weak sub-grade and is considered as a sub-grade improvement, rather than part of the structural layers of the road.

The CBR of the compacted capping layer shall be at least 15%. Wherever possible, recycled and/or locally available materials should be used for capping material.

1.12.3. Sub-base

Also refer to Section 5, Chapter 8: Road Pavements - General (Series 700).

The thickness of sub-base required depends on the CBR value of the sub-grade and whether a capping layer has been provided. Details are given in table 4.1.12.1

CBR	Minimum Capping Thickness	Minimum Sub-Base Thickness
Less than <2.5%	600 mm	150 mm
2.5 – 5.0%	-	350mm
	350mm	150mm
5.0 – 15.0%	-	225mm
15.0 – 30.0%	-	150mm
Greater than >30%	-	-

Table 4.1.12.1: Minimum Sub-grade and Capping Thicknesses by CBR value

Wherever possible, recycled and locally available materials should be used for sub-base material.

1.12.4. Bituminous Layers & Block Paving

Also refer to Section 5, Chapter 8: Road Pavements - General (Series 700).

The total thickness of bituminous material, laid on top of the sub-base, is related to the number of goods vehicles likely to use the different categories of road. In cases where there are likely to be large numbers of HGV's, HCC may require that the thickness of any pavement layer be increased to take account of the additional loading.

The bituminous material will usually consist of a base, binder course and surfacing layers. In some cases the base and binder course can be combined. Also, for Minor Access roads the binder course and surfacing layers may be replaced with block paving.

For Secondary Distributor roads and above, the carriageway construction will be determined as per the DMRB. For Local Distributor roads the total thickness of bituminous material shall be at least 250mm. For Major or Minor Access roads the total thickness of bituminous material shall be at least 190mm.

Minor Access roads may also be constructed with a block paved surface. The construction, above sub-base, consists of at least 90mm of base, 50mm of compacted sharp sand and 80mm thick block pavers. If a blocked paved areas to be used as part of SUDS an alternative construction detail will be required.

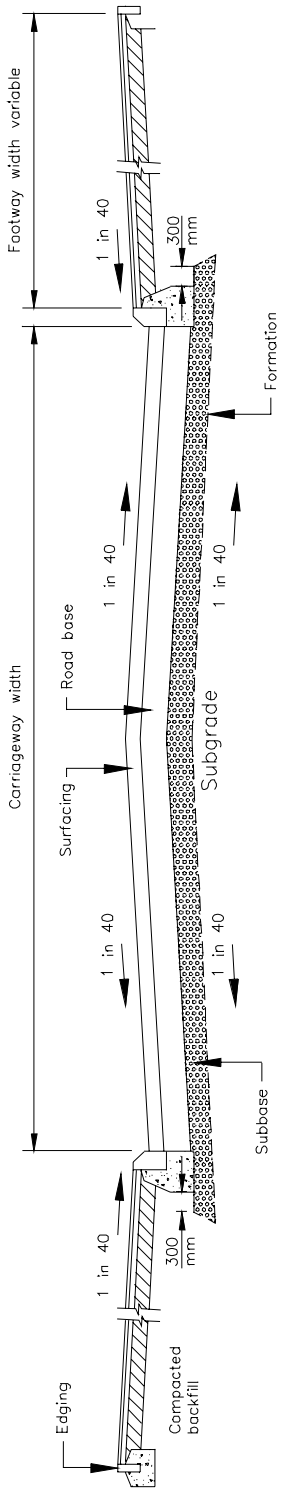

Figure 4.1.12.1: Typical flexible bituminous split crossfall carriageway cross section

1.13. Kerb Upstands

Also refer to Section 5, Chapter 9 Kerbs: Footways and Paved Areas (Series 1100).

Where a footway / cycle track is adjacent to the carriageway the kerb upstand should generally be 125mm.

An upstand of 50mm will be sufficient where adjacent properties, footways, cycle tracks, etc. are to be separated from an area of shared surface block paved carriageway.

At dropped kerb vehicular crossings the upstand should be 25mm.

At dropped kerb crossings used by pedestrians or cyclists the upstand should be zero. Care must be taken to avoid the ponding of water adjacent to flush dropped kerbs.

A higher kerb upstand should be provided in certain circumstances, such as at bus stops (see Section 4, Chapter 10: Passenger Transport Facilities).

1.14. Footways

Also refer to Section 4, Chapter 11: Pedestrian Facilities and Street Furniture and Section 5, Chapter 9: Kerbs, Footways and Paved Areas (Series 1100).

Footways should be provided on all new roads, unless it can be demonstrated that only one footway is necessary.

Footways should be at least 2m wide wherever possible.

1.14.1. Footway & verge crossovers

In general, the number of crossovers should be kept to a minimum to reduce conflict with and discomfort for footway users.

The widths of drives and the length of dropped kerbs at a crossover should be sufficient to allow vehicles to manoeuvre into and out of the property. Unnecessarily long crossovers should be avoided to minimise inconvenience to pedestrians. Figure 4.1.14.1 gives appropriate dimensions for a typical crossover.

Where practicable, at entrances to driveways a flat area with a width of 900mm carried through at footway level should be provided to enable pedestrians and wheelchair users to avoid the ramps to dropped kerbs, as a minimum 800mm maybe provided in some circumstances.

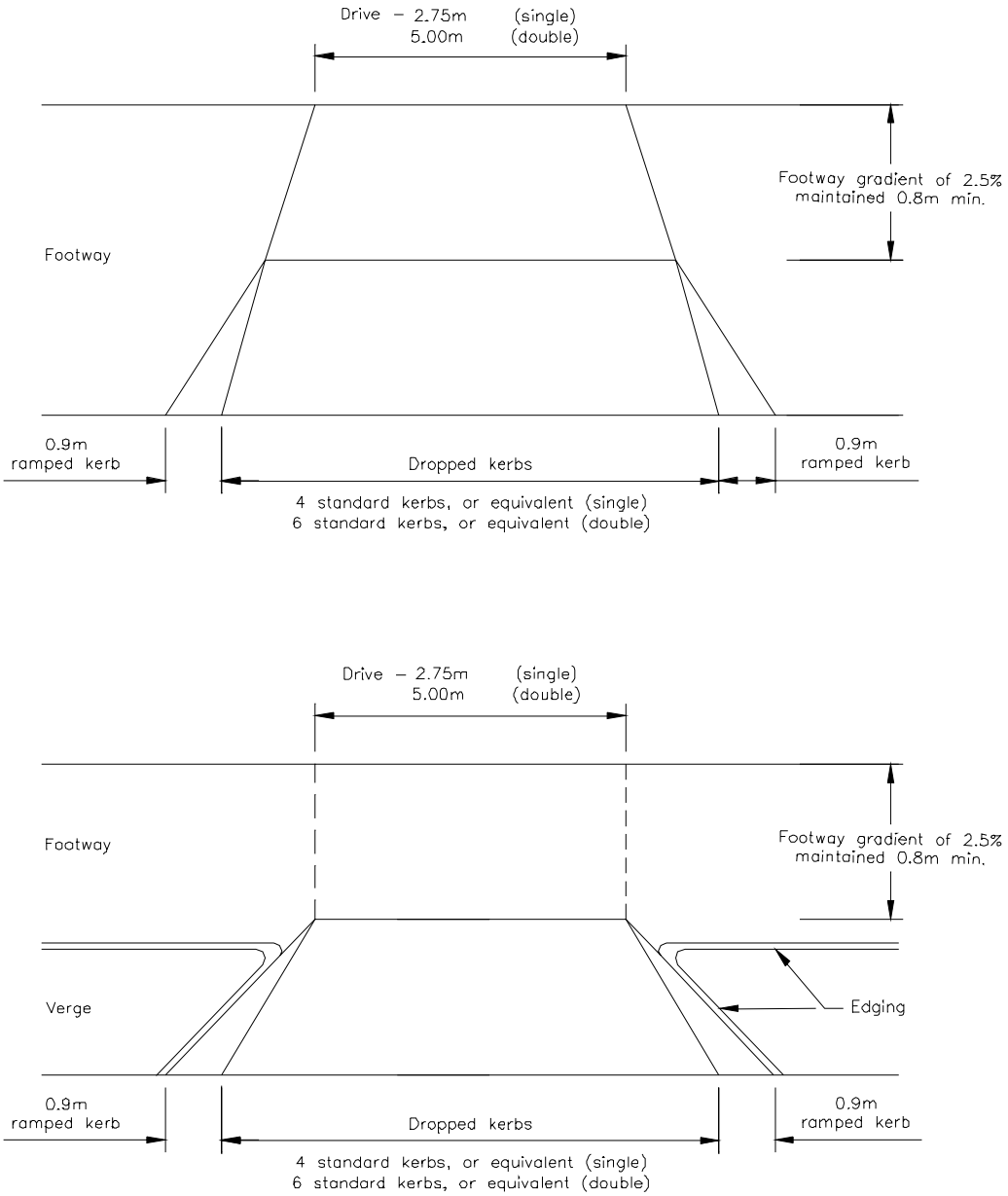

Figure 4.1.14.1: Vehicular footway and verge crossovers

1.15. Footway / Footpath & Cycle Track Construction

Also refer to Section 5, Chapter 9: Kerbs, Footways and Paved Areas (Series 1100).

1.15.1. Bituminous Construction

Standard bituminous construction should consist of 150mm granular sub-base, 60mm bituminous binder course, and 20mm of bituminous surfacing, machine-laid to ensure smoothness.

Where the footway or cycle track is likely to be overrun by heavy vehicles, such as at non-domestic crossovers or adjacent to industrial roads, the construction should be 200mm granular sub-base, 100mm bituminous binder course and 45mm surfacing.

1.15.2. Block Paved Construction

Standard block paved construction should consist of 60mm thick block paving laid on 50mm of compacted sharp sand and 150mm granular sub-base.

Where the footway or cycle track is likely to be overrun by heavy vehicles, such as at non-domestic crossovers or adjacent to industrial roads, the construction should be 200mm granular sub-base, 100mm bituminous base, 50mm of compacted sharp sand and 80mm thick block paving. If a blocked paved area is to be used as part of SUDS an alternative construction detail will be required.

Block paving should be laid in herringbone pattern, unless otherwise agreed with HCC.

1.15.3. Flag Paving and Other Materials

The use of flag paving for footways or footpaths should be avoided unless required by location (conservation area, historic town centre, etc.) or as part of a development covered by commuted sum, as they can lead to future maintenance problems and give rise to trip hazards. Flag paving should not be used for cycle tracks.

Concrete flags and other paving units, when larger than 450mm x 450mm, should be laid on a 25mm to 40mm thick bed of cement mortar. This replaces the layer of sharp sand used underneath block paving described above. Other layers should be as per block paving.

In certain locations other types of paving units or materials may be used. This may be the case were an existing character is continued within the scheme or for aesthetic purposes; in all cases advice from the Local Planning Authority should be sought and, in the case of development, agreement reached with HCC over commuted sums to cover future maintenance.

1.16. Verges

For Secondary Distributor roads and above, the recommendations within the DMRB should be adopted for the provision and dimension of verges.

For Local Distributor roads, a verge at least 1.5m wide should generally be provided between the footway and carriageway.

A verge should be at least 2m wide if it is to accommodate underground services and should be at least 1.25m wide if it is grassed. Verges should not generally be provided between the back of a footway and the highway boundary.

1.17. Highway Boundary Markers

The highway boundary should be marked for future reference. The boundary of private property will normally be marked using a fence, wall, hedge or other planting.

In urban areas or at the entrance to a private road, it may be necessary to mark the boundary using a feature, such as brass studs, laid into the surfacing.

Boundary markers in grassed areas should be pre-cast concrete or stone. The marker, which should have a surface area of 75cm^2, should be set in the ground to a depth of 600mm. The top should be flush with the surface of the ground and must not interfere with grass mowing.

Boundary markers in planted areas should be made of oak. They should be set in the ground to a depth of 600mm and extend to a height that is hidden by the planting, but easily found.

Boundary markers should set at a spacing of approximately 2m. This may need to be reduced on tight radii.

Table 4.1.1.1 Road Design Criteria

	Secondary Distributor	Local Distributor	Major Access	Minor Access	Shared	Industrial
Maximum dwellings	Not applicable	Not applicable	300	100	50	Not applicable
Frontage access	Not normally	Not normally	Yes	Yes	Yes	No
Connections	Main Distributor (1).	Secondary Distributor(1)	Local Distributor	Local Distributor & Major Access	Major & Minor Access	Local Distributor
Gateway	None	None	Not normally	Desirable	Essential	Normally signing
Target maximum speed	40mph	30mph	25mph	20mph	10mph	25mph
Min forward visibility(3)	66m	43m	33m	25m	11m	51m
Junction spacing	40m opposite 66m adjacent	30m opposite 43m adjacent	20m opposite 33m adjacent	Not applicable	Not applicable	30m opposite 50m adjacent
Min c'way width (2)	7.3m	6.75m	5.5m	4.8m	4.1m	7.3m
Min horiz curve (radius)	DMRB standard	90m	40m	30m	25m	60m
Reverse curves (min separation)	DMRB standard	20m	17m	14m	11m	20m
Max distance betw'n speed restraints	Not applicable	150m	100m	60m	40m	Not applicable
Min vert curve (radius)	DMRB standard	1000m	1000m	600m	300m	600m
Carriageway construction	DMRB standard	Min 250mm total bitmat	Min 190mm total bitmat	Min 190mm total bitmat	Min 90mm r/b + block paving	Min 250mm total bitmat

NOTES:
1 - Main and Secondary Distributor roads are normally classified as 'A' and 'B' respectively. The Principal Road Network comprises the most important routes in the County, which are normally 'A' roads.
2– For Major Access and lower category roads the notional minimum widths of carriageway indicated above may be reduced locally for speed reduction purposes and in accordance with the aims of MfS subject to an absolute minimum width of 2.75m.

3- The minimum forward visibility will depend on the function of the road. Those carrying high volumes of traffic, particularly lorries and buses, may need an increased forward visibility.

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Chapter 2 – Junctions

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2. Junctions

2.1. Junction Types

The type of junction selected should depend on the traffic flows and turning movements that will be encountered at the location. Guidance on junction type can be obtained from TD42 and MfS. MfS points out that:

> *"Junctions are places of interaction among street users. Their design is therefore critical to achieving a proper balance between their place and movement functions."*

The dimensions and layout of a junction must cater for the swept path of all vehicles likely to be encountered, which will include those used for emergency services and refuse collection.

The common types of junction that are likely to be encountered are the three types of roundabout, the simple T-junction and ghost island junction. MfS reminds designers that the uncontrolled crossroads can have a role to play in the creation of connected network in residential and town centre areas.

A normal roundabout has a one-way circulatory carriageway around a kerbed central island 4m or more in diameter and usually with flared approaches to allow multiple vehicle entry. Conventional roundabouts are not generally appropriate for residential developments. Their capacity advantages are not usually relevant, they can have a negative impact on vulnerable road users, and they often do little for the street scene.

Normal roundabouts and mini roundabouts should be designed to the requirements of TD16.

Photo 4.2.1.1: Example of a normal roundabout

The compact or continental roundabout has single lane entries and exits on each arm and sit between conventional roundabouts and mini-roundabouts in terms of land take. They retain a conventional central island but differ in other respects; there is minimal flare at entry and exit and they have a single-lane circulatory carriageway. In addition, the circulatory carriageway has negative camber, so that water drains away from the centre, which simplifies drainage arrangements. Their geometry is effective in reducing entry, circulatory and exit speeds.

The use of continental roundabouts is described in TD 9/97 and 7.3.16 in MfS. See also Section 4, Chapter 12: Cycling Facilities.

Photo 4.2.1.2: Example of a compact roundabout

A mini roundabout has a one-way circulatory around a flush or slightly raised circular marking less than 4m in diameter and with or without flared approaches.

Mini roundabouts may be used as a traffic speed constraint or where it is anticipated that traffic will have difficulty exiting the minor road.

A simple T-junction is an at-grade junction of two roads, at which the minor road joins the major road approximately at a right angle.

T-junctions and ghost island junctions shall be designed to the requirements of TD42 and MfS

A ghost island junction is a T-junction that has an area marked on the carriageway of the major road for traffic turning right into the minor road.

For the majority of situations encountered on Local Distributor and lower category roads, a simple T-junction will suffice. Normal roundabouts should be avoided as they are inconvenient for pedestrians and can be hazardous for cyclists. A ghost island or mini-roundabout may be required on a Secondary Distributor road.

Crossroads are convenient for pedestrians, as they minimise diversion from desire lines when crossing the street. They also make it easier to create permeable and legible street networks. They are not normally used on Secondary Distributor or higher category roads unless they are

controlled by traffic signals. Crossroads may be suitable for lower category roads where the traffic volumes are low, such that vehicle conflicts would be minimal.

The size of roundabouts and major/minor priority junctions should be determined using TA23.

2.2. Junction Spacing (for Simple T-Junctions)

The spacing of junctions should be determined by the type and size of urban blocks appropriate for the development. Block size should be based on the need for permeability, and generally tends to become smaller as density and pedestrian activity increases.

In movement terms, the minimum spacing of junctions, on the same side of the road, is related to the stopping sight distance for the speed of the road. The spacing of junctions, on opposite sides of the road, is intended to keep turning movements at each junction separated by sufficient distance to avoid confusion or conflict.

For staggered junctions, when progressing from one side road to the other a right-left stagger is preferred to a left-right stagger.

The junction spacing for different categories of road is given in Table 4.1.1.1, Section 4, Chapter 1: Road Design Criteria. Where these spacings cannot be achieved the combination into a roundabout or signalised crossroads could be considered.

2.3. Visibility

The visibility requirements for roundabouts are laid down in TD16.

The visibility requirements for major/minor priority junctions are laid out in MfS and TD42.

The visibility splay is measured from a distance X on the minor road for a distance Y along the major road. The distance X is measured back from the edge of the major road along the centre line of the minor road. The distance Y is measured from the centre line of the minor road along the nearside kerb line of the major road. This is summarised in Table 4.2.3.1

Major Road	Major Road Speed	X	Y (excluding bonnet allowance)	Y (including bonnet allowance)
Secondary Distributor	40mph	4.5m	66m	66m
Local Distributor	30mph	4.5m	43m	43m
Major Access Road	25mph	2.4m	31m	33m
Minor Access Road	20mph	2.4m	22m	25m
Shared Surface Road	10mph	2.4m	9m	11m
Industrial Road	25mph	4.5m	50m	50m

Table 4.2.3.1: Visibility Requirements

The X distances given above are for 'give way' junctions. They may be reduced at junctions with stop lines, with the agreement of HCC. This might be appropriate for situations on existing roads where the visibility is constrained by existing features.

The visibility requirements outlined above also apply to private drives, but the X distance can be reduced to 2.4m from the edge of the footway or carriageway.

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Chapter 3 – Casualty Reduction and Safety Cameras

Hertfordshire

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3. Casualty Reduction and Safety Cameras

3.1. Casualty Reduction

The safety of the public is one of the highest priorities of any highway authority and there are stringent targets for casualty reduction. The current collision reduction targets run to the end of 2010 and are:

- 40% reduction in the number of people killed or seriously injured (KSI) – a reduction from 1084 to 600 for Hertfordshire;
- 50% reduction in the number of children KSI – a reduction from 113 to 56 for Hertfordshire;
- No increase on 1994-98 average baseline for the number of people slightly injured. No more than 5509 for Hertfordshire.

New targets will be set to run to 2020 based on 2004-2008 figures.

3.2 Hertfordshire has on average 3500 injury collisions a year. Details are available in the HCC Annual Collisions Reports which can be downloaded at http://www.hertsdirect.org/envroads/roadstrans/rsu/accidents/.

Each collision has a significant impact on those involved, especially the more serious, and these may be life-changing.

The Department for Transport (DfT) estimates that the average cost of an injury collision to the community is approaching £100,000 (DfT Highways Economic Note – Table 4a). So the estimated total cost to Hertfordshire is around £350 million each year. Collisions also impact on the operation of the highway network adding significantly to congestion.

Understanding the cause of any collision is fundamental to the choice of remedial measure. In recent years, HCC has invested significant funds in the investigation and treatment of existing collision problem sites. Therefore a very high priority is placed on ensuring that improvements or additions to the highway network do not introduce new safety problems for road users.

3.1.1. What Scheme Promoters need to do

Any change to the network should not create an increased risk of casualty or collision. Scheme promoters or designers must know and understand any relevant collision history that relates to the proposal and be able to demonstrate how their proposal might affect locations with known collisions issues. A collision study, safety audit or both will help with this. Scheme promoters or designers should also be aware (and be able to demonstrate) if the proposed scheme is at or close to a hazardous site.

Collisions must be analysed by suitably trained and qualified staff who have completed the RoSPA Accident Investigation Course and ideally be in position to regularly review collision data.

For collision data contact antony.oldridge@mouchel.com.

3.1.2. Safety audits

The primary purpose of carrying out safety audits is to ensure that any changes carried out on the highway do not include features or combinations of features that may have a contributory influence on future injury collisions.

Scheme promoters must follow the current three stage safety audit procedure set out in Section 3 Chapter 6: Design Checks and Safety Audits. This includes a requirement for sponsors to sign off an "exception report" if any safety problems are identified at any stage of the process.

3.1.3. Consultation and communication

Scheme promoters must consult with the Road Policing Unit in Hertfordshire Constabulary for most highway modifications. These include:

- Pedestrian crossings:
- TROs outside Greater London;
- Experimental TROs;
- Regulation of the use of highways by public service vehicles (buses);
- Powers of local authorities outside Greater London to prohibit traffic in roads to be used as playgrounds / play streets, the introduction and control of parking places on public highway;
- Powers for the purposes of general traffic control;
- Bus and coach station parking;
- Designation of chargeable parking places on the highway;
- Loading areas;
- Speed limits on roads other than restricted roads; and
- Traffic calming, including items such as chicanes, gateway features, traffic islands, over run areas, pinch points, rumble strips, road marking layouts e.g. double white lines.

If a proposal is located at, or might have an influence on, a known hazardous site, scheme promoters or designers must consult with HCC's casualty reduction target delivery group. The aim is to improve awareness, provide co-ordination and assess impact.

3.1.4. Further help and advice

HCC seeks to determine the causes of injury collisions and make recommendations to prevent their recurrence. They also seek to provide further professional advice to prevent possibilities of new collisions. They do not seek to apportion blame or liability.

3.2. Safety Cameras

The Hertfordshire Safety Camera Partnership (HSCP) manages the provision, maintenance and deployment of all safety cameras. The HSCP consists of Hertfordshire County Council (lead organisation), Hertfordshire Constabulary, the Highways Agency and the Magistrates Service.

Stringent criteria are used for the selection of sites, based on police Stats 19 casualty data over a three-year period, with emphasis being placed on the number of people Killed and Seriously Injured (KSI), speed data is also required. The criteria vary for static, mobile and red light enforcement cameras. Other measures must be considered as part of the selection process before safety cameras are chosen as the final option at any given location.

A strict four-stage process is undertaken when reviewing potential safety camera locations.

1. Review the number of injury collisions. For a fixed camera there needs to have been four or more serious or fatal collisions in a kilometre of road in a three year period. For a mobile camera there needs to have been two or more serious or fatal collisions in a kilometre of road in a three year period.
2. Review the collision details to assess the likelihood of the provision of speed enforcement actively addressing any collision pattern that may have formed.
3. Review the speeds that vehicles are travelling along the road. To meet the criterion, the 85th percentile speed must exceed the speed limit by 10% plus 2mph. This threshold is set by the Association of Chief Police Officers (ACPO).
4. Finally a practical assessment to ascertain if it is physically possible to install a camera in the desired location.

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Section 4 - Design Standards and Advice

Chapter 4 – Road Drainage

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4. Road Drainage

Also refer to Section 5, Chapter 6: Drainage & Service Ducts (Series 500).

Approval must be obtained, from HCC, for the proposed surface and sub-surface drainage systems.

4.1. Surface Water System

4.1.1. General Requirements

Only surface water systems that just take water from adoptable highway areas will be adopted by HCC. Once the Flood and Water Management Act 2010 is fully implemented and understood an additional suite of guidance documents will be issued to supplement this guide.

Where systems take water from adoptable areas and other sources, such as roof water from dwellings, they may be eligible for adoption as a public surface water sewer. This would be undertaken as an agreement between the scheme promoter and the Regional Water Company.

Normally the drainage system will be contained within the adoptable highway boundary. When this is not possible the scheme promoter must arrange a wayleave, giving all necessary rights to enter the land for future inspections and maintenance. The wayleave must be in perpetuity, in writing and to the satisfaction of HCC.

Water from areas that are not adoptable highway must not be allowed to run onto areas of adopted highway and water from the highway must not be allowed to run onto non-highway areas.

The use of linear channel drainage systems should be avoided. Trapped gullies are preferred.

4.1.2. Sustainable Drainage Systems (SUDS)

Traditionally, surface water has been rapidly removed from site via a network of pipes. This approach tends to concentrate water flows, which can cause flooding and pollution at, or beyond, the point of outfall.

HCC and other organisations, such as defra, the DfT and the Environment Agency, are supporting a more sustainable approach to the design of drainage systems; as contained in the Flood and Water Management Act 2010. This will provide the legislation for better, more comprehensive management of flood risk for people, homes and businesses. More information available at http://www.defra.gov.uk/environment/flooding/policy/fwmb/.

This more sustainable approach to drainage is to retain as much of the water on, or near, the site. This can be achieved by using a combination of methods, including:

- Swales - An open grass lined channel that carries water from the site but also allows water to be dispersed into the ground;
- Filter drains - A linear trench filled with permeable material. Often contains a permeable pipe in the base of the trench to remove storm water;
- Perforated pipes - Using perforated pipes, surrounded by permeable material, as carrier drains can help disperse water into the ground. Permeable pipes should not be used under the carriageway;
- Soakaways - Traditional soakaways may be installed as part of a pipe network system, with an inlet and overflow pipe. During light rain, water would be dispersed into the

ground. In conditions of heavy rainfall water would fill the soakaway and run along the overflow pipe to an outfall. See Figure 4.4.1.1 at the end of this chapter.

- Drainage basins/ponds - These store water during heavy rain, allowing a more gradual dispersal once the risk of flooding has passed.
- Permeable surfaces - Permeable paving, such as block paving or concrete grass paving, can be used to reduce runoff. A geotextile may be necessary to prevent the loss of bedding material. This approach would be suitable for parking areas or driveways, but not for carriageway construction.

The use of these drainage techniques will depend on a number of factors, including: land availability, the permeability of the ground, the level of the water table, the quality of the ground water, the implications on landscape character and treatment and the risk of pollution.

It may not be possible to dispose of all storm water using the above techniques. However, they may be incorporated into a pipe network system to reduce the impact of high water flows and disperse pollutants.

The scheme promoter or designer should investigate the possibility of incorporating on-site disposal techniques into the drainage design. They should be able to demonstrate to HCC that this process has been carried out.

Guidance should be sought from Sustainable Urban Drainage Systems - Design Manual for England and Wales.

4.1.3. Catchment Areas

For the purpose of highway drainage design the catchment area shall include carriageway, footway, verge and allowance for other areas of hardstandings on the highway when appropriate.

4.1.4. Design of the Surface Water Drainage System

The internal diameter of pipelines is dependent on the area of highway to be drained.

For all catchments the pipe size requirements will be determined using the 'Rational (Lloyd-Davies) Method', as set out in Road Note 35. This will be used in conjunction with the Tables for the Hydraulic Design of Pipes, Sewers and Channels.

For pipe network design the storm return period shall be at least 2 years. However, this period may increase in certain circumstances, such as where there is an increased likelihood of flooding, or where the consequences of any flooding could lead to the damage of private property. A 10 year storm is the minimum appropriate for the design of soakaways, see BRE Digest 365.

Additionally:

- Time of entry should be 2 minutes;
- The minimum velocity for the self cleansing of pipes is 0.76m/sec;
- The maximum full bore velocity must not exceed 3m/sec;
- The impermeability factor shall be 1 over the whole of the catchment area; and
- The roughness coefficient for the pipe shall be at least 0.15mm.

The likely storm intensities in Hertfordshire are not dissimilar to those given in Road Note 35. Hence, for most small schemes, it will not be necessary to obtain site specific data. However, for larger schemes more site specific storm intensities must be obtained from the Meteorological Office.

To assist HCC in checking calculations, the scheme promoter or designer must provide their design calculations in the form of the design sheet given in Table 1 of Road Note 35. Where an appropriate computer software design package has been used, HCC may accept the output as sufficient for checking purposes.

4.1.5. Gullies

The maximum area to be drained by each gully is 170m^2.

The spacing of gullies on roads shall be in accordance with the design requirements of HA 102/00. The channel flow width shall be limited to 0.5 metres on roads in urban areas or with adjacent footways.

Photo 4.4.1.1: Gully Construction

Gullies should be set below the carriageway drainage channel. Kerb inlets, or set back gullies are to be avoided. The top of the gully grating should be set 10mm below the carriageway level. Gullies used to drain cycle tracks and footways or footpaths should be set back, so that they are not within the trafficked area.

Gullies shall not be placed:

- Where edge restraints are lowered for pedestrians to cross;
- Where pedestrians are likely to cross;
- At vehicular entrances;
- Within a footway, footpath or cycle track; or
- Where a cycle track meets a carriageway.

Gullies should be located immediately upstream of:

- A road junction or major vehicular access;
- A speed restraining feature;
- Where a cycle track or pedestrian route joins or crosses the carriageway; and
- Where the carriageway crossfall is zero, when superelevation is being applied.

At each low point of a sag curve in the carriageway alignment, two gullies shall be provided. Each gully will have a separate connection to the carrier drain.

Gullies should connect into chambers, however where this is not possible they shall be connected to the carrier drain by means of a 45° oblique angled junction pipe. The flow from the gully connection should be in the same direction as the flow in the carrier drain.

Gully connections shall be no longer than 12m and gully connections shall be at least 150mm internal diameter.

4.1.6. Chambers

Chambers shall be either manholes, catchpits or inspection chambers. They shall comply with the HCD.

Chambers shall be constructed within the highway boundary. Where possible, they should not be within the carriageway.

Chambers shall be provided at all changes of direction, gradient or diameter in any pipe network. Along straight pipelines, chambers must be provided at intervals not exceeding 90m.

Backdrop type chambers should not be used, unless the topography of the site makes their use unavoidable.

4.1.7. Pipelines

Pipelines shall be laid in straight lines, without curves or changes in gradient.

Pipelines shall be constructed within the highway. The only exception is where a wayleave has been provided (See General Requirements previously in this chapter) and where possible pipelines should not be laid within 600mm of the carriageway.

Pipelines should be laid with a depth of cover of at least 1.5m, when below carriageway. The cover can be reduced to 1m in other locations.

A clearance of at least 150mm must be maintained between the drainage pipe and any pipe, duct or cable for the use of another service.

4.2. Sub-Surface Water System

4.2.1. Requirements

It is important to keep water out of the sub-base, capping and subgrade, both during construction and during the service life of the road.

Drainage of the sub-base may be omitted only if the underlying materials (capping and subgrade) are more permeable than the sub-base and the water table never approaches the formation closer than 300mm.

Where the above requirements are not met, sub-surface drainage must be provided to the requirements of the DMRB.

The scheme promoter or designer must carry out sufficient site investigation and calculations to determine what the maximum level of the water table will be throughout the seasons of the year. They must also provide HCC with the results of these site investigations and calculations.

4.2.2. Pollution Risk Assessment

New outfalls into existing surface or ground water systems carry an increased risk of pollution from spillage or other discharge. The amount of risk that is acceptable, in this regard, is related to the probability of a pollution incident occurring and the sensitivity of the water environment into which the new system discharges.

In small residential developments, with minimal goods vehicle movements, the likely discharge will be uncontaminated surface water run-off. Where this type of discharge is fed into the existing highway drainage or sewer network, there is unlikely to be an appreciable increase in the risk of pollution.

In large developments, industrial areas and routes that will carry high numbers of HGV's, there may be a significant risk of pollution occurring. In such cases, the scheme promoter or designer must carry out a risk assessment of the likelihood and severity of a pollution event occurring. Guidance is given in Volume 11 of the DMRB. Guidance may also be obtained from the relevant authority responsible for the type of discharge proposed (see following paragraphs).

The scheme promoter or designer must provide the HCC with a pollution risk assessment and satisfy the HCC that the reasoning used to produce the assessment is acceptable.

4.2.3. Discharge to Surface Water

Outfalls to ditches, streams or other water courses must have the written consent of the Environment Agency. The scheme promoter or designer must provide HCC with proof that such approval has been given.

The scheme promoter or designer will comply with any requirements for headwalls, catchpits and oil traps required by the Environment Agency or HCC.

The scheme promoter or designer must satisfy themselves and the Environment Agency that the capacity of the water course is sufficient for the output of the drainage system.

4.2.4. Discharge to Ground Water

The use of discharge to groundwater must have the written consent of the Environment Agency. The scheme promoter or designer must provide HCC with proof that such consent has been given.

The scheme promoter or designer must carry out sufficient site investigations and calculations to determine that the ground conditions are suitable for soakaways or other groundwater disposal methods.

The scheme promoter or designer must provide HCC with the results of his site investigations and calculations.

Soakaways must not be located within 2m of any carriageway, or 5m of the foundations for a structure or building.

Adoptable soakaways may be located within private property. In such a situation the scheme promoter must provide HCC with the necessary wayleaves to allow future access.

In certain circumstances a deep bored soakaway may be required to reach a sufficiently permeable layer. The detail of the design and construction of the soakaway will need to be agreed with HCC and Environment Agency.

Guidance on the design of soakaways is given in BRE Digest 365.

As mentioned above the use of other groundwater dispersal methods, such as swales and filter drains, will be encouraged. Such solutions should be developed in consultation with the Environment Agency, HCC and Water Companies. (See Sustainable Drainage Systems.)

In addition to the requirement for commuted sums to be paid for soakaways, it may also be necessary for the scheme promoter to pay a commuted sum for other types of groundwater discharge feature.

4.2.5. Discharge to other Highway Drainage

Where the scheme promoter or designer proposes to connect a new highway drainage system into an existing network the approval of HCC must be obtained.

The scheme promoter or designer must carry out sufficient site investigations and calculations to determine that the existing drainage system can accommodate the outfall from the new network. The principles for assessing the capacity of the existing system are the same as those outlined for the new system. (See Design of the Surface Water Drainage System.)

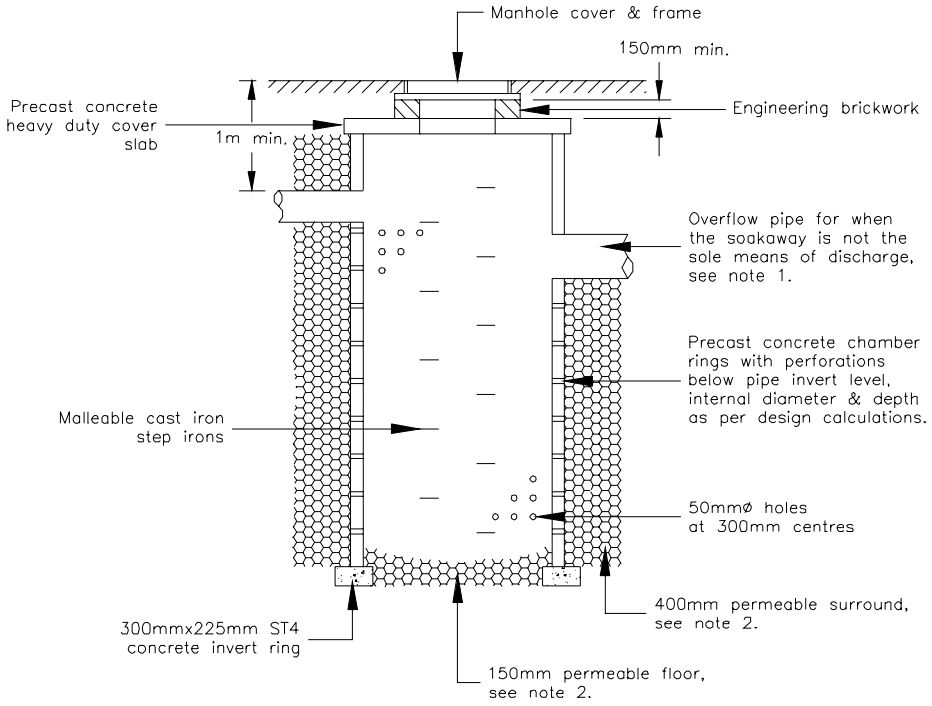
The scheme promoter or designer must provide HCC with the results of their site investigations and calculations for the capacity of the existing network.

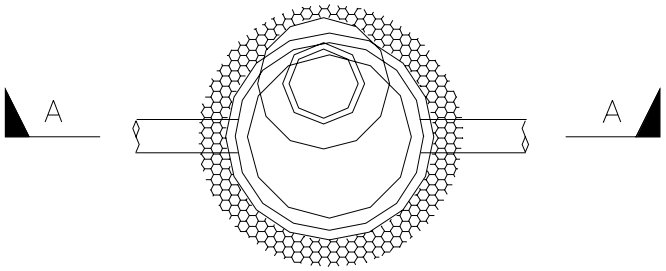
The existing drainage system will need to be upgraded where, in the opinion of HCC; it cannot accommodate the new outfall. Such work will be carried out by the scheme promoter, designer or contractor and form part of the adoptable works.

Connections to the existing highway drainage shall only be made into an existing chamber. Where this is not practical a new chamber will need to be constructed.

4.2.6. Discharge to Regional Water Company Sewers

Where the scheme promoter or designer proposes to connect a new highway drainage system into an existing public sewer, the consent of the Regional Water Company must be obtained. The scheme promoter or designer must provide HCC with proof that such consent has been given.





Notes:

1. A soakaway may be included in a pipe network to discharge light rainfall into the ground. If heavy rainfall occurs, or the soakaway capacity has deteriorated over time, water will flow down the overflow pipe to an outfall.

2. The permeable surround should be recycled material, preferably obtained locally, with the following characteristics:
   100% passing a 75mm sieve
   0 to 5% passing a 5mm sieve
   A ten percent fines value of 30kn, or more, when wet.

Figure 4.4.1.1: Typical chamber soakaway

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Section 4 - Design Standards and Advice

Chapter 5 – Structures - Details

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5. Structures - Details

5.1. Technical Approval

HCC are responsible for the construction, maintenance and repair of highways structures. HCC are the Technical Approval Authority (TAA) for highways structures.

Guidance on the Technical Approval process is published by the Highways Agency in BD02 Technical Approval of Highway Structures. Chapter 3 of BD02 details highways structures requiring technical approval.

By agreement (under section 38, 278, etc.) new highway structures may be adopted by HCC for future ownership and maintenance. Non-adoptable structures which the highway depends upon will require technical approval but will not be owned or maintained by HCC.

Private structures built in private land will be considered individually. However, if they are not signed appropriately or securely fenced off to avoid public use then they may be subject to technical approval.

Temporary works, such as excavations adjacent to the highway, could cause structural damage or instability to the highway and may be subject to technical approval.

5.2. Information Required as part of Technical Approval Submission

Details of requirements for technical approval submission can be found in BD02 Appendices. In addition HCC require technical approval submission to include:

- 1:1250 scale location map and OS grid reference of proposed structure;
- 120 year design life;
- Detail how safety for pedestrian and road users will be maintained;
- Details of how future maintenance has been minimised;
- Details how impacts of vandalism has been minimised; and
- Consideration of the aesthetic harmony of the proposal within the surrounding environment.

Scheme promoters are also reminded of their duties for health and safety including the CDM Regulations 2007. The general topic of health & safety is covered in Section 3 Chapter 4: Health & Safety.

5.3. Fees, Commuted Sums and Bonds

The general topic of commuted sums is covered in Section 3 Chapter 2: Commuted Sums. HCC will seek to recover costs incurred during the technical approval process. HCC will provide an estimate and cost breakdown upon receipt of preliminary details of the proposed scheme.

Structures promoted for adoption by HCC will require a commuted sum to be paid to HCC to cover the costs of future inspection, maintenance and renewal work.

The commuted sum will be equal to 20% of final construction cost and is payable before the end of the maintenance period. Final construction costs are to be agreed with HCC.

Structures effecting or over Network Rail assets or land, or structures requiring special provisions, will be considered on an individual basis and may attract higher commuted sums.

A bond equal to the cost of construction must be made available to HCC before works begin on site. This bond will be released upon successful completion of the scheme.

5.4. Specification and Design Criteria

All structures are to be designed by suitably qualified engineers with a working knowledge and experience of current highway design standards.

Some structures may be subject to building regulation approval. The scheme promoter must seek building regulation approval direct from the relevant authority.

The design methods for highways structures are laid down in the Design Manual for Roads and Bridges (DMRB), published by the Highways Agency, including published interim advice, and amendments.

The specification for highways structures is laid down in the Manual of Contract Documents for Highway Works (MCHW), published by the Highways Agency, including associated notes for guidance and amendments.

5.5. Supervision of Construction

Before construction begins the developer must submit a programme to HCC for approval. The programme should detail:

- The level of supervision to be provided during the works to ensure the structure will be built in accordance with the design and specification;
- Proposals for materials testing.

HCC will audit the supervision to ensure the agreed standard of supervision has been met.

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Chapter 6 – Fences

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6. Fences

6.1. Permanent Fencing

Various types of fencing or other boundary treatments may be required for different situations:

- Denoting property boundaries;
- Accommodating the needs of adjacent landowners;
- Protecting or delineating landscape areas;
- Protecting or delineating public areas;
- Highway fencing.

In general, such fencing will be erected on adjacent private property and will not be adopted by HCC.

The specific details of fence type, style and foundation must be indicated and in some cases may need the specific written approval of the Local Planning Authority.

The use of barbed wire on fences adjacent to the highway will not normally be allowed, as this may cause injury to persons legally using the highway.

HCC and the Hertfordshire Constabulary have produced guidance which suggests how boundaries may be secured through the use of imaginative design, natural products, planting and low impact structures. Boundaries can contribute to the wildlife and character of home, work and leisure environments. This guidance is available at: http://www.hertsdirect.org/infobase/docs/pdfstore/natsecprevu.pdf.

6.2. Temporary Fencing

Health and safety legislation places a duty on the client, designer and contractor to protect third parties from possible injury resulting from construction work.

All construction sites must be separated from adjacent highway land with a suitable temporary fence to a height of 1.8m minimum. The type of fence will form part of the scheme promoter's traffic management proposals, which must be approved by the HCC (see Section 5, Chapter 3: Preliminaries (Series 100)). Such fence shall be maintained in place and in good repair until such time as the construction works on the site are completed or that HCC's consent is given for its removal.

Where such fencing is on highway land, the scheme promoter must obtain a licence from HCC.

In certain circumstances, people may retain a right of access through construction sites by way of public footpaths, etc. Such corridors of access will also need to be protected by temporary fencing.

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Chapter 7 – Road Restraint Systems

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7. Road Restraint Systems (Vehicle and Pedestrian)

7.1. Vehicle Restraint Systems (VRS)

Refer to Section5, Chapter 5: Road Restraint Systems (Vehicle and Pedestrian) (Series 400).

Vehicle Restraint Systems (VRS) are systems installed on a road to provide a level of containment for errant vehicles. They will not normally be required on single carriageway roads with speed limits less than 50mph.

There may, however, be circumstances where protection is required to prevent large vehicles from colliding with structures. There may also be a specific need to provide protection where a hazard such as a river, road, railway or pedestrian subway passes underneath the road. See also TD19 chapter 3 for the General Requirements, including visibility, set-back, working width class and lists of hazards for consideration of protection. For these circumstances, a risk assessment should be carried out using the guidance given in TD19 para.1.2.3 for roads with speed limits of less than 50mph.

Where VRS are to be provided on roads where the speed limit is 50mph or higher, then they shall conform to the requirements in TD19 [DMRB 2.2.8].

TD19 is now a risk based Standard and does not follow the conventional Standard format. The Standard has two parts that must be used together, namely: the written Standard TD19 Requirement for RRS [DMRB 2.2.8] and the Road Restraint Risk Assessment Process (RRRAP), which is software driven. This software is available from www.highways.gov.uk and is located in "Doing Business With Us/Technical Information".

Road furniture must not be positioned in front of a new or existing VRS and, in general, it should not be placed immediately in advance of nor within the available working width of a new or existing VRS unless the road furniture has been designed to be passively safe, and if hit, will not be displaced into the adjacent carriageway or give rise to a secondary event. Refer to TD19 paras.3.123 to 3.128 for use of passively safe lighting columns and signs.

There may be circumstances where due to physical geometric restraints, a VRS cannot be accommodated within the TD19 standard for roads with speeds of greater than 50mph.

Relaxations may be introduced at the discretion of HCC, having regard to advice and guidance given in TD19 and all relevant local factors.

Careful consideration must be given to layout options and the effects of incorporating relaxations, having weighed the benefits and potential disadvantages. The preferred option must be compared against options that would meet full standards. It is recommended that the details of the relaxation and justification are copied to HCC before incorporation into the works, (See TD19 paragraphs 1.37 and 1.38).

Where special circumstances arise and the technical requirements for provision of a VRS cannot be achieved for some reason, users are encouraged to come forward with departures which go beyond relaxations from criteria, or to propose additional criteria based on a reasoned assessment. Details of the departure and justification should be copied to HCC in order for the proposals to be assessed, (See TD19 paragraphs 1.39 and 1.40).

Where a contractor needs to use a VRS as part of Temporary Traffic Management, then it shall conform to the requirements' given in TD19 Chapter 8.

Road Safety Audits must be undertaken on all highway schemes involving removal, provision or improvement of VRS in accordance with HD19 [DMRB 5.2.2]. Guidance on HCC's approach to safety audits is given in Section 3, Chapter 6: Design Checks and Safety Audits.

7.2. Pedestrian Restraint Systems

Reference should be made to Chapter 9 of TD19 for further guidance on Pedestrian Restraint Systems.

7.2.1. Pedestrian Crossings

The minimum height of pedestrian guardrail or pedestrian parapet must be as shown in Table 4.7.2.1:

Users	Guardrail	Parapets (drops over 1.2m)	
		Not over railway	Over railway
Pedestrian	1.0m	1.15m	1.5m
Cyclist	1.0m	1.4m	1.5m
Equestrian	1.8m	1.8m	1.8m

Table 4.7.2.1: Minimum Guardrail or Parapet Heights

Reference should be made to Chapter 4 of TD19 for accepted heights of parapets and Chapter 9 of TD19 for information on Pedestrian Restraint Systems.

Many accidents at pedestrian crossings occur on the approach to the crossing. The provision of pedestrian guard railing at such positions should be considered. However, there is a growing realisation that the excessive use of such features has caused substantial aesthetic damage to our towns and cities as well as being a deterrent to walking and a potential hazard to cyclists.

High Inter Visibility pedestrian guard railing may be required to give motorists a clear view of waiting pedestrians. The appropriate type guard railing will depend on the geometric layout of the crossing facility, (See manufacturer's details for the various types of guard railing to be used in different scenarios, be it on a straight road or on a bend).

The effectiveness of guard railing is lessened if gaps have to be left for access for vehicles and the loading and unloading of goods. Where possible, crossings should be sited to avoid the necessity for such gaps.

Pedestrian guard railing at traffic signal controlled crossings should start at the signal post but not encroach beyond the push button position.

It is desirable in some cases to restrict the crossing of pedestrians to certain approaches. This may be the case at a traffic signal controlled junction or where a change in direction is required across an island such as a roundabout. Pedestrian guard rails can be used to prevent pedestrians crossing at dangerous places (for example where filtering traffic may be moving at times unexpected by pedestrians) however this should only be done as a last resort of the potential conflict cannot be mitigated by other means.

Pedestrian guard rails should not be provided as a deterrent to kerbside vehicle parking.

7.2.2. Pedestrian Parapets

All footbridges and bridleway bridges must be provided with pedestrian parapets conforming to the requirements of BS7818.

Pedestrian parapets on bridges over railways are subject to special design requirements with respect to infill panels, as detailed in BS7818 and the design and material must be approved by the Network Rail or London underground Ltd as appropriate.

On cycleway bridges or accommodation bridges frequently used by equestrians, the height of the parapet above the adjoining paved surface must be increased to 1.8m, and a 600mm high solid infill panel must be provided at the bottom of the parapet in order to obstruct the animal's view of the road below.

7.2.3. Pedestrian Restraint and Protection at Head Walls, Wing Walls and Retaining Walls.

Where any pedestrian movement may occur within the highway from use or maintenance of the highway and there is a risk to health and safety from a fall from a height, suitable protective measures must be provided in accordance with the requirements detailed below.

Where a structure, such as a retaining wall, head wall or wing wall, presents a vertical or near vertical face 1.5m or more in height and it would be possible for a person to gain access to the upper edge of the structure, a pedestrian restraint system such as a protective barrier or guard rail must be installed close to, or on top of the structure.

A pedestrian protective barrier or guard rail must also be installed at walls less than 1.5m in height if a particular hazard, such as a watercourse, or road, is near the wall.

The type of pedestrian protective measure to be used will need to be determined locally and be in keeping with any structural, drainage, environmental and aesthetic considerations. The protective measures could include pedestrian guard railing, pedestrian parapet or appropriate types of boundary fencing.

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Section 4 - Design Standards and Advice

Chapter 8 – Earthworks

Hertfordshire

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8. Earthworks

8.1. General

Earthworks are those works required to shape the area of the highway (and adjoining area as necessary) prior to the construction of the pavement layers forming the carriageways and footways/verges.

The scheme designer or promoter is encouraged to maximise the quantity of excavated material retained within the site. The importing and exporting of material should be kept to a minimum. Excavated material that is to be incorporated into the permanent works must comply with the Specification for Highway Works (SHW).

The requirements for the earthworks design, and therefore the extent of the site investigation, is dependent on a number of site specific factors. These include: is the road in cutting or embankment; is fill material used for structural or landscape purposes; what are the groundwater conditions; what is the possibility of flooding; what are the soil characteristics of the site; is there a possibility that the site contains contaminated soil.

The scheme designer or promoter must assess the nature of the proposed works and determine the appropriate scope of site investigation and design requirements. The scheme designer or promoter must receive the approval of HCC for the earthworks proposals. HCC may require the scheme designer or promoter to carry out specific site investigation or design works, as necessary for the approval process.

Earthworks for highways shall be designed and constructed to the requirements of the DMRB.

8.2. Site Investigation and Testing

Site investigations in ground that is un-contaminated, for the purposes of earthworks and carriageway design, shall be carried out to the requirements of BS5930 and BS EN 1997: 2002.

The methods used for the testing of soils shall conform to BS1377.

8.3. Topsoil

In most circumstances, a minimum of 150mm thick layer of topsoil should be laid on areas of highway verge. However, in some circumstances, particularly in rural locations, it may be more appropriate to not provide a topsoil layer. This helps encourage the growth of indigenous species. Advice should be sought from HCC and the Local Planning Authority.

All existing turf and topsoil shall be stripped over the area of any carriageway, footway, footpath, cycle track, cycle lane, embankments or bunds.

Stripped soils are a valuable resource and should be stored and handled in accordance with best practice guidance. As far as is practical, the topsoil stripped from the site should be reused within the site. The quantity of exported topsoil and the need for imported material should be minimised.

8.4. Embankments and Cuttings

In general the side slopes should be no steeper than 26.5^{o}, i.e. 1:2 (vertical: horizontal).

Where the side slopes are designed at greater than 26.5°, the scheme designer, promoter or contractor will provide HCC with sufficient information for an assessment of the slope stability.

8.5. Geosynthetics

Geosynthetics is a general term used to include geotextiles, geogrids, geomeshes and other related products.

Geosynthetics have a wide range of applications in earthworks design. These can be grouped into four main functions:

- Separation
- Reinforcement and retention
- Drainage and filtration
- Impermeable barrier

HCC may require the scheme designer, promoter or contractor use geosynthetics for any particular purpose deemed necessary for the successful construction or future function of the works.

Guidance on the use of geosynthetics can be obtained from the DMRB and CIRIA "Special Publication 123, Soil Reinforcement with Geotextiles".

8.6. Ground Improvement

8.6.1. Contaminated Land

Contaminated land is ground that contains substances which, when present in sufficient quantities or concentrations, are likely to cause harm, directly or indirectly, to man, to the environment, or on occasion to other targets.

The site investigation of contaminated land should be carried out in accordance with HA73 and CIRIA publication Remedial Treatment of Contaminated Land, Volumes 1 to 12. The scheme designer or promoter should seek the advice of a land contamination specialist who will assess the scope of the site investigation required, establish the level of contamination, identify the hazards posed to human health and the environment, and recommend appropriate remediation measures.

The site investigation and remedial action should be carried out on a risk assessment and risk management management basis. A procedure for risk management is given in HA73, CIRIA and ICE design and practice guides, Contaminated Land.

Further guidance on means of investigating and treating contaminated land can be obtained from CIRIA publication Remedial Treatment of Contaminated Land, Volumes 1 to 12.

HCC and statutory undertakers carry out works in areas of adopted highway and areas with wayleaves, as part of their maintenance and other duties. The degree of remediation of contaminated land must allow these duties to be carried out, such that the relevant organisation can comply with the Health and Safety at Work Act and NRSWA, without the need for special precautions or working methods.

The designer, promoter or contractor must provide HCC with a risk assessment and proposals for remedial actions, and must liaise with any relevant statutory bodies, such as the Environment Agency or Health and Safety Executive.

8.6.2. Other Remedials

Other ground improvements may be required to stabilise the ground before construction can take place. Techniques include grouting, dynamic compaction, lime stabilisation and cement stabilisation.

The application of these techniques requires the input of specialists that have experience of the particular methods proposed. HCC may request that the scheme designer or promoter employ a specialist to validate his proposals, as part of the earthworks approval procedure.

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Section 4 - Design Standards and Advice

Chapter 9 – Vehicle Parking Facilities

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9. Vehicle Parking Facilities

9.1. Provision

Provision and standards of parking within developments are set by each Local Planning Authority. Details are to be found in Supplementary Planning Guidance (or similar) available on each Borough or District Council's website or from their planning department.

9.2. On Street Parking

Generally the most appropriate solution will be to design for a level of on-street parking that takes account of the following factors:

- The overall level of car ownership in the immediate area;
- The amount of off-street parking provided;
- The amount of allocated parking provided;
- The speed and volume of traffic using the street; and
- The width and geometry of the street and its junctions

On-street parking, particularly when the vehicles are parked in echelon formation or perpendicular to the carriageway, has been found to be an effective speed-reducing feature.

Where unassigned spaces are provided on the carriageway, or on-street parking is likely to occur, the carriageway should be a minimum of 5.5m wide. If simultaneous parking on both sides of the carriageway is likely, a minimum width of 7m should be provided.

Parking provision shall not be located within the visibility splays at junctions and accesses. Parking areas should not obstruct forward visibility requirements, turning areas or inhibit the movement of refuse vehicles, buses or the emergency services.

Where unassigned parking spaces are provided, these will only count toward the Local Planning Authority's required provision if they are within 20m of a point immediately adjacent to the path or drive leading to the dwelling to which they relate. This distance shall be measured along the shortest practicable pedestrian route between the parking space and the path or drive to the dwelling entrance. Where spaces are grouped, the distance applies to the nearest space in a group of no more than 5 spaces.

9.3. Dimensions for car-parking spaces and manoeuvring areas

The dimension and location requirements for parking bays, driveways and turning areas shall be in accordance with the guidance in Manual for Streets in paragraphs 8.3.48 to 8.3.54.

Wider parking bays for use by disabled people should be provided in accordance with the guidance given in Traffic Advisory Leaflet 5/95. Additional information is given in Manual for Streets in paragraphs 8.3.55 to 8.3.58.

Unassigned parking bays at right angles to the carriageway shall not have a gradient in excess of 5%.

Parking areas should be clearly marked to deter unsociable, dangerous or illegal parking. Tactile paving should be used at dropped kerbs next to parking bays for wheelchair users as per the DfT document Inclusive Mobility.

It is recommended that Local Planning Authorities stipulate that in order to be an effective storage space for cars, on-plot garages must measure at least 6m long and 3m wide. Research has shown that only 44% of domestic garages are currently used for their stated purpose.

9.4. Footway parking

Drivers should be encouraged to regard the footway as reserved for pedestrians unless it is specifically marked for use. Public information and education programmes can help to influence attitudes in line with this objective.

Footway parking can be discouraged by installing physical measures such as bollards, raised planters or other street furniture, but these can add to clutter and discourage walking if designed poorly.

Guidance on deterring footway parking is to be found in Traffic Advisory Leaflet 04/93.

9.5. Motorcycle parking

Guidance is provided in Traffic Advisory Leaflet 02/02 and IHIE Guidelines for Motorcycling (2005).

9.6. Cycle parking

This is covered in Section 4, Chapter 12: Cycling Facilities.

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Section 4 - Design Standards and Advice

Chapter 10 – Passenger Transport Facilities

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10. Passenger Transport Facilities

10.1. General

In order to reduce the growth in car usage, HCC is pursuing a policy of integrated transport. It will be necessary when designing new developments to ensure that provision is made for adequate public transport services.

The scheme promoter must liaise with HCC to develop public transport services, priorities and infrastructure.

The scheme promoter will need to consider a variety of issues such as, bus lanes, busways, bus gates, bus priority at junctions, bus stop location, bus stop layout, service provision and passenger access.

As a general guide the following provision should apply:

Up to 50 dwellings	The need for a new bus stop and shelter should be considered.
50 to 100 dwellings	The need for the diversion of an existing bus route should be considered.
More than 100 dwellings	The need for a new route should be considered.

Bus shelters should comply with Hertfordshire County Council's specification as detailed in Quality Bus Infrastructure in Hertfordshire: A Design Guide.

Bus stops should be located so that the maximum walking distance from any dwelling is 400m. This should be reduced to 200m in retail and leisure developments, where there will be a significant proportion of elderly persons and where steep gradients are encountered.

The scheme promoter is responsible for making arrangements to continue bus services throughout the construction period. Arrangements for temporary bus stops and routes should be made in consultation with HCC. The scheme promoter may be asked to contribute to the development costs of local bus services.

HCC is introducing a range of Intelligent Transport Systems in partnership with passenger transport operators across Hertfordshire. More details on this are given in Section 4, Chapter 18: Intelligent Transport Systems and in the ITS Strategy which is available at http://www.hertsdirect.org/envroads/roadstrans/congestion/ITS/.

10.2. Design Guidance

A solar power source may be considered for bus shelters instead of a standard electrical supply.

Bus stop signs are obtained from the HCC Passenger Transport unit..

The design of bus stops and lay-bys should be to the standards laid out in the Guidelines for the Design of Bus Bays and Bus Stops.

Guidance on planning bus services can be obtained from a variety of sources. In particular:

- Local Transport Note 1/97
- Manual for Streets
- The DfT's Inclusive Mobility guidance

Specific design guidance can be found in the Hertfordshire County Council documents:

- Quality Bus Infrastructure in Hertfordshire: A Design Guide
- Passenger Transport in New Development
- Planning for Public Transport in Developments
  http://www.hertsdirect.org/envroads/roadstrans/publictransport/developmentdocuments/

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Section 4 - Design Standards and Advice

Chapter 11 – Pedestrian Facilities and Street Furniture

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11. Pedestrian Facilities and Street Furniture

11.1. General

As part of the draft third Local Transport Plan, HCC produced a draft Walking Strategy in September 2010. This is available at http://www.hertsdirect.org/envroads/roadstrans/transplan/ltp/ and gives the policy direction of the authority in this area.

Footways are those parts of a road intended for pedestrian use. They generally run parallel to the adjacent carriageway and may be separated from it by kerbs and a verge.

Footpaths are pedestrian routes generally located away from the carriageway and not associated with routes for motor vehicles.

Also refer to Section 5, Chapter 9: Kerbs, Footways and Paved Areas (Series 1100).

11.2. Design Guidance

11.2.1. User Audit

HCC has developed a User Audit process to ensure that there is a consistent approach to the consideration of Non-Motorised Users (NMUs) for all highways schemes.

The needs of NMUs must be assessed at key stages during the project life and, where appropriate, the design should be altered or key decisions recorded. This procedure forms part of the commissioning process and is key to ensuring all parties, including HCC, are kept informed of any critical or controversial issues, including departures from the agreed standards.

11.2.2. Design Standards

The design standards within this section are derived from the following documents:

- LTN 2/08 Cycle Design Infrastructure
- DfT Manual for Streets (2007)
- DMRB TA 90/05 The Geometric Design of Pedestrian, Cycle And Equestrian Routes (2005)
- DMRB TD 50/04 The Geometric Layout of Signal Controlled Junctions and Signalised Roundabouts (2004)
- DfT Inclusive Mobility (2002)
- DMRB HD 39/01 Footway Design (2001)
- IHT Providing for Journeys on Foot (2000)
- DfT Guidance on the use of tactile paving surfaces (1998)
- DMRB TD 42/95 Geometric Design of Major/Minor Priority Junctions (1995)
- LTN 2/95 The Design Of Pedestrian Crossings (1995)
- DMRB TA57/87 Roadside Features (1987)

Throughout this chapter the standards referred to are defined in three levels as follows:

- Recommended

These generally follow the recommended standards set out in the various standards / guidance and HCC policy / strategy. Designers should aim to adopt these standards wherever possible as the first choice.

- Acceptable Limits

These are generally the minimum standards set out in the various standards / guidance and HCC policy / strategy. Although it is acceptable for designers to use these standards, there use should be limited, and they must carefully consider the impact on NMUs.

- Absolute Limits

These are the minimum standards that will be accepted by HCC, and are sometimes referred to as absolute minimum in the various standards \ guidance and HCC documents referred to above.

If there is no alternative but to adopt standards between the Acceptable Limits and the Absolute Limits then this must be recorded and agreed with the client.

11.2.3. Route

Footways should be continuous and follow pedestrian desire lines where possible.

11.2.4. Footway Widths

The total footway width includes for any separation from the carriageway that has been allowed for, generally 0.5m.

Below 30mph

	Total Width	Effective Width
Recommended	3.1m	2.6m
Acceptable Limits	2.0m	1.5m
Absolute Limits *	1.25m	1.25m

Table 4.11.2.1: Footway widths below 30mph
* - No separation allowed for

Where there is a safety benefit or a high number of pedestrians, the footway width should be increased. This would be appropriate outside schools, shops and other community facilities.

Below 30mph with high pedestrian volumes

	Total Width	Effective Width
Recommended	4.0m	3.5m
Acceptable Limits	3.5m	3.0m
Absolute Limits	2.0m	1.5m

Table 4.11.2.2: Footway widths below 30mph with high pedestrian volumes

Above 40mph

Footways on roads with a speed limit of 40mph or more should ideally be separated from the carriageway by a 1.5m verge strip

.	Total Width	Effective Width
Recommended	2.6m	2.6m
Acceptable Limits	2.0m	2.0m
Absolute Limits *	2.0m	1.5m

Table 4.11.2.3: Footway widths above 40mph
* - 0.5m footway separation included.

Where footpaths exceed 50m in length from a vehicular access point, they should lie in an unobstructed corridor 2.5m wide. This allows for the future access of maintenance vehicles.

The width of a footway may need to be locally increased around features, such as bus shelters, to maintain adequate footway width and to avoid any conflict between pedestrians and passengers accessing the shelter.

Vertical headroom is described later in this chapter.

11.2.5. Boundary Treatments

The boundary treatment is the clearance between the edge of the footway and any continuous vertical obstruction e.g. walls, fences, hedges etc.

	up to 1.2m high	above 1.2m high
Recommended	0.25m	0.5m
Acceptable Limits	0m	0m
Absolute Limits	N/A	N/A

Table 4.11.2.4: Boundary treatments

11.2.6. Horizontal clearance to obstructions

In exceptional circumstances the footway or footpath width may be reduced around obstacles, over a short distance (up to 6m). This must be agreed with HCC.

	Minimum Footway Width over a maximum of 6m
Recommended	1.25m
Acceptable Limits	1.25m
Absolute Limits	1.0m

Table 4.11.2.5: Horizontal clearance to obstructions

Wherever possible ensure that street furniture does not reduce the available width by locating features at back of footway or footpath.

11.2.7. Crossfall

	Max	Min
Recommended	2% (1:50)	1% (1:100)
Acceptable Limits	2.5% (1:40)	1% (1:100)
Absolute Limits	See note 11.16	See note 11.17

Table 4.11.2.6: Crossfall

Steeper gradients will only be considered where existing ground levels make it impractical to achieve the acceptable limits specified.

If shallower gradients are used drainage must be considered to prevent ponding.

The crossfall of footways and footpaths will increase locally around a crossing point. This should be an absolute maximum of 8% (1:12.5) for no more than 5m.

Where possible a level area should be left at the back of the footway

	Level area at back of footway
Recommended	0.9m
Acceptable Limits	0m (only if existing footway too narrow, and no space available within highway to widen)
Absolute Limits	N/A

Table 4.11.2.7: Level area

11.2.8. Gradient (Longfall)

The gradient of a footway is likely to be the same as the adjacent road. The gradient of a footpath should not exceed 5%. In exceptional circumstances this may be increased to 8% over short distances less than 5m.

	Max	Min
Recommended	5% (1:20)	1% (1:100)
Acceptable Limits	8% (1:12.5)	1% (1:100)
Absolute Limits	See note 11.21	See note 11.17

Table 4.11.2.8: Gradient (longfall)

Where it is unavoidable to have a footpath with a gradient greater than 8%, steps should be provided with a bypass ramp for wheelchairs and pushchairs.

Steps must be provided with a handrail running 900mm above the steps. Steps should also be provided with corduroy paving complying with Guidance on the use of Tactile Paving Surfaces.

11.2.9. Construction

The details of footway and footpath construction are given in Section 4, Chapter 1: Road Design Criteria.

Care must be taken to provide safe pedestrian routes through construction works. Provision must comply with Chapter 8 of the TSM and the code of practice Safety at Street Works and Road Works.

11.2.10. Surface Condition \ Regularity

Ensure good surface regularity with no trip hazards. Maximum deviation over 1m should not exceed 3mm. To meet these criteria it is the use of cobblestones is not recommended.

11.2.11. Kerb Upstands

	Recommended	Accept-able Limits	Absolute Limits
Controlled Crossings	Flush 0mm	Flush 0mm	N/A
Uncontrolled Crossings	Flush 0mm	6mm rounded bullnose *	N/A
Vehicle Crossovers	25mm	25mm	N/A
General Use	125mm	Min 100mm Max 140mm	N/A
Junction Tables \ Flat Topped Road Humps	Min 50mm	Min 25mm	N/A
Bus Stops	160mm	160mm	N/A

Table 4.11.2.9: Kerb upstands
* - If essential for drainage

11.2.12. Headroom (Minimum vertical clearance to obstructions)

	Clearance
Recommended	Signs – 2.3m Obstacles up to 23m – 2.3m Obstacles longer than 23m – 2.7m
Acceptable Limits	Min 2.3m
Absolute Limits	N/A

Table 4.11.2.9: Minimum vertical clearance

The minimum clearance to tree branches that overhang any pedestrian facility should be 2.3m. Therefore where possible trees should be crown lifted to 3m to minimise the need for excessive routine maintenance due to re-growth of branches, or any sag from the weight of the foliage.

Horizontal clearances are described earlier in this chapter.

11.2.13. Drainage

Carriageway gullies should never be located in crossing areas.

Ensure that adequate footway drainage is provided, but do not use dished channels within pedestrian routes.

11.2.14. Lighting

All pedestrian facilities should be designed with adequate lighting. Refer to Volume 4, Chapter 15: Street Lighting - Detail

11.2.15. Pedestrian Guardrail

Refer to Volume 4, Chapter 7: Road Restraint Systems for details of pedestrian guardrail requirements. Government guidance in this area is available in the form of Local Transport Note 2/09 at http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/.

11.2.16. Staggered Barriers

Staggered barriers are used to protect pedestrian only areas from use by cyclists and motorised vehicles. The recommended spacing (1.2m) and offset (0.6m) for this type of configuration is shown in figure 4.11.2.1.

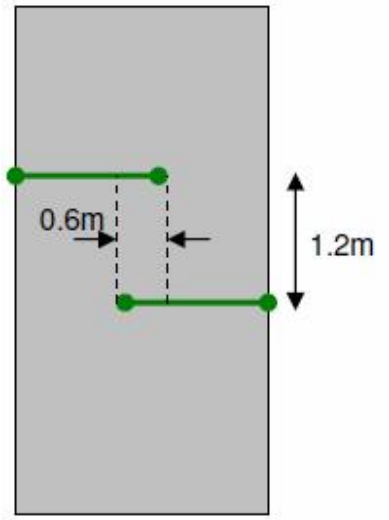

Figure 4.11.2.1: Configuration of Cycle Barriers

11.3. Crossing Points

11.3.1. General

Pedestrian crossing points should be provided at junctions, adjacent to bus stops, near to amenities such as a post box, shops, and schools and at any other location where pedestrians are likely to cross the road.

The recommended frequency of crossing point in urban areas is every 100m.

In certain circumstances, such as where the carriageway is wide or traffic volumes are high, there may be a need to provide refuge islands at crossing points. The exact details are specified later in this section, but should be wide enough to cater for the numbers and type of users they will encounter. For example, wider refuges would be needed where they are likely to be used by parents with pushchairs or cyclists.

At locations where a lot of people may be crossing the road, such as shops, parks or community facilities, there may be a need for a controlled crossing. Guidance is given in Local Transport Note 1/95 and Local Transport Note 2/95. The layout of formal pedestrian crossings must conform to the Zebra, Pelican and Puffin Pedestrian Crossings Regulations 1997 or any subsequent regulations which may supersede these.

In general, a pedestrian phase should be provided at signal controlled junctions. Liaison with HCC will be required to assess the need and any impact on capacity. Guidance is given in TA15.

Photo 4.11.3.1: A controlled pedestrian crossing

11.3.2. Tactile Paving

All crossing points shall be provided with tactile paving to the standards laid out in Guidance on the use of Tactile Paving Surfaces and dropped kerbs flush with the carriageway..

In exceptional circumstances, for example areas with extremely low pedestrian flows, HCC may consider omitting tactile paving at uncontrolled crossing points, subject to the agreement of local disability groups. However, it must always be used at controlled crossings.

11.3.3. Crossfall of carriageway adjacent to kerb

To ensure there is a smooth transition from footway to carriageway, the crossfall of the first 600mm of carriageway is set out below

	Maximum crossfall of first 600mm of carriageway adjacent to kerb
Recommended	2.5% (1:40)
Acceptable Limits	5% (1:20)
Absolute Limits	*

Table 4.11.3.1: Minimum crossfall

11.3.4. Crossfall of footway at crossing point

	Max Crossfall
Recommended	5% (1:20)
Acceptable Limits	8% (1:12) for no more than 5m
Absolute Limits	*

Table 4.11.3.2: Max crossfall

11.3.5. Longfall by crossing point side ramps

	Max Longfall
Recommended	8% (1:12)
Acceptable Limits	13% (1:7.5) (Based on typical 914mm long dropper kerb - 125mm to 0mm)
Absolute Limits	*

Table 4.11.3.3: Max longfall

* Steeper gradients will only be considered where existing ground levels make it impractical to achieve the acceptable limits specified.

11.3.6. Uncontrolled Crossing Points

Where the recommended width of uncontrolled crossing points give a range of values, the appropriate width should be selected based on the level of pedestrian flow.

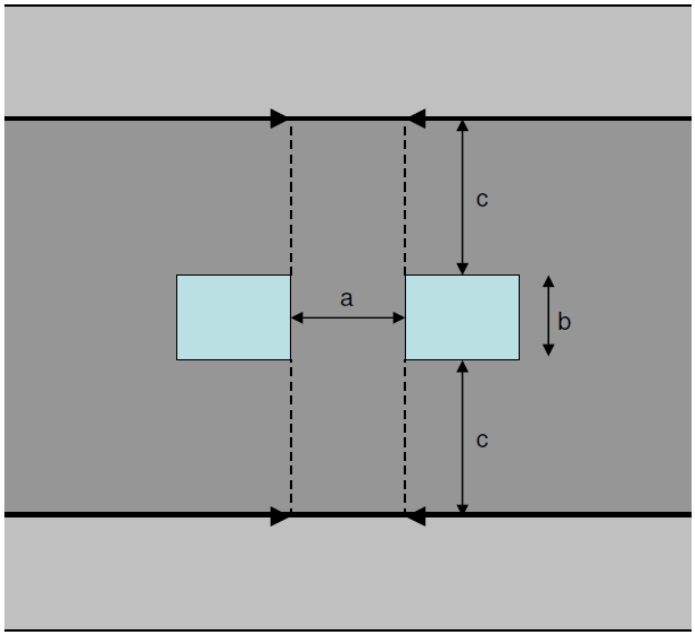

Figure 4.11.3.2: Pedestrian Crossing Dimensions

Without Pedestrian Refuge	'a'
Recommended	1.8m to 3m
Acceptable Limits	Min 1.2m
Absolute Limits	N/A

Table 4.11.3.4: 'a' dimension without refuge

With Pedestrian Refuge	'a'	'b'
Recommended	2m to 4m	Min 2m
Acceptable Limits	Min 1.8m	Min 1.5m
Absolute Limits	N/A	Min 1.25m*

Table 4.11.3.5: 'a' and 'b' dimension with refuge

* - A typical illuminated bollard is approx 0.35m wide therefore 1.25m allows for 0.45m clearance on either side.

With Staggered Pedestrian Refuge	'a'	'b'
Recommended	2m to 4m	Min 4m
Acceptable Limits	Min 1.8m	Min 3m
Absolute Limits	N/A	Min 2.5m

Table 4.11.3.6: 'a' and 'b' dimension with staggered refuge

The traffic lane widths (dimension 'c') should not be between 3m and 4m in order that the lane is wide enough to allow vehicles to safely overtake cyclists or narrow enough to discourage overtaking.

11.3.7. Visibility splays at crossing points

Visibility splays are measured using diagram 4.11.3.3.

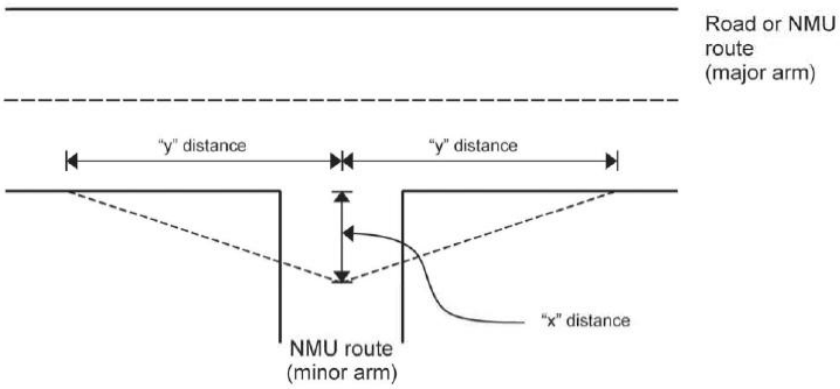

Figure 4.11.3.3: Visibility Splays

	'x' distance
Recommended	Min 2m
Acceptable Limits	Min 1.5m
Absolute Limits	N/A

Table 4.11.3.7: 'x' distance

	'y' distance
Recommended	Primary or Main Distributor 30mph – 90m 40mph – 120m All other 30mph limits use DfT MfS Table 7.1
Acceptable Limits	As above.
Absolute Limits	If the required visibility cannot be met then speed reduction measures should be considered.

Table 4.11.3.8: 'y' distance

11.4. Controlled Crossings

11.4.1. Zebra Crossings

Crossing Width	Min	Max
Recommended	2.4m	5.0m
Acceptable Limits	2.4m	5.0m
Absolute Limits	N/A	10.1m*

Table 4.11.4.1: Crossing width – zebra crossings

* only with approval from Secretary of State

The acceptable proximity of a zebra crossing to a junction should be calculated using the distance from driver to give-way line according to the table below.

Proximity to junctions	Min
Recommended	20m
Acceptable Limits	20m
Absolute Limits	5m

Table 4.11.4.2: Min proximity to junctions – zebra crossings

11.4.2. Pelican or Puffin Crossings

Crossing Width	Min	Max
Recommended	2.4m	10.0m
Acceptable Limits	2.4m	10.0m
Absolute Limits	N/A	N/A

Table 4.11.4.3: Crossing width – pelican or puffin crossings

Proximity to junctions	Min
Recommended	20m
Acceptable Limits	20m
Absolute Limits	10m

Table 4.11.4.2: Min proximity to junctions – pelican or puffin crossings

11.5. Street Furniture

11.5.1. Type: Colour and Style

Street furniture should be provided where it is necessary. It should be of a suitable design, quantity and located appropriately to improve the street and assist users. The style, material, size, colour and installation of street furniture within a scheme will depend on the location and its intended usage.

In areas where there is no consistent theme in the current street furniture, it is recommended that any new street furniture is a contrasting colour to the environment (galvanised is not acceptable). It should be a minimum height of 1m and have rounded edges. Guidance on the role of street furniture in making public areas accessible to those with disabilities is given in part M of the Building Regulations 2000, which is known as 'Access to and Use of Buildings'.

It is available to download at
http://www.planningportal.gov.uk/england/professionals/buildingregs/technicalguidance/bcaccesstopartm/bcapproveddocuments10.

In areas, such as town centres where there is likely to be a specific type of street furniture that is already in use, it is appropriate to match the existing furniture to provide a consistent visual appearance.

The designer or scheme promoter must receive the approval of the Local Planning Authority and HCC for the street furniture to be used.

Containers provided for plants, should generally have a clearance from the carriageway of 500mm if they are higher than 150mm above the carriageway surface.

Street name plates should be fixed to permanent structures adjacent to the highway, in preference to erecting them on posts. New street names must be agreed with the Local Planning Authority.

11.5.2. Locating street furniture

Where possible all street furniture should be located as close to the back of footway to ensure the maximum available footway width is maintained for pedestrians. However, the designer should ensure that enough room is left for maintenance, such as painting.

If there is sufficient footway width to allow street furniture to be located at the front of the footway then the clearance to the kerb face should be as follows:

Clearance	Min
Recommended	0.50m
Acceptable Limits	0.45m
Absolute Limits	N/A

Table 4.11.5.1: Min street furniture clearance

11.5.3. Bollards

Where bell bollards are required to prevent overrun of the footway by large vehicles, these should incorporate a standard height bollard.

11.5.4. Seating

It is recommended that seating should be provided every 50m in busy pedestrian areas.

11.5.5. Litter Bins

It is recommended that the opening for litter to be deposited should be at 1m above ground level.

11.5.6. Low level signs supported by two posts e.g. Notice Boards

The outer edge of the sign should be no more than 150mm beyond the posts and a tapping rail should be installed 300-400mm above ground level.

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Section 4 - Design Standards and Advice

Chapter 12 – Cycling Facilities

Hertfordshire

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12. Cycling Facilities

12.1. General

Cycling is a low cost, convenient, quick, healthy and sustainable form of transport that is well suited to many short to medium distance journeys. Increasing levels of cycling forms an essential part of HCC's transport strategy. As such any additions or changes to the highway must show consideration to cyclists as users of the highway network.

Details of the Hertfordshire Cycling Strategy can be found on line at the address below:

www.hertsdirect.org/envroads/roadstrans/transplan/ltp/ltp2/newcyclestrat/

The following Section sets out the design process to be followed when designing for cyclists and to ensure wherever possible cyclists are not compromised by other highway schemes.

More extensive details on designing for the needs of cyclists can be found in DfT LTN 2/08 Cycling Design Infrastructure. (http://www.dft.gov.uk/pgr/roads/tpm/ltnotes/).

In general cycling will be encouraged on the carriageway rather than along special, segregated facilities, especially in urban areas. To this end, new roads in residential areas will be designed to bring about self-enforcing mean speeds below 20 mph.

12.2. Hierarchy of Provision

All new cycle facilities should be designed following the hierarchy of provision shown in diagram 4.12.1.1 the aim of which is to promote on road cycling as the first choice and details of the treatments that may be appropriate are set out in the Section on Types of Provision.

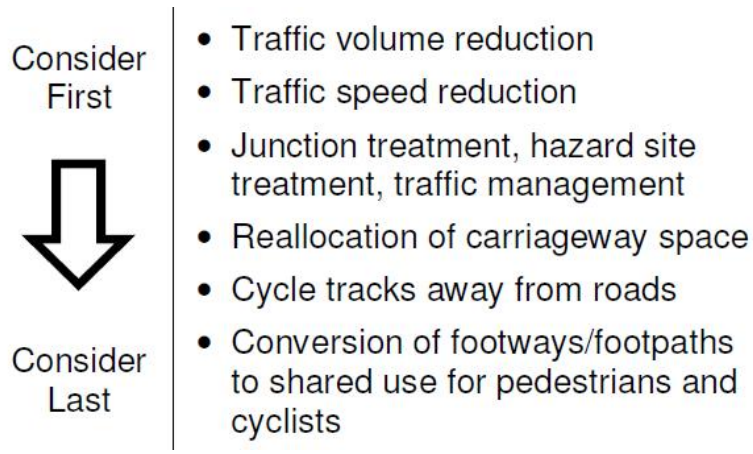

Diagram 4.12.1.1: Hierarchy of Cycle Provision

Designers should also use the graph overleaf (diagram 4.12.1.2) to establish what type of provision may be appropriate for the traffic flows and speeds of the Section of route under consideration.

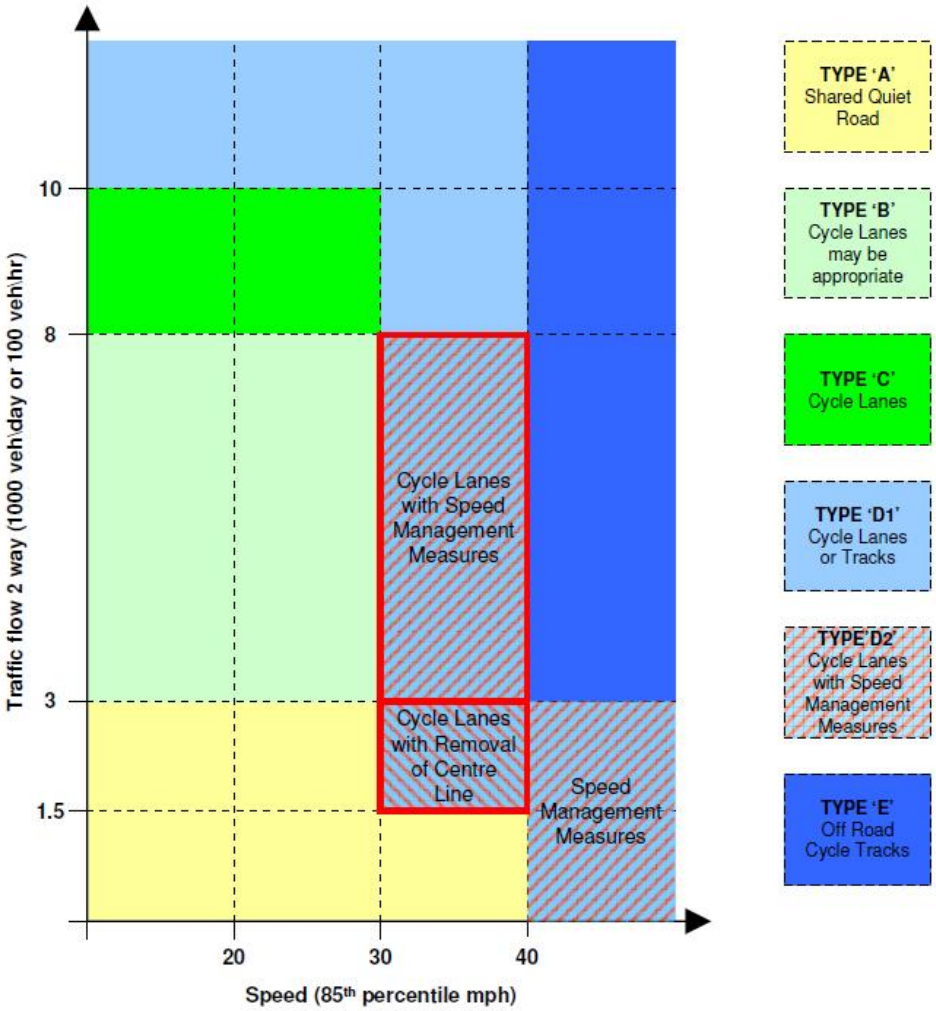

Diagram 4.12.1.2: Cycle Provision by Traffic Flow and Speed

It should be noted cycle lanes are routes provided on the carriageway; while cycle tracks are segregated from the carriageway but may be shared with pedestrians.

As shown in diagram 4.12.1.2, for small residential developments, where traffic speeds are less than 30mph, it will not be necessary to provide cycle lanes or tracks. However, there may be justification for cycle track links between roads or to adjacent developments, where this would add to cycle permeability or be the safest route for cycle journeys.

12.3. Design Guidance

12.3.1. User Audit

HCC has developed a User Audit process to ensure that there is a consistent approach to the consideration of Non-Motorised Users (NMUs) for all highway schemes.

The needs of NMUs must be assessed at key stages during the project life and where appropriate, the design should be altered or key decisions recorded. This procedure forms part of the commissioning process and is key to ensuring all parties, including HCC, are kept informed of any critical or controversial issues, including departures from the agreed standards.

12.3.2. Design Standards

The design standards within this Section are derived from the following documents:

HCC Cycling Strategy (2007)

LTN 2/08 Cycle Design Infrastructure

DMRB TA 90/05 The Geometric Design of Pedestrian, Cycle And Equestrian Routes (2005)

DfT Inclusive Mobility (2002)

DfT Guidance on the use of tactile paving surfaces (1998)

DMRB TD 42/95 Geometric Design of Major/Minor Priority Junctions (1995)

LTN 2/95 The Design Of Pedestrian Crossings (1995)

Throughout this Section the standards referred to, are defined in three levels as follows:

a) Recommended

These generally follow the recommended standards set out in the various standards or guidance and HCC policy and strategy. Designers should aim to adopt these standards wherever possible as the first choice.

b) Acceptable Limits

These are generally the minimum standards set out in the various standards or guidance and HCC policy and strategy. Although it is acceptable for designers to use these standards their use should be limited, and they must carefully consider the impact on NMUs.

c) Absolute Limits

These are the minimum standards that will be used in Hertfordshire and are sometimes referred to as absolute minimum in the various standards and guidance and HCC documents referred to above.

If there is no alternative but to adopt standards between the Acceptable Limits and the Absolute Limit then this must be recorded and agreed with the client

12.4. Types of Provision

These segment of the cycle facilities chapter discuses the options for improvement given in the hierarchy of provision shown in diagram 4.12.1.1.

12.5. 1st Choice - Traffic Volume Reduction

Measures to reduce traffic volume include the following

- Road Closures
- One-Way (including Plugs)
- Turning Bans
- Pedestrianisation

Cyclists must be exempt from all Traffic Regulation Orders (TROs) banning turns or closing roads and physical provision must be made for cyclists where necessary as a result.

12.6. 2nd Choice - Traffic Speed Reduction

12.6.1. Traffic Calming

Speed reduction schemes shall accommodate the needs of cyclists, particularly where physical measures are introduced. Refer to Section 4, Chapter 14: Traffic Calming and Road Features for further details.

12.7. 3rd Choice - Junctions & Traffic Management

12.7.1. Junction Treatment

One of the key considerations in the provision of a safe, convenient and continuous route for cyclists is how cyclists will negotiate junctions along their route.

Specific guidance is covered within LTN 2/08 Cycle Infrastructure Design Section 9.

12.7.2. Continental roundabout design

Where capacity requirement allow all new roundabouts should be designed to the compact design standards in TD16/07 to allow safe use by cyclists. A key factor to consider in preparing a practical layout will be the swept path requirements of large vehicles.

It is recognised that when modifying existing roundabouts to follow continental principles, there may be difficulties in meeting the requirements for compact design set out in TD 16/07. Where there are curved or angled approaches the swept path requirements of large vehicles may be difficult to accommodate within the narrow entries and exits. Capacity requirements may also be a constraining influence. In this instance the layout should be modified to incorporate the key principles of continental design that optimise safety for cyclists but within conventional roundabout design standards. In practice this will mean narrower entries (6m min. = 2x3m lanes) and more radial approaches featuring high entry angles and greater entry path curvature.

Refer to Section 4, Chapter 2: Junctions for further details.

12.7.3. Advance Stop Lines (ASLs)

Advance Stop Lines should be provided at all traffic signal junctions where feasible, this should enable cyclists to:

- position themselves ahead of other traffic;
- assist turning manoeuvres;

- be more visible to motorists; and
- clear the junction before other vehicles.

Detailed guidance can be found in LTN 2/08 Cycle Infrastructure Design Section 7.4.2 & 9.4.

12.7.4. Cycle Reservoir Depth

	Cycle reservoir depth
Recommended	4m generally, 5m where there are multiple approach lanes to be crossed.
Acceptable Limits	4m (Min), 5m (Max)
Absolute Limits	N/A

Table 4.12.7.1: Cycle reservoir depth

12.7.5. Feeder Lane Widths

	Feeder Lane Width
Recommended	1.5m
Acceptable Limits	1.2m
Absolute Limits	N/A

Table 4.12.7.2: Feeder lane width

12.7.6. ASL - Feeder Lane Length

The Feeder Lane must be as long as the maximum traffic queue length in peak hours.

12.7.7. Contraflow Cycle Lanes

It is essential to ensure that cyclists are allowed permeability through the road network, therefore, contraflow lanes should always be provided on any one-way streets or at any "No Entry" Plugs

Detailed guidance can be found in LTN 2/08 Cycle Infrastructure Design Section 7.6 but as a guide the graph overleaf (diagram 4.12.7.1) shows which type of provision may be suitable depending on site conditions.

Contraflow lane width criteria is the same as for on road cycle lanes.

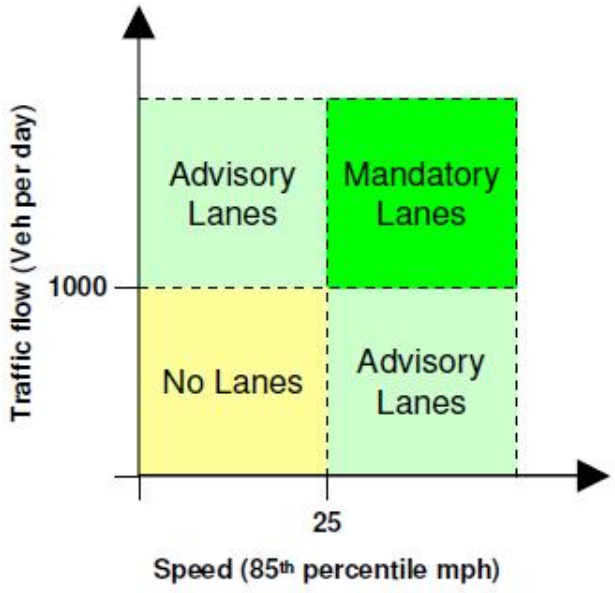

Diagram 4.12.7.1: Selection of Contraflow Cycling Provision

12.7.8. Hazard Site Treatment

Refer to Section 4, Chapter 3: Casualty Reduction and Safety Cameras.

12.8. 4th Choice - Reallocation Of Roadspace

12.8.1. On Road Lanes

Mandatory cycle lanes should always be considered as the first choice where feasible. The design criteria for on road lanes is set out below and further details can be found in LTN 2/08 Cycle Infrastructure Design Section 7.

12.8.2. Lane Widths

	Width
Recommended	2m
Acceptable Limits	1.5m
Absolute Limits	N/A

Table 4.12.8.1: Lane width

12.8.3. Carriageway Crossfall

	Feeder Lane Width
Recommended	2.5% (1:40)
Acceptable Limits	Min 2% (1:50) Max 3% (1:33)
Absolute Limits	Steeper gradients will only be considered where existing ground levels make it impractical to achieve the acceptable limits

Table 4.12.8.2: Feeder lane width

12.8.4. Clearance to Parked Cars

Detailed guidance can be found in LTN 2/08 Cycle Infrastructure Design Section 7.5.2

	Buffer Width	Approach Taper
Recommended	1m	1:10
Acceptable Limits	0.5m	1:10
Absolute Limits	N/A	N/A

Table 4.12.8.3: Clearance

Alternatively these may be omitted if parking lay-bys are at least 2.5m wide.

12.8.5. Surface Colour

To minimise the future maintenance requirements of any new scheme the use of Green coloured surfacing should be kept to a minimum. As a result it should only be used to highlight conflict areas and features.

In areas where a new scheme will connect to existing cycle facilities that have extensive use of coloured surfacing, exceptions to this rule may be considered to ensure visual consistency.

12.8.6. Bus Lanes

Where bus lanes are provided, dual use by cyclists should be considered and the lane widths should be as follows. Refer to Section 4, Chapter 10: Passenger Transport Facilities for further information on bus facilities.

	Width
Recommended	4.5m
Acceptable Limits	4m
Absolute Limits	N/A

Table 4.12.8.4: Bus lane width

12.8.7. Contraflow Bus Lanes

	Width
Recommended	4.25m
Acceptable Limits	4m
Absolute Limits	3m (for short lengths or low flows)

Table 4.12.8.5: Contraflow bus lane width

12.8.8. Removal of Centre Lines

Where traffic volumes are <3000 vpd or <300 vph and speeds are between 30 and 40mph consideration should be given to the removal of the centre line and the introduction of 1.5m wide advisory cycle lanes. A minimum lane width of 3.5m should be maintained for general traffic and therefore a minimum total carriageway width of 6.5m is required.

12.8.9. Drainage

The position and style of drainage such as gullies needs careful consideration as this can affect the comfort of any cycle route. Ideally gully gratings should have a mesh style grating and be flush with carriageway.

12.9. 5th Choice - Off Road Cycling Facilities

12.9.1. Definition of Terminology

Within the numerous documents available a number of different names are given to describe the different type of facility that can be implemented. To avoid confusion the following definitions shall be used in Hertfordshire.

- Shared - an off-road facility catering equally for both pedestrians and cyclists. Sometimes referred to as Un-segregated;
- Segregated shared - an off-road shared facility where pedestrians and cyclists are separated by means of a central delineator strip;
- Segregated - an individual facility for either pedestrians or cyclists or adjacent facilities separated by a physical level difference such as a kerb (see below). Sometimes referred to as Adjacent Use.

Photo 4.12.9.1: Cycle Track

12.9.2. Segregated Cycle Track Widths

Care should be taken to avoid conflict between cyclists and pedestrians. Where a bus stop or shelter is located adjacent to a cycle track, the needs of passengers must be taken into consideration.

The following tables give the effective widths for cycle tracks. Additional width for the appropriate "Boundary Treatments" and "Separation" need to be added to these figures to calculate the total width required (covered later in this chapter).

12.9.3. Segregated Shared Track Widths

	One Way Pedestrian /Cycle	Two Way Pedestrian /Cycle
Recommended	3m 1.5m / 1.5m	5m 2m / 3m
Acceptable Limits	3m 1.5m / 1.5m	3.5(4)*m 1.5m / 2m*
Absolute Limits	Consider Shared Facility	

Table 4.12.9.1: Segregated shared track widths

* - Widen cycle Section to 2.5m where space allows.

12.9.4. Shared Track Widths

	One Way	Two Way
Recommended	3m	3m
Acceptable Limits	2.5m	2.5m
Absolute Limits	2m *	

Table 4.12.9.2: Shared track widths

* The Absolute Limit of 2m should only be considered for sites with low pedestrian and cycle flows (up to 200 users/hr). Where this is appropriate it should only be used over short distances (approx 20m) with good inter-visibility from either end of the Section.

12.9.5. Cycle Track (for cycles only) Widths

Where there is an alternative route for pedestrians the following widths may be used for tracks that will predominately be used by cycles only.

	One Way	Two Way
Recommended	1.5m	3m
Acceptable Limits	1.5m	2(2.5)m*
Absolute Limits	2m	

Table 4.12.9.3: Cycle track widths

* - Widen cycle Section to 2.5m where space allows.

Where a separate cycle track runs close to a route used by pedestrians a gap (usually a strip of grass verge) known as the separation should be provided between the two facilities as specified below.

12.9.6. Separation of Non Motorised Users

	Separation
Recommended	1m
Acceptable Limits	0.5m
Absolute Limits	N/A

Table 4.12.9.4: Separation of non-motorised users

12.9.7. Boundary Treatments & Separation

Detailed guidance can be found in LTN 2/08 Cycle Infrastructure Design Section 8.5 & Table 8.2

12.9.8. Boundary Treatment

Type of edge constraint	Additional Width
Flush or near flush surface	Nil
Low upstand up to 150 mm	200mm
Vertical feature from 150 mm to 1.2 metres*	250mm
Vertical feature above 1.2 metres	500mm

Table 4.12.9.5: Boundary treatments

* Including bridge parapets, etc. over 1.2 metres for short distances.

12.9.9. Separation to Vehicles

	≤30mph	≥40mph
Recommended	1.5m	1.5m
Acceptable Limits	0.5m	1.5m
Absolute Limits	N/A	N/A

Table 4.12.9.6: Separation of vehicles

12.9.10. Tapers

Transitions from one width to another should generally be 1:7, although this may be relaxed to 1:5 on the approach to crossing or subway.

12.9.11. Longfall (off carriageway adjacent to road)

This will match existing carriageway but where gradient >5% (1:20) consider using signs to warn cyclists or SLOW markings.

12.9.12. Longfall (off carriageway away from road)

	Max	Min
Recommended	3% (1:33)	1.25% (1:80)
Acceptable Limits	7% (1:14) for 30m 5% (1:20) for 100m	1.25% (1:80)
Absolute Limits	*	

Table 4.12.9.7: Carriageway longfall

12.9.13. Crossfall

	Max	Min
Recommended	2% (1:50)	1% (1:100)
Acceptable Limits	Absolute Max – 8% (1:12.5) (for no more than 5m)	
Absolute Limits	*	

Table 4.12.9.8: Carriageway crossfall

* Steeper gradients will only be considered where existing ground levels make it impractical to achieve the acceptable limits specified. If shallower gradients are used drainage must be considered

12.9.14. Tactile Paving

Tactile paving should be provided in accordance with the DfT's Guidance on the use of Tactile Paving Surfaces which is available at http://www.dft.gov.uk/transportforyou/access/peti/guidanceontheuseoftactilepav6167

On segregated shared facilities at locations where it is necessary to provide a 2.4m long Section of ladder and tramline paving, the designer must ensure that cyclists can negotiate the paving in a straight line. Therefore this paving must be set back a suitable distance to accommodate the turning radii of cyclists.

12.9.15. Headroom

	Required headroom
Recommended	Signs – 2.4m Obstacles up to 23m – 2.4m Obstacles longer than 23m – 2.7m
Acceptable Limits	2.4m
Absolute Limits	2.3m Use warning sign diagram 530 and yellow\black chevron diagram 530.2 across top of subway entrance

Table 4.12.9.9: Headroom

Consider mounting signs on existing street furniture or using low level signs that are incorporated into bollards

The minimum clearance to tree branches that overhang any pedestrian facility should be 2.4m. Therefore where possible trees should be crown lifted to 3m to minimise the need for excessive routine maintenance due to re-growth of branches, or any sag from the weight of the foliage.

12.9.16. Visibility splays at junctions between Non Motorised Users

At junctions of more than one cycle track, clear priority arrangements should be indicated by 'give way' signs and markings.

Visibility on the non-priority track shall be measured from a point 4.5m back from the give way markings. The area within the visibility splay shall be kept clear of obstructions above a height of 0.5m. The visibility along the major track in both directions shall be as specified in the table overleaf.

	Commuter Route (20mph)	Local Access Route (12mph)
Recommended	25m	15m
Acceptable Limits	For design speed of 10kph the acceptable minimum over short distances – 10m Use 'SLOW' markings	
Absolute Limits	*	

Table 4.12.9.10: Visibility splays for non motorised users

* For existing subways with right angle corners, barriers or other means can be used to guide cyclists away from inside of corner.

12.9.17. Horizontal Alignment

The minimum radius of curves should be as follows:

Minimum radius of curves	Commuter Route (20mph)	Local Access Route (12mph)
Recommended	25m	15m
Acceptable Limits	25m	15m
Absolute Limits	4m over short distances	

Table 4.12.9.11: Horizontal alignment

12.9.18. Vertical Alignment

The minimum Crest K value should be as follows:

	K value
Recommended	5.0
Acceptable Limits	1.6
Absolute Limits	N/A

Table 4.12.9.12: Minimum Crest K values

12.9.19. Construction

Cycle tracks should be constructed to the standards laid out in Section 4, Chapter 1: Road Design Criteria. Cycle lanes have the same construction as the carriageway.

In Urban Areas all off road cycle facilities shall be constructed with a surface course of DBM that has been machine laid to ensure a smooth surface.

Hand lay will only be permitted in small areas, up to approx 30 m^2, where it is impractical or unsafe to use a paving machine.

In rural areas where environmental considerations outweigh the need to provide a smooth surface DBM may be substituted for a crushed concrete construction. The use of gravel or loose aggregate is not acceptable.

12.10. Road Crossings

12.10.1. General

Crossing facilities should allow cyclists to approach the crossing at right angles to the carriageway. Where this is not possible use non-slip kerb surfacing. Where a cycle route runs

parallel to the carriageway, 'jug handles' should be used where possible to ensure that cyclist can cross at right angles to the carriageway.

12.10.2. Traffic islands

Figure 4.12.10.1 gives a diagrammatic representation of the preferred layout for a cycle crossing.

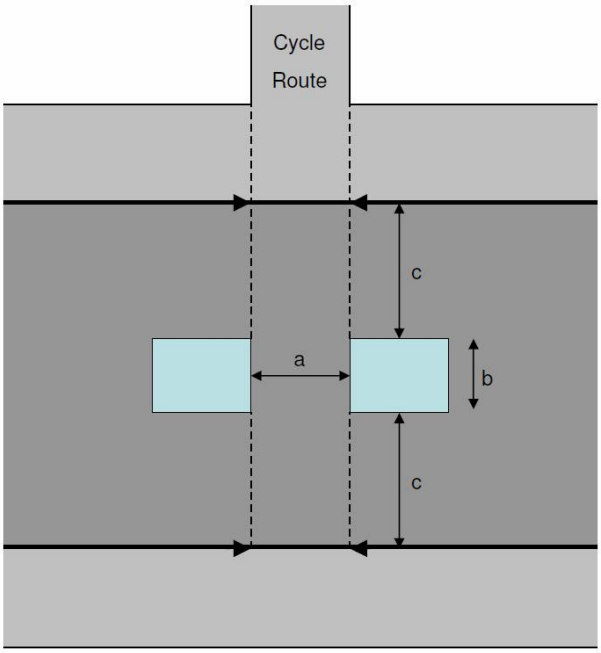

Diagram 4.12.10.1: Preferred Dimensions for a Cycle Crossing

Dimension 'a' should match the effective width of the cycle lane or track.

Dimension 'b' is given in table 4.12.10.2.

	'b'
Recommended	Min 3m
Acceptable Limits	Min 2m
Absolute Limits	N/A

Table 4.12.10.2: Dimension 'b'

The traffic lane widths (dimension 'c') should be wide enough to allow vehicles to safely overtake cyclists or narrow enough to discourage overtaking. Therefore the traffic lane widths (dimension 'c') should be less than 3m or greater than 4m, but not between the two.

12.10.3. Staggered Traffic Islands

It is recommended that staggered traffic islands are not used on cycle facilities. However if this type of facility is essential then the minimum distance between the barriers or guardrail should be 2m.

12.10.4. Kerb Upstands

At transitions between on road and off road cycle routes or at crossings, kerb upstands should ideally be flush (0mm) or where possible the kerbs should be omitted completely.

If a flush transition will result in drainage issues then a bull-nosed kerb with a 6mm upstand may be used.

12.10.5. Visibility splays at road junctions and crossings

Visibility splays are measured using the diagram below:

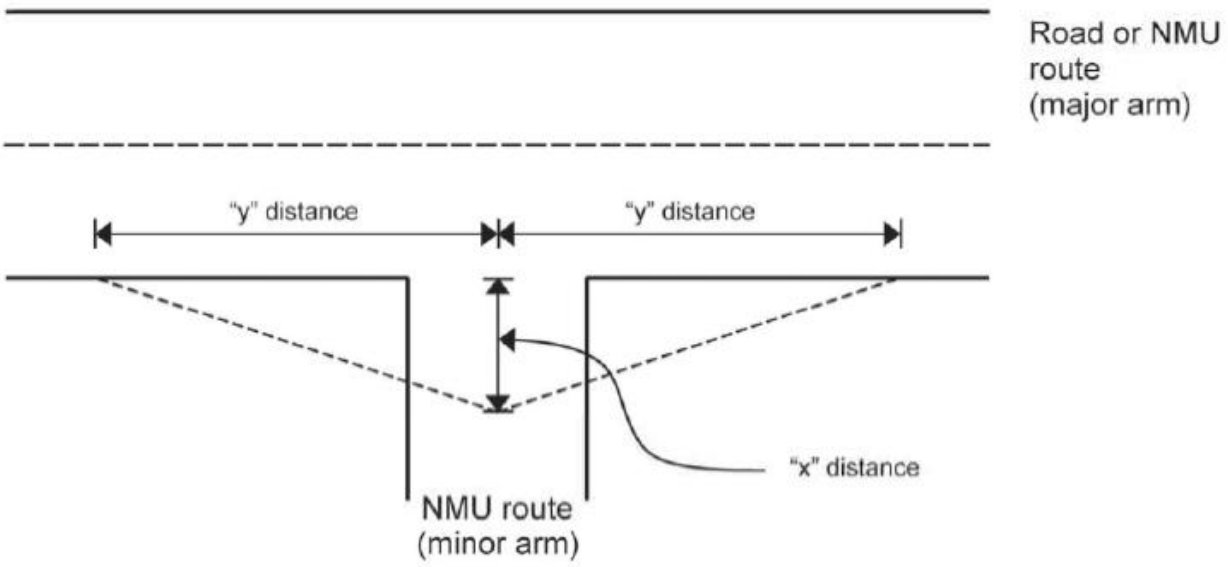

Diagram 4.12.10.3: Visibility Splay Measurement

The 'x' distances to be used are given in table 4.12.10.4.

Absolute Limits	N/A
Absolute Limits	N/A
Absolute Limits	N/A
Absolute Limits	N/A

Table 4.12.10.4: 'x' Distances

For Primary or Main Distributor roads the 'y' distances given in table 4.12.10.5 should be used.

Speed Limit	30mph	40mph
'y' distance	90m	120m

Table 4.12.10.5: 'y' distances for Primary and Main Distributor Roads

For all other roads with a speed limit of 30mph (max 85th percentile of 35mph) use MfS Table 7.1.

12.10.6. Vehicular access across a cycle route

Where a vehicular access in regular use (e.g. field access) crosses a cycle route protective posts may need to be installed on the cycle route either side of the access to prevent vehicle parking on the route and causing an obstruction. The bollards should be as per Standard Drawing SD/1200/06 and set at a spacing of 1.8m. Consideration should be given to how maintenance vehicle will access the cycle facility.

12.10.7. Priority for cyclists at side road junctions

Consideration should be given to giving cyclists priority across side roads where feasible. Detailed guidance can be found in LTN 2/08 Cycle Infrastructure Design Section 10.2 & 10.3

12.10.8. Zebra Crossings used by cyclists

As cyclist legally do not have right of way over traffic at zebra crossings, dismount signs should be installed.

12.10.9. Toucan Crossings

Width	Min
Recommended	4.0m
Acceptable Limits	3.0m
Absolute Limits	N/A

Table 4.12.10.6: Toucan Crossing Widths

12.11. Legal Aspects

Depending upon the location of any new cycle facilities there are various legal requirements that need to be followed, such as the creation of TROs (Traffic Regulation Orders).

12.11.1. On Road Facilities

Advisory Lanes – No legal process required to create lane, however may need to consider parking restrictions to keep the lane clear of parked vehicles.

Mandatory Lanes – TRO required to restrict use to pedal cycles. May require exclusion for residents to cross lane to reach driveways

Contraflow – One Way TRO will need to exclude cyclists, this will require a modification to any existing TROs. If the contraflow facility does not have a marked cycle lane, then the signs will require special authorisation from the DfT see TAL 6/98 Contraflow Cycling.

12.11.2. Off Road – alongside carriageway

Section 65 of the Highways Act 1980 provides HCC with powers to create new cycle tracks in the highway verge without any special legal procedures, however there must be clear evidence the above powers have been exercised. This is achieved by means of a conversion report that must be endorsed by the Director of Environment and Commercial Services.

When creating a cycle track it should always be stated in the conversion report that a cycle track with a Right of Way on foot is being created to allow pedestrians to use the cycle track as well.

Where an existing footway needs to be modified to accommodate the cycle track the process becomes more complex; table 4.12.11.1 outlines the requirements for various scenarios.

Location of new Cycle Track & Type of facility	Powers used from Highway Act 1980	
	Section 65 Create / Remove Cycle Track	Section 66 Create / Remove Footway
Verge (shared)	Create Cycle Track	
Verge (segregated shared)	Create Cycle Track	Create Footway
Existing Footway (shared)	Create Cycle Track	Remove Footway
Existing Footway (segregated shared)	Create Cycle Track	Remove Footway & Create in new location as appropriate

Table 4.12.11.1: Summary of Requirements for Modification of Existing Footway to Accommodate Cycle Track

12.11.3. Off Road – away from carriageway

Creating a cycle track away from the carriageway can be a complex process sometimes requiring agreement from third party land owners. Table outlines some of the possible options.

Location	Option
Bridleways, BOATs and Restricted Byways	Can be used by cyclists
Footpaths	Cycle Tracks Act 1984 Section 3 - Cycle Tracks Order to convert footpath. (only up to 95% of width to retain Public Right of Way status on definitive map). This option can be difficult and costly to pursue as it will require approval from the Secretary of State, and any objections would need to be resolved at a Public Inquiry.
Private Land	Landowner dedicate as highway
	Permissive agreement with landowner
	Purchase land

Table 4.12.11.2: Summary of Some Options for the Creation of Off Road Cycle Tracks

12.12. Miscellaneous

12.12.1. Route Signing

Refer to HCC Signs Policy.

12.12.2. Pedestrian Guardrail

Refer to Section 4, Chapter 7: Road Restraint Systems for details of pedestrian guardrail requirements.

12.12.3. Barriers on cycle tracks

Because of the difficulties that barriers can cause all users, they should only be used where absolutely necessary to slow cyclists on approach to a hazard. Where possible consider speed

reduction using sign and road markings as an alternative. See Cycling England Design Portfolio B.08 Access and Speed Controls for further details.

If barriers are used they should be configured as shown below with a 2m offset between the two panels as illustrated in diagram 4.12.12.1

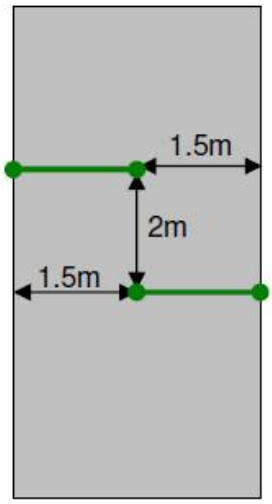

Diagram 4.12.12.1: Cycle Barrier Offset

12.12.4. Lighting

Urban cycle tracks away from the carriageway which cyclists are encouraged to use after dark will have lighting to provide both user safety and Security. However, Dutch experience shows that routes remote from natural surveillance will not be used even if lit. Lighting will not generally be required on such routes.

12.13. Cycle Parking

Refer to HCC Cycle Strategy & Cycle Parking Guide:
www.hertsdirect.org/infobase/docs/pdfstore/cycleparkguide.pdf

12.14. Cycle Mapping

Details HCC's cycle network can be found online at the address below:

www.hertsdirect.org/envroads/roadstrans/transplan/travelwise/webcycle/

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 13 – Safer Routes to School

Hertfordshire

3rd Edition – Version 1 – January 2011

13. Safer Routes to School

13.1. Introduction

HCC aims to increase opportunities for children and young people to travel to, from and between schools and colleges by sustainable modes.

The Education and Inspections Act (2006) defines sustainable modes of travel as:

> *"those that may improve the physical wellbeing of the individuals who use them, the environmental well-being of all or part of the local authority's area, or a combination of the two".*

In practice this means walking, cycling, travelling by bus or train and in some cases car-sharing. This Act placed a new requirement on all local authorities from 1st April 2007 to promote the use of sustainable travel and transport to school. Included within this are children and young people of 6th form age and therefore further education colleges must also be considered. Whilst this is a new duty for HCC it builds on a substantial body of work that they have already undertaken; such as school travel plans, safer routes to school, accessibility planning and other initiatives, all of which are considered throughout this document.

13.2. Footway Widths

In most cases the school community starts and finishes at the same time so there is intense concentrated use of the footway during peak times. Consideration needs to be given to provide adequate footway capacity to reduce the possibility of pupils or other users spilling out onto the carriageway.

13.3. Guardrailing

Consideration should be given to the installation of railings directly outside pedestrian entrances into schools where pupils have the potential to access directly to the carriageway. Schools should be treated on an individual basis to determine if there is adequate footway width available without reducing the capacity of the footway. Where possible the footway should be widened to overcome any loss of footway width caused by the installation of guard railing. The type of railing installed should not reduce the intervisibility of vehicles to pedestrians.

13.4. Additional Pedestrian Entrances to School Sites

Additional pedestrian entrances into school sites can be provided if the existing entrance requires a significantly longer journey (which may be more attractive by car) due to the size of the school site.

13.5. Signage and Road Markings

13.5.1. School Keep-Clear Markings

In order to keep the areas around school entrances clear of vehicles that may obstruct visibility and cause impediment for pedestrians wishing to cross the use of a series of road markings is recommended. These markings would ordinarily comprise of School Keep Clear to both delineate the presence of the school whilst acting as a greater visual deterrent than conventional road markings. These markings should be further enforced by a Traffic Regulation Order (TRO) that would make it illegal for vehicles to park in this area. These markings should

be placed only at the main access points to the school and should not be used to supplement other restrictions.

Refer to TSRGD Chapter 5 Road Markings Section 22.20-22.24 for guidance on the use of these markings. Multiple use of these markings would only be recommended in certain circumstances where the entrance area around the school are extensive in nature and other forms of road markings are inappropriate.

13.5.2. School Warning Signs

To warn other road users about the proximity of schools and the presence of school children in the area, school warning signs should be located in prominent locations on the main access routes, for greater prominence these signs can be mounted on yellow backing boards. However it should be recognised that these signs can have a detrimental effect on the environment and their effectiveness can be diminished through overuse.

Supplementing these signs and in conjunction with the operation of the School Crossing Patrols school flashing warning signs (wig-wags) are recommended, again on a yellow backing board for greater prominence where it is felt to be appropriate.

To give greater prominence to school, warning signs flashing amber lights may be used around them. Refer to TSRGD Chapter 4 Warning Signs Section 9.7-9-12 for guidance on the use of these signs. These flashing signs should be programmed to operation to reflect the hours that the school crossing patrol is in operation or to reflect the school peak periods.

13.6. School Transport

13.6.1. School Buses

With the majority of schools requiring and using passenger transport (bus and coach) to and from school for pupils, adequate waiting space is required, either within or just outside the school site. This will allow a safe location for the picking up and dropping off of pupils.

13.6.2. Park & Stride

Where it is not possible to make the entire journey to school by sustainable means and journeys need to be made by car, schools can encourage the use of park and stride facilities. This can be agreed informal use of parking facilities a short walk from the school so that fewer vehicles are dropping off or picking up children at the school gate. Park and stride measures can also encourage and promote independent travel for older primary school children who cannot walk all the way to school.

13.6.3. Walking Buses

With the support of the school parents can set up and run a walking bus, where trained volunteer adults walk to school picking children up at pre-determined points along the route. This initiative reduces the number of low occupancy cars making identical journeys and provides a safer and more enjoyable walk to school. Children can also benefit from absorbing pedestrian skills whilst being supervised when crossing roads. Walking bus routes can be improved with the use of additional measures that make them more attractive and safer to use. These measures may include waiting restrictions to improve visibility, kerb build-outs to reduce carriageway width and vehicle speeds, etc.

13.6.4. Lollibus

Is a similar concept to the walking bus, however the trained volunteer is used as a mobile School Crossing Patrol at predetermined locations along the route of the walking bus.

13.6.5. School Crossing Patrols

These allow safe pedestrian movements across busy roads and therefore bridge significant severance in pedestrian networks. Each potential school crossing location will need to be assessed by the HCC's Road Safety Unit.

13.7. Links and Acknowledgements

- HCC's Sustainable Modes of travel strategy (SMoTS) which is available at http://www.hertsdirect.org/envroads/roadstrans/transplan/travelwise/schooltravel/smots.
- HCC's Guide to Developing a School Travel Plan which is available at http://www.hertsdirect.org/envroads/roadstrans/transplan/travelwise/schooltravel/improve/devshooltrav/schooltravplan/guidetravplan/.

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 14 – Traffic Calming and Road Features

Hertfordshire

3rd Edition – Version 1 – January 2011

14. Traffic Calming and Road Features

14.1. Introduction

Local Transport Note 1/07 and the HCC Speed Management Strategy (SMS – available at http://www.hertsdirect.org/infobase/docs/pdfstore/SpeedManStrategy.pdf) should form the basis for the selection of speed management measures including home zones, speed limits, shared surfaces, traffic calming measures (vertical and horizontal) as well as additional supportive measures such as roundels, speed cameras and rumble devices.

14.2. Road Humps

14.2.1. Flat Top Road Humps

The Highways (Road Hump) Regulations 1999 allow a variety of hump profiles up to a maximum height of 100mm all of which have different effective speed reduction properties.

However, whilst the regulations allow for humps up to 100mm in height, HCC has adopted a flat top hump profile with a standard nominal height of 75mm and a ramp gradient of 1:10. In exceptional circumstances, such as on a strategic emergency services route or bus route, it is permissible to consider reducing the height of the feature to 65mm and\or reduce the ramp gradient to 1:20. This is summarised in table 4.14.2.1.

Nominal height	Ramp gradient:	10%(1:10)	6.7%(1:15)	5%(1:20)
75 mm	Ramp length:	750mm	1125mm	1500mm
65 mm	Ramp length:	650mm	975mm	1300mm

Table 4.14.2.1: Summary of Road Hump Profiles

Vehicles travelling uphill may encounter an increased 'actual gradient' on the uphill approach ramp. It is recognised that in such situations adjustments will need to be made to prevent grounding of vehicles. Combining the road gradient and the proposed ramp gradient should result in a value less than 1:15 (6.7%).

LTN01/07 advices that a nominal 'uphill' ramp gradient of 1:15 (6.7%) on a road gradient of 1:10 (10%), giving a combined actual gradient of 16.7%, is acceptable, see table 4.14.2.2 for details.

Road gradient	Ramp gradient:	10% (1:10)	6.7% (1:15)	5% 1:20	4%(1:25)
2.5%	Actual gradient:	12.5% (1:8)	9.2% (1:10)	7.5% (1:13)	6.5% (1:15)
5%	Actual gradient:	15% (1:7)	11.7% (1:9)	10% (1:10)	9%(1:11)
10%	Actual gradient:	20% (1:5)*	16.7% (1:6)	15% (1:7)	14% (1:7)

* denotes unacceptable combined actual gradient – greater that 16.7%

Table 4.14.2.2: Combination of Road and Ramp Gradients

To minimise discomfort to cyclists, road hump ramps should be designed with smooth transitions at the top and bottom.

14.2.2. Cushions

General guidance on the use of cushions is given in LTN01/07, SMS, TAL1/98 and TAL4/94.

A standard cushion height of 75mm on 30mph roads has been adopted within Hertfordshire in order to achieve effective speed reduction. This should have a maximum width of 1.8m. If cushions are used on a strategic emergency route or bus route the option of using a 65mm height and/or a 1.6m width cushion may be considered.

To accommodate the safe passage of cyclists the recommended gap between any speed cushion and the kerb is 1m, although this may be reduced to 0.75m. Where appropriate parking restrictions should be installed for approx 10m either side of the speed cushions to maintain cycle access to the kerbside gap.

The SMS states that bolt-down cushions will be used to ensure that the desired consistency of construction and durability is achieved. Pre-formed recycled rubber cushions are favoured and incorporate the required white triangular marking on the approach.

To guarantee extended performance of these features, the scheme promoter or designer may enter into a maintenance contract with the supplier/installer. These are generally for a five year duration from installation and allow for an annual inspection, replacement of any faulty parts and a 48hr call-out to attend to any reported damage to a unit. If this arrangement is undertaken maintenance costs need to be included in future budgets.

Where cushions are used on a bus route, measures need to be taken to ensure that parking is discouraged adjacent to the cushions. This may take the form of parking restrictions and/or a narrowing of the carriageway. This ensures that buses can be correctly aligned thus minimising discomfort to bus passengers.

14.3. Rumble Devices and Over-run Areas

14.3.1. Rumble Devices

Rumble devices are useful in providing a vibratory, audible and visual effect. They must be located at least 200m from any residential property and as such are usually only located in rural areas. They can be used to highlight a particular hazard, such as on the approach to a junction or bend, or they can be combined with a gateway feature to signify the beginning of a traffic calming scheme either as strips or as a whole area providing a contrasting ride.

Rumble devices are not a hazard in themselves, they alert motorists of a hazard ahead; they do not need to be highly visible or signed separately.

Single areas of rumble devices have minimal effect on speed reduction so they should only be considered as part of a package of measures. When used they should cover the full width of the carriageway to discourage drivers from crossing the centreline to avoid them.

Rumblewave surfacing is a quieter propriety alternative to rumble strips/areas making it suitable for use in residential areas. As with other rumble devices the effect on speed reduction is minimal and as such its use should only be considered as part of a package of measures.

14.3.2. Over-Run Areas

These are used to visually narrow the road whilst maintaining effective width for larger vehicles at roundabouts, narrowings and chicanes.

14.4. Narrowings

Narrowing can be achieved through a number of methods including road markings and coloured surfacing, physical measures, reallocation of road space or a combination of features.

14.4.1. Islands

'Island' is the collective term for traffic islands and pedestrian refuges differentiable only by the inclusion or exclusion of dropped kerbs and tactile paving for pedestrians in their construction. An effective speed reduction measure though the effect on cyclists needs to be considered. They should only be used as part of a package of measures.

14.4.2. Pinch Points

Pinch-points are used to narrow the carriageway from both sides at the same position for a distance of 5-10m. The effective carriageway width should be suitable for the type of vehicles expected and cycle by-passes should be considered.

14.4.3. Build-Outs

A section of kerb built-out on one side narrowing the carriageway. This measure can be used to narrow junctions, provide footway extensions and areas for planting. As with pinch points the effective carriageway width should be suitable for the type of vehicles expected and cycle bypasses should be considered if space allows.

14.4.4. Sheltered Parking

This can be created by any of the preceding measures in this section to formalise parking arrangements. The footway projections can increase visibility for pedestrians thereby improving crossing conditions.

14.4.5. Cycle Bypasses

Cycle by-passes should be used wherever the effective carriageway width is reduced by traffic calming features i.e. pinch points and chicanes. The recommended width of cycle by-passes is 1.5m with an acceptable minimum width of 1.2m. Care needs to be taken to ensure that the exit alignment does not require cyclists to merge abruptly with motor vehicles. Consequently, in areas of high on-street parking, parking restrictions will need to be considered. The design should enable self-cleansing and/ or access by street cleaners to prevent tyre-puncturing detritus from gathering in lightly trafficked bypasses.

14.5. Chicanes

Chicanes can either be single-lane working or two-way working. For single-way working to be considered two-way vehicle flows should be less than 3,000 vehicles per day and must not exceed 4,000 vehicles per day.

Chicanes can only be used on roads with a 40mph speed limit or below. Cycle bypasses need to be incorporated where single-lane working is used.

Overrun areas may be incorporated into the chicane design to accommodate large vehicles such as combine harvesters if sited in rural areas. Chicanes can be used as effective gateway features.

14.6. Gateway and Entry Treatments

These are used to signify the entry into a traffic calmed area or different environment such as a village. They commonly incorporate a change in road surface (colour or material), signage (change in speed limit or village name) and 'dragon's teeth'.

Care needs to be taken to ensure that the feature is not visually intrusive and that it suits its environment. Future maintenance of the chosen feature also needs to be considered.

Entry treatments are usually used in more urban areas at side roads signalling to motorists that they are leaving their present environment and entering one that is different such as a traffic calmed area or 20mph area. They may incorporate a raised crossing area.

14.7. Mini Roundabouts

These have a central island diameter of up to 4m and assist access from side roads. They are appropriate where the speed limit is 30mph or less. Pedestrians and cyclists should be considered throughout the design development to ensure they can safely negotiate the junction.

The central island should be smooth and white and can be flush or domed. Where a mini roundabout is being considered on a route used by buses, the PTU design guide recommends that the central island should be less than 75mm in height with slope gradients of less than 1:20.

Designers are directed to TD 54 / 07 Design of Mini Roundabouts.

14.8. Continental or Compact Roundabouts

Compact or Continental roundabouts have single lane entries and exits on each arm. They sit between conventional roundabouts and mini-roundabouts in terms of land take. They retain a conventional central island, but differ in other respects – there is minimal flare at entry and exit, and they have a single-lane circulatory carriageway. In addition, the circulatory carriageway has negative camber, so water drains away from the centre, which simplifies drainage arrangements. Their geometry is effective in reducing entry, circulatory and exit speeds. The use of continental roundabouts is described in TD 9/97. Refer to Section 4, Chapter 2: Junctions for further information.

14.9. Vehicle Activated Devices

14.9.1. Vehicle Activated Signs (VAS)

VAS can take the form of roundels and hazard warning. The SMS prescribes a number of key criteria that needs to be met before either type of sign can be considered.

14.9.2. Speed Indicator Device

These can take the form of permanent or mobile units. For permanent units there are a number of key criteria that need to be met to ascertain the appropriateness of such a device.

A trial is currently under way to assess the effectiveness of mobile speed indicator devices.

14.9.3. Speed Cameras

The SMS sets out the current criteria being used by HCC for proposed camera sites based on DfT guidance documents. For more information see Section 4, Chapter 3: Casualty Reduction and Speed Cameras of this design guide on this subject.

14.10. Traffic Signs, Road Markings and Street Furniture

14.10.1. Countdown Signs

These require DfT authorisation and therefore need to be approved by the Speed Management Group prior to application for this to ensure consistent use countywide.

14.10.2. Hatched Road Markings

Any measure that reduces the available road width, real or perceived, needs to consider cyclists. For more information see Section 4, Chapter 12: Cycling Facilities of this design guide on this subject.

14.10.3. Maintenance Issues

When planning to use any of these supplementary measures, future periodic maintenance needs to be considered as part of the design process.

14.11. Other Road Features

14.11.1. Planters and Bollards

Planters and other street furniture can be used to enhance traffic calming schemes; however, appropriateness of materials for their intended use is essential. If planting is incorporated this should not block driver's visibility of pedestrians, particularly children. This can be preventing by avoiding planting at heights between 600mm and 2000mm.

14.11.2. Maintenance Issues

When planning to use planters or bollards as supplementary measures to a traffic calming scheme, future periodic maintenance needs to be considered as part of the design process. This should include material choice and longer term up-keep.

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Chapter 15 – Lighting Detail

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15. Lighting Detail

Also refer to Section 5, Chapter 11: Road Lighting Columns and Brackets (Series 1300) and Section 5, Chapter 12: Electrical Work for Road Lighting and Traffic Signs (Series 1400).

15.1. General

The scheme designer of promoter must obtain HCC approval for all street lighting and electrical design, including lighting for signs and supplies to bus shelters. All relevant design calculations, layout drawings and equipment specifications must be provided, in order to allow HCC to assess the adequacy of the design.

HCC must consider any modifications to the street lighting design and layout.

HCC has a number of Standard Detail drawings for electrical installations and equipment. The scheme designer or promoter should liaise with HCC to obtain the drawings relevant to the proposed installation. Copies can be acquired from the Street Lighting Team at Highways House, Welwyn Garden City. Tel: 01707 356200.

Where lighting already exists the scheme designer or promoter must, at all stages of the contract, maintain a standard of road lighting in accordance with British Standards. Where columns have to be re-sited, temporary lighting must be provided and must be operational before disconnecting existing street lighting.

The installation should minimise future energy consumption and maintenance costs.

Private electrical networks will only be considered where there are no adjacent Distribution Network Operator supply cables in the same verge or footpath of residential, link roads, spine roads or roundabouts.

15.2. Design of Road Lighting for Highways

Lighting design shall be to BS5489:2003 (BS EN 13201:2003) unless superseded by another updated standard. The objective is to achieve compliance with respect to:

- Luminance levels on traffic routes;
- Luminance levels in residential areas;
- Glare Control;
- Visual guidance;
- Appearance by day;
- Appearance by night;
- Light control (Pollution and Trespass).

For further guidance on street furniture and street lighting see MfS Chapter 10.

15.3. Lighting Levels

Luminance / illuminance and uniformity control requirements for road lighting should be as defined in BS5489:2003 Part 1.

15.4. Glare Control

Glare control requirements should be in terms of Threshold Increment (TI) for Traffic Routes intended for drivers of motorised vehicles of medium to high driving speeds, i.e. 'ME' lighting classes:

ME1 & ME2 <10%

ME3 to ME6 < 15%.

For installations on residential roads, pedestrian streets, parking places, footways, i.e. 'S' lighting classes, the luminous intensity classification (G rating) will be considered. Residential areas within towns and urban areas (E3 & E4) shall consider luminous intensity classifications of G3 or greater, low district brightness areas (E1 and E2) will use G5 or G6.

Special light controls are required in the following situations:

- In the vicinity of aerodromes, where light output above the horizontal may need to be limited. BS5489-1:2003 suggests an installed luminous intensity requirement of G4 or greater;
- In the vicinity of railways and navigable water – BS5489-1:2003;
- In environmentally sensitive areas, where spill light would otherwise be regarded as unacceptable and visually intrusive, E1 and E2 zones as defined in Guidance Notes for the Reduction of Light Pollution, Luminaires with good cut offs and high G classes are required;
- In the vicinity of astronomical observations (Guidelines for minimising Urban Sky Glow near Astronomical Observatories) should be considered.

In rural areas, reference should be made to Lighting in the Countryside – Towards Good Practice published by the Countryside commission but available to download for free from the Department for Communities and Local Government website at http://www.communities.gov.uk/archived/publications/planningandbuilding/lighting'.

Reasonable measures must be taken to prevent light over spill into properties. Should a member of the public request a device to reduce overspill the developer will be financially liable for the application, design, device, fees for dealing with the request, and any other amendments required up until the point of adoption.

In addition, designers should take into account guidance given in Road Lighting and the Environment and Lighting the Environment – A guide to good urban lighting, particularly when designing schemes for potentially sensitive areas.

15.5. Visual Guidance

The requirements for visual guidance and performance by day and by night should be as in BS5489-1:2003. The suitability of the lighting should also be in accordance with the the guidance set out in MfS.

Visual guidance is an aspect of the lighting that complements the lane and edge of carriageway markings. The lighting should assist in revealing the run of the road, particularly at junctions and bends, as described in BS5489-1:2003.

The arrangement of the lighting should remain consistent if the road characteristics do not change. The road lighting arrangements should be co-ordinated with any traffic signing, signalling and surveillance installations to minimise shadows. Transition lighting, by gradual reduction at the end of lit sections should be provided.

The minimum distance between two illuminated sections of road should be 500m (measured as column to column), unless special environmental aspects take precedence.

15.6. Equipment Performance Requirements

Columns should comply with BS5649, BS EN 40 and BD26, with the amendment that all columns should be designed for the following attachments:

- A sign, rectangular in elevation, with a surface area of 0.3m² for columns up to 5m in height and 0.6m² for columns greater than 5m in height;
- The eccentricity from the centre line of the column to the centre of the sign should be 300mm for columns up to 5m in height and 500mm for columns greater than 5m in height;
- Column finish and protection details can be found in Section 5, Chapter 13: Protection of Steelwork against Corrosion;
- Passive safe columns should be considered as per the current BS guidelines, BS EN 12767 or any that supersedes it.

Columns of height 8m or greater should be certified to Annex C2 of BD2/05.

The lanterns shall conform with the following:

- All enclosure elements concerned with their optical performance should have a minimum degree of ingress protection rating of IP66, as defined in BSEN60529;

The bodies shall be manufactured from marine grade aluminium and be powder coated in RAL 9007 or similar. Where town centres have colour plans the lanterns can be painted to match. Conservation Areas should be as per the Conservation Grey RAL 9005;

- Control gear is to be Electronic Dimmable;

For installations where remote monitoring is not practical, a ¼ watt UMSUG rated photocell is to be used, with a maximum of 35 lux on 18 lux off.

Feeder pillars shall be fabricated from minimum 3mm stainless steel (5mm for larger pillars) details in Section 5, Chapter 12: Electrical Work for Road Lighting and Traffic Signs.

Central Management Systems (CMS) shall be utilised to the following requirements:

- For installations with a private network the monitoring system should be that of a Mains Borne;
- Where the cable network belongs to the Distribution Network Operator an Air Borne system will be utilised.

Central Management Systems will enable HCC to:

- Control the operation of individual lamps, allowing accurate switching times and fine tuning of burning hours;
- Allow part night dimming / switching;
- Give feedback on the performance of the lamp and control gear, i.e. power factor, power usage, and lamp operation;
- Identify fault conditions.

The system must be capable of reporting accurate energy usage in line with BSCP520 pooling arrangement.

HCC guidance on CMS must be sought prior to installation.

The technology involved with CMS is developing quickly; full consultation with HCC should be sought for approval of the system to be used.

All lanterns and associated equipment shall be compatible with the HCC Street Lighting Maintenance Contract. Guidance can be obtained from HCC.

15.7. Decisions Prior to Design

The proposed location for the installation should be inspected to determine the type, arrangements, source, supply details and the like of any existing lighting. This will also enable an environmental assessment of the area to be made.

Lighting levels do not have to be constant throughout the night. After a specified time (e.g. 2am) lighting levels can be dimmed down by one lighting class with the uniformity remaining the same, or even switched off. This saves on energy consumed and reduces any negative impact that the lighting may have at times when the roads will be at their quietest. Central Management Systems are now freely available enabling the equipment to do this.

Lantern arrangement and mounting height should be in accordance with the options set out in BS5489-1:2003, and consistent with any existing installations that abut or form part of the design area. In addition, there may be local geometric, maintenance and environmental constraints that apply. Details of any existing lighting and the supply source can be obtained from HCC.

The choice of lamp type will be primarily a lamp with a Ra > 60, e.g. Cosmopolis (Cosmo) / fluorescent. This is to provide better colour differentiation and enhance a feeling of safety. High pressure sodium (SON-T) should be used for road lighting close to sites of high wildlife conservation value, or near known populations of rare species. Permission for the use of high pressure sodium in other areas must be agreed with HCC.

Columns should be located at the back, but within the footway wherever possible, or positioned in the easement strip where no footway exists. For roads of speeds up to 50 km/h the minimum horizontal clearance from edge of carriageway to face of lighting column will be at least 0.8m, increasing to 1m for roads between 50 and 80 km/h. The bracket projection should, wherever possible, place the lantern above or behind the kerb face, not in front of it.

On housing estates columns should be located such that they are on boundaries of properties or adjacent to property walls.

The maximum bracket projection for each height of column should generally be in accordance with the following Table:

Lantern Mounting Height	Maximum Bracket Projection
15m	2.5m
12m	2.0m
10m	1.5m
8m	1.0m
6m	Post Top (No bracket)
5m	Post Top (No bracket)

Table 4.15.7.1: Max bracket projection

15.8. Brackets

Brackets should be webbed and should either provide a tilt of zero or five degrees from the horizontal, the spigot should be in line with the bracket. Brackets are to have the same paint finish as the columns, where applicable specialised brackets can be agreed after consultation with HCC.

Maintenance factors should be obtained from BS5489-1:2003 Annex D where:

- The IP rating, as defined in BSEN60529, of the lamp housing for road lighting lanterns should be at least IP66. For Decorative / Heritage lighting IP65 will be sufficient;
- The proposed cleaning interval is taken as 36 months for design purposes;
- The category of environmental atmospheric pollution is identified in accordance with the guidelines within Table D.1;
- The lamp lumen depreciation factor should be taken as 90% or less depending upon current manufacturer's data. The value taken should be the average lamp lumen depreciation as given by at least two lamp manufacturers for a burning period equivalent to three years.

Design tables based on the 'representative British road surface' as given in BS5489-1:2003 should be used. However, the use of any coloured road surface should be taken into account.

The alternative enhanced reflective properties for a coloured surface should be presented in the form of an 'r-table' as described in the CIE/PIARC joint technical report, Road Surfaces and Lighting.

Where Distribution Network Operator low voltage cables are present then services must be obtained from them. These services should be unmetered where the load is less than 500w, and the service should include all cable works up to and including the cutout. Electricity Company cut outs should be located at the base of the backboard and fused to suit the lamp requirements. There will also be an additional secondary isolation required (see Standard Drawings for details).

Where Distribution Network Operator cables are not present then a private group switched cable network should be designed and installed. Feeder pillars should be located conveniently to the nearest Local Electricity Company low voltage cable.

In general, supplies to signs and bollards should be obtained from the nearest lighting columns, via a double pole sub-fuse unit (see Standard Drawings).

15.9. Normal Design Procedure

The normal design procedure should be that set out in BS5489-1:2003, depending upon the category of the road or area to be illuminated. Taking into account any particular features such as:

- Unconventional road layouts;
- Tighter glare or light spill limitation requirements;
- Enhanced road surface reflection characteristics.

Consultations should be undertaken by the scheme designer or promoter, so far as necessary during the design procedure, in order to:

- Eliminate as far as possible any confusion with air or water navigation lights, railway signals or the safe operation of other services;
- Identify if passively safe equipment is required as per guidelines set out by the Department of Transport;
- Identify the most appropriate and acceptable mode of lighting for locations in rural, environmentally sensitive and conservation areas. For sites of special scientific interest consultation must take place with HCC's Biological Records Centre;

  HCC Biological Records Centre
  biorec.info@hertscc.gov.uk
  01992 555220
  HBRC, Environment, County Hall, Hertford, SG13 8DN.
- Identify and agree the use of any heritage or non-maintenance standard equipment. The latter may require the payment of commuted sums and provision of spare or replacement equipment;
- Identify over head lines and follow current and preceding standards GP-10 (2004) ILE.

15.10. Special Design Procedure

15.10.1. Traffic Calming

Lighting for traffic calming should comply with Section 9.2 of BS5489-1:2003.

15.10.2. Underpasses and Subways

Lighting should comply with BS5489-1:2003 and in the most part illuminated by cornice systems.

See Standard Drawing 14-13-008 & 009.

15.10.3. Footpaths and Cycle Tracks

Lighting for footpaths and cycle tracks should comply with BS5489-1:2003 Section 9.

Columns used for footpaths where normal vehicle access is not possible should be fold-down (base hinged) columns with base doors; this should be accessible without the need of the column to be folded.

15.10.4. Pedestrian Crossings

Lighting for pedestrian (both zebra and signal controlled) crossings should comply with BS5489-1:2003.

15.10.5. Illuminated Bollards and Signs

Illuminated bollards should be of an LED type. Sign lighting if required should use LED lighting, where this is not suitable then fluorescents should be utilised.

Bollards must have a means of isolation and must not be supplied directly by a Distribution Network Operator supply, but by a sub fused circuit from the nearest column.

15.10.6. Signs on Lighting Columns

0.3m² is the maximum permissible area of a sign to be erected on an existing lighting column.

Holes drilled in a lighting column for the sign lantern supply cable are unlikely to affect the column provided that they are of a small enough size in relation to the diameter of the column. In general, the diameter of the hole should be less than 1/5th of the diameter of the column. These holes should be bushed.

The use of offset brackets should be avoided in columns smaller than 8m.

If a large sign is erected on a column and an additional supporting post, the supporting post and foundation should be capable of supporting the whole sign plate alone. The column therefore only acts as a support to prevent the sign plate turning.

Christmas decorations and hanging baskets should not be fitted to columns unless the column and foundation has been designed for the additional loading. A license from HCC will be required if festive lighting is to be used on any of the columns.

The installation of CCTV & Mobile masts requires consultation with HCC.

15.11. Private Cable Networks

Private cable networks should be in accordance with BS7671.

The cables used should be XLPE/PVC/SWA/PVC consisting of either 2 or 4 cores (single and three phase supplies respectively). The armour should provide the earth conductor. Two core cables should be 16 or 25mm² for the main circuits and should be looped between units (signs, bollards and the like should be on separate sub-circuits fed from the nearest lighting column using 6mm² cable). Where this size of cable cannot be used then four core jointed systems should be installed, the service cable on jointed systems should be of 16mm² XLPE/PVC/SWA/PVC. The preference should be for single phase installations wherever possible.

Private cable networks should be run from feeder pillars and be fitted with control circuitry complying with BS7671. Circuit protection should be by means of BS88 fuses.

Earth rods should be installed at the end of each circuit, of three or more columns and at the feeder pillar / column.

The minimum size of any earth bonding should be 16mm² unless otherwise permitted within BS7671.

15.12. Design Documentation

The following documentation should be provided for design approval:

- Location Map;
- Lighting design calculations including electronic calculation files, all input data and details of the software package that has been used – lighting plots alone are not acceptable;
- Details of any assumptions made;
- Details of all equipment proposed and supporting certification / documentation;
- Electrical cable calculations, where the scheme requires them;
- Scheme drawings – electronic file and hard copy with 1:500 scale or greater;
- Details of power supplies, including any detailed supply cable calculations;
- CDM details (Designer's Risk Assessment);
- EMS (Environmental Impact Assessment).

Two sets of the proposed lighting design should be submitted to HCC, in order to obtain the required lighting unit maintenance numbers.

As-built drawings with grid references are to be submitted to HCC after installation.

15.13. Standard Procedure for New Lighting Installations

15.13.1. Setting Out and Supervision of the Works

The exact position of all apparatus and equipment shall be determined in agreement with HCC.

Apparatus and works should not commence on private property without the permission of the land owner.

The contractor should satisfy himself as to the integrity of all connections and perform any necessary tests, including completion of all electrical test certificates. Copies of these certificates should be passed to HCC and must comply with BS7671.

Where existing columns are remaining or being revised structural testing will be required and copies of the certificates should be supplied to HCC.

All testing must be completed by an adequately trained professional contractor with the correct accreditation. HCC reserve the right to request proof of authenticity and accuracy of testing certificates. HCC may request proof of accreditation and authorisation of the subcontractor to perform such duties. HCC reserve the right to request a resubmission of any test certificates.

15.13.2. Notification of New Installation

The designer or scheme promoter shall notify HCC, five working days prior to completion of the installation, in order that they may arrange for appropriate inspections and if necessary instruct and witness further electrical tests.

15.13.3. Electrical Services – Unmetered Supply

An unmetered supply will be where the total load is less than 500w. Where it is more than 500w then a meter must be installed.

The designer or scheme promoter should notify the Distribution Network Operator (DNO) of service connections required and pay the full cost of such work. Authorisation from HCC may be required.

The electricity services should include all cable works up to and including the cutout if the supply is connected direct from the supply cables.

If the scheme promoter provides the cable network, then a suitable termination point, such as a feeder pillar, should be installed to enable the Electricity Company to make the connection from the supply cables.

The scheme promoter will be responsible for all energy charges until the date of the developments adoption. The scheme promoter should obtain connection, unmetered and meter supply agreements for energy supplies.

The scheme promoter shall advise HCC of the date of energising the street lighting.

15.13.4. Maintenance Period

Until the date of adoption the scheme promoter should provide routine inspection (minimum of three weekly) and bulk change lamp replacements (three yearly) for the lighting units during the maintenance period. The scheme promoter is responsible for the maintenance and replacement of any faulty or damaged equipment until such time as the installation is formally adopted in accordance with the Section 38/106/278 agreements together with 'As-Installed Drawings' and Electrical Test certificates as identified elsewhere in this guide. Should it be necessary for HCC to undertake site visits beyond the scope of this clause, HCC shall be entitled to charge the scheme promoter accordingly.

15.13.5. Emergency Repair

HCC has the right to make safe or cause to be made safe any equipment that is dangerous (i.e. vehicular impact damage, etc.) and the costs will be recharged to the developer. This situation will apply until the installation is adopted.

15.13.6. Health and Safety Act 1974 and Electricity at Work Regulations 1989

The scheme promoter should only employ approved street lighting contractors for the installation, testing and related electrical work, who also operate a company electrical safety system for the protection of their own employees and the general public. This system will also require a competent and qualified electrical supervisor to be on site when electrical work is being undertaken.

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 16 – Traffic Signs and Road Markings

Hertfordshire

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16. Traffic Signs and Road Markings

16.1. Introduction

The designer's attention is also drawn to Section 5, Chapter 10: Traffic Signs and Road Markings (Series 1200).

There are a number of circumstances where signing and lining will be required to comply with legislation or for safety reasons. The designer must obtain the approval of HCC for the signing and lining regime he proposes.

In general, the use of road markings and traffic signs should be kept to a minimum. A proliferation of signs and markings can cause confusion, lessen the impact on drivers and create a poor streetscape. The TSM highlights that "Signs are used to control and guide traffic and to promote road safety. They should only be used where they can usefully serve these functions." Further guidance is provided in LTN1/08 and MfS.

16.2. Definition of Highway Traffic Signs

Permanent highway traffic signs which will be adopted and maintained by HCC include the following:

- Warning Signs;
- Regulatory Signs (including Parking plates);
- Informatory Signs;
- Route Directional Signing; and
- Tourist Signing.

In addition the following temporary signs are permitted within the highway and should conform to the requirements of this guide:

- Signing for roadworks;
- Signing for new housing developments; and
- AA and RAC signs.

16.3. Signing Strategy

Before carrying out the signage design it is necessary to have a Signing Strategy Plan (SSP) in place.

The following should be considered when the SSP is being devised:

- Existing signing and road layout;
- Type of sign to be used;
- Route destination planning;
- Continuity of signing; and
- Reduction of environmental impact, sign clutter and proliferation.

16.4. Existing Signing

A full survey of the existing road and signing layout should be carried out prior to design, at any location where existing signing may be affected by the new development. This should include the location of existing signs, type and location of power supply and sign measurements where appropriate.

The designer will be responsible for the cost of changing any of the existing signs and lines that are required by HCC as a consequence of the designer's works.

16.5. Types of Signs to be Used

The designer should decide what type of sign is appropriate for each particular circumstance, with the approval of HCC. Traffic signs can be categorised as follows:

16.5.1. Route Direction Signs

Advance Direction Signs (ADS) - A sign placed in advance of the junction giving drivers information about the route ahead.

Local Advance Direction Sign (LADS) - A sign placed in advance of a junction (or in addition to the ADS) giving a driver information relating to local destinations. This can take the form of a map type or stack type sign.

Flag Direction Signs (FDS) - This is a sign placed at (not before) a junction for the benefit of turning traffic.

Route Confirmatory Signs (RCS) - This is a sign placed after (usually a major) junction which gives confirmation and often additional information about the route ahead.

Tourist Signs (TS) - These are signs that provide route information for tourists to approved destinations. Tourist signs can take the form of any of the above or can be included on any of the above as a brown patch.

Variable Message Sign (VMS) - These are signs capable of displaying alternative legends appropriate to changing circumstances.

Finger-Post Sign (FPS) - These are small flag or wooden square end signs erected on one post at a road junction. (Usually in rural locations or conservation areas).

16.5.2. Informatory Signs

These are signs either in written or diagrammatic form to inform drivers about places and facilities of particular value or interest on a route.

16.5.3. Warning Signs

These are signs that warn of a particular road hazard requiring caution and are normally bordered by a red triangle and are sometimes supplemented by a rectangular plate giving additional information relating to the sign.

16.5.4. Regulatory Signs

These are signs normally bordered by a red circle or displayed on a circular blue background indicating a requirement prescribed by a traffic order, regulation or by-law and may be supplemented by a sign augmenting the message given by the sign.

Regulatory signs are either prohibitary or mandatory. Prohibitary signs indicate that the use of a highway by all or a specified class or classes of vehicles is forbidden or restricted by an order, regulation or by-law. Mandatory signs indicate an obligation to comply with an instruction given by an order, regulation or by-law.

The procedure for implementing a traffic order is covered in Section 3, Chapter 10: Traffic Regulation Orders.

16.6. Route Destination Planning

The scheme promoter or designer must consult with HCC when determining the destinations to be signed and any abbreviations used as continuity must be maintained between new and existing signing.

Destinations can be categorised as follows:

- Primary destinations: designated in Traffic Signs Manual – Chapter 2.
- Non-Primary destinations: cities not designated as primary destinations, towns, villages, local destinations (i.e. industrial estates, hospitals, schools etc.)
- Tourist destinations: destinations that meet the requirements of Circular Roads 1/91 and Circular Roads 3/95.

Consideration should be given to the signing of area names where it is felt that a large number of small destinations can be signed to one area before being signed separately. HCC shall be consulted as to the naming of any such area where a name does not already exist.

In general, smaller destinations located within larger areas that are individually signed, should only have signing provided when the larger area has been reached or when the route to the smaller destination deviates from the focal point of the larger destination.

16.7. Continuity of Signing

The scheme promoter or designer should ensure that the continuity of signing is maintained within the area affected by a new signing scheme.This will include a full network sign survey where traffic is to be redirected due to the implementation of a new scheme. (i.e. new road construction, reclassification of existing road, permanent road closure or diversion routing etc.)

16.8. Traffic Sign Detail Design

Signs should be designed to the requirements of the TSRGD and the TSM.

Where the Scheme promoter or designer proposes any variant not permitted in the TSRGD approval will be required from either HCC and/or DfT.

The following information is required by HCC for all new traffic signs:

- Sign reference & location;
- TSRGD diagram number;
- Sign face design;
- 'x' - height (if applicable);
- Sign face dimensions;
- Illumination requirements;
- Sign face material;
- Mounting requirements / method of mounting;
- Foundation details;
- Post dimensions; and
- Additional relevant information.

16.8.1. Speed Limit Signs

Speed limit signs are covered in TSM Chapter 3, Section 14.

16.8.2. Route Directional Signs

In addition to TSRGD and TSM Chapter 1 and 7, guidance is given in Local Transport Note 1/94.

16.8.3. Types of Sign Face

The use of stroke widths, 'x' heights and tile heights is fundamental to the design of route directional signing. An explanation (with examples) as to their use is given in TSM Chapter 7.

Attention should be given to the type of alphabet used:

- Medium Text - White, or Yellow legend
- Heavy Text - Black legend
- Motorway Text - White route numbers on motorway signs

16.8.4. Map Type Signs

Map type signs should convey the physical layout of the junction or roundabout as much as possible.

16.8.5. Colour Coding

Details of the colours to be used on traffic signs are given in TSRGD, TSM and Local Transport Note 1/94.

On the approaches to a junction the destinations reached by turning off at that junction are to be on panels appropriately coloured to the type of road leading from the junction. Coloured panels are used to distinguish between routes of different status.

Panels and patches on white background signs should not have a border unless they are Ministry of Defence (MoD) establishments.

Panels are not used on flag type signs except for tourist destinations where applicable. Continuation flags (kicker flags) are to be the same colour as the final exit flag for the given route.

Local destinations, signed on advance signs, should be incorporated within the panel of the particular road category. Where there is no panel these destinations should be shown beneath the more important destinations on the same background.

Panels should only be used on advance signs at the actual junction where the different category side road leaves the main carriageway, except for tourist attractions, advisory lorry routes and MoD establishments.

The use of patches with bracketed route numbers should be used for more important categories of road on signs at advance junctions except for tourist attractions, advisory lorry routes and MoD establishments.

Car parks should have individual white background panels incorporated on the advance sign.

16.8.6. Use of Symbols

Guidance on the use of symbols is given in TSRGD, TSM and Local Transport Note 1/94. Symbols (including, Regulatory and Warning signs) should be incorporated onto route direction signs wherever practicable.

Regulatory and warning sign symbols, when used on a stack or flag sign, should be situated adjacent to the arrow or chevron (the symbol will be between any text and the arrow or chevron). Other types of symbol should be placed such that any text is between the symbol and arrow or chevron. The exception is where a parking symbol is used, in which case the legend will always be to the right of the symbol.

On map type signs the symbol should always be located adjacent to the entry arm.

Any symbol with a directional element should point to face the direction of travel, either left or right horizontally. It should point left for straight ahead destinations.

16.8.7. Proliferation of Destinations

Where sign shows more than three directions a map type sign should be used, rather than a stack sign. The number of destinations on any one sign should not exceed six.

16.8.8. Junction Name Plates

When a junction is widely known by a particular name, this should be included on the primary signs. Care should be taken where the name used has a commercial connotation. The name of the junction shall be agreed with HCC.

16.8.9. Destination Distances

Distances should not be provided for destinations on any signs other than route confirmatory signs.

16.8.10. Cancelled Route Numbers, Diversion Route Signing & Alterations to Existing Signing

Information regarding cancelled route numbers, diversion route signing and alterations to existing signing is given in TSM Chapter 7, Section 11 and Chapter 8.

Sign alterations should be carried out using over-stickers unless the sign construction allows for plank replacement, in which case plank replacement is preferable. The over-sticker should match the existing sign face material. Over-plating should not be used unless agreed with HCC.

Permanent diversion routes shall be agreed with HCC.

16.8.11. Efficiency of Design

All route directional signs should be designed so as to maximise the available space and minimise the amount of background necessary. This should ensure that the sign size is kept to a minimum whilst meeting the sign design criteria.

The ‘x’-height should not be compromised to save cost. However, the size may be reduced in order for the sign to fit into the highway verge/footway, provided that the minimum ‘x’ height is used. Minimum ‘x’ heights should not be used as standard except in conservation areas.

Should the sign still be marginally too big for the highway verge/footway, it is possible to ‘squeeze’ the width of the sign by a small amount to make it fit. The sign may be reduced

during manufacture by a maximum of 5%; the scheme promoter or designer should convey this information on the sign schedule.

16.8.12. Illumination Requirements

Traffic signs should only be illuminated when the TSRGD dictates that it must be lit and not on occasions where it is optional.

Traffic signs should be illuminated by means of external lighting and to the specification as given in Section 4, Chapter 15: Lighting - Detail. Internal illumination is not permitted unless agreed with HCC.

The table 4.16.8.1 gives the type of lantern required for the area of sign:

	LED	Low wattage alternative to 2x20 watt
Length	< 0.9m	0.9m to 1.8m
Height	< 0.75m	0.75m to 1.8m

Table 4.16.8.1: Lantern Requirements

Lanterns should be centrally mounted above the sign face on a large base post or stub post. All other lighting units can be off-set or centrally mounted.

Photocell units will not be fitted on sign lighting unless the sign is on a direct Regional Electricity Company supply.

16.8.13. Sign Face Material

All sign face materials used must comply with BS EN 12899-1:2007. The following sign face materials should be used where specified below:

16.8.14. Class 2 retro-reflective

- All illuminated signs
- Signs in non-lit areas or with a low level of ambient lighting (i.e. villages, conservation areas)
- Route directional signs on single carriageway roads with either a high level of ambient lighting and/or on single carriageway competing with an amount of commercial background signing (i.e. Town Centres, busy shopping thoroughfares)
- Signs not in direct line of vision (i.e. mounted on the opposite side of carriageway) or where greater visibility distance is required
- Gantry signs, ADS or route directional signs on dual carriageways

16.8.15. Other reflective materials (i.e. Class 1)

- Neighbourhood Watch and Bus Stop signs
- Signs to housing developments
- AA and RAC signs

It is not acceptable to use Diamond Grade sign face material instead of illumination unless special dispensation is given by the DTLR. This should only be sought where it is felt that

lighting of signs is impracticable due to power supply problems or, that lighting is seen to be visually or environmentally obtrusive as in villages/conservation areas.

16.9. Positioning of Signs

There should be a minimum clearance of 0.45m from the kerb face to any part of the sign assembly. On roads with a speed limit of 50mph or above, this should be increased to a minimum of 1.2m. Where there is a hardened verge the nearest edge of the sign should not be less than 0.6m behind the edge of the hardening.

Recommendations for the positioning of signs can be found in TSM Chapter 1, Section 6.

The sign should be sited at the correct distance before the site to which it relates. This is generally dependant on the 85th percentile speed of the road.

The sign must be seen from adequate reading distance and not be obscured by any obstructions. See TSM Chapter 2 for details on how to work out the reading distance.

Signs should be placed on the left hand side in most circumstances. Siting on the right hand side is appropriate when there are difficulties with placement on the left or when two signs can be used on one post at for example at a T junction. This does not apply to signs that need to be placed both sides of the road.

Signs should, by their nature, be clearly visible and their environmental impact minimised by careful consideration when siting. Particular care needs to be taken in environmentally sensitive areas such as conservation areas.

Care should be exercised when siting sign assemblies and they should be positioned so as to minimise disruption to pedestrian and vehicular traffic. Particular care is to be taken when siting signs near junctions so as to avoid intrusion to the sight lines of pedestrians and drivers.

Signs should be sited clear of shop and house windows, areas where vehicles unload, shop canopies, garage accesses and other pavement crossings and any foliage and vegetation that may obscure the sign. Furthermore signs should not be erected where they will be obscured by existing street furniture or obscure existing traffic signs.

The siting distances for signs are given in the TSM. These should be adhered to wherever possible but may be relaxed if doing so would provide better visibility of the sign.

Mounting Requirements

Please adhere to the guidelines in TSM Chapter 1, Section 7 with the following in mind:

Any part of a sign mounted over a pedestrian footway or footpath shall have a minimum vertical clearance of 2.3m.

Any part of a sign mounted over a route where cyclists ride shall have a minimum vertical clearance of 2.4m.

Any part of a sign mounted over a bridleway shall have a minimum vertical clearance of 3.7m.

Any part of a sign mounted in a cutting or on an embankment with a gradient greater than 25% should have a minimum vertical clearance of 0.9m.

Any part of a sign mounted on a verge with a gradient of 25% or less should have a minimum vertical clearance of 1.5m.

Any sign mounted at a junction where visibility may be impaired by its presence should have a minimum vertical clearance of 1.8m.

Minimum post spacing on a footway or footpath should be 1.2m where it is necessary for pedestrians to pass underneath the traffic sign. Where this is not possible due to physical constraints an absolute minimum of 0.9m post spacing shall be maintained.

Signs mounted on one post should generally be no more than one metre in length. For larger signs, with the approval of HCC, it may be acceptable to mount the sign on two posts erected in the same foundation 200mm apart.

Where stub arms are used on cantilevered signs the construction shall be approved by HCC.

Where triangular signs and roundels are to be off-set on a single post, the signs should be mounted on a grey backing board with any associated supplementary plate.

The maximum distance between adjacent posts should 2.0m, but 1.5m is preferable. There are circumstances where the post spacing is increased, for example when it is desirable to span a cycleway. In such circumstances the sign plate may need to be strengthened.

The typical overhang of a sign should be 300mm although the maximum unsupported overhang of a sign beyond the posts is 600mm (except for cantilevered signs mounted on one post). Signs should be mounted so that the overhang is equal on both sides unless restricted by post positioning or existing obstructions.

If signs are to be mounted on existing posts these should be inspected to ensure that they have not corroded or otherwise deteriorated. A check should be made as to whether they are able to support the new sign.

In multi post installations all posts should be the same size, the post containing the electrical equipment should be furthest from the carriageway.

Signs should be mounted so that the top of the sign is level with the top of the posts. The only exception to this is when a sign is to be illuminated (see post details below).

16.10. Foundation Details

Sign foundations should be constructed from ST4 concrete. The concrete foundations for a sign should not be loaded for 48hrs after laying. Therefore sign plates should be erected at least 48hrs after the foundation has been laid. The top of a sign foundation should be at least 150mm below finished ground level.

Two types of foundation are used for signs: ‘Raft’ and ‘Separate’ foundations.

Raft foundations should be used when sign posts are greater than 140mm diameter or where separate foundations are less than 250mm apart due to limited post spacing.

Separate foundations should be used when sign posts are equal to or less than 140mm in diameter, when it is not possible to provide a raft foundation due to Statutory Undertakers’ plant or when posts are to be placed on different verge or footway levels.

16.10.1. Separate Foundations

The length/width of the separate foundation for each post is given in table 4.16.11.1:

Area of Sign (m^2)	Height to centre of sign			
	2m	3m	4m	5m
1	0.6m	0.6m	0.6m	0.6m
2	0.6m	0.6m	0.6m	0.6m
4	0.75m	0.75m	0.75m	0.75m
8	0.75m	0.75m	0.9m	0.9m
12	0.9m	0.9m	1.05m	1.05m
16	0.9m	1.05m	1.05m	1.2m

Table 4.16.11.1: Length and Width of Separate Sign Foundations

The depth of the foundation for each post is given in table 4.16.11.2:

Area of Sign (m^2)	Height to centre of sign			
	2m	3m	4m	5m
1	0.6m	0.6m	0.9m	0.9m
2	0.9m	0.9m	1.2m	1.2m
4	1.2m	1.2m	1.5m	1.5m
8	1.5m	1.5m	1.8m	1.8m
12	1.8m	1.8m	2.0m	2.0m
16	1.8m	2.0m	2.0m	2.0m

Table 4.16.11.2: Depth of Separate Sign Foundations

16.10.2. Raft Foundations

A raft foundation is made from one continuous block of concrete. The length should be the same as the sign, the width should be at least 1.5m and the depth should be ¼ of the height to the top of the sign at the tallest post.

Post pots are to be provided. Posts are to be grouted into the pots with sand and a 150mm deep cement collar at the top.

16.11. Post Details

Traffic sign post diameters should be calculated using the Standard Nomograms (See Figures 4.16.12.1 and 4.16.12.2) at the end of this chapter.

The length of post required is calculated by adding the following:

Sign height + vertical clearance + foundation depth.

Where a large base post, for the provision of a lighting unit is required, an additional 150mm should be provided to its length.

16.12. Removal of Illuminated Signs

Where existing illuminated traffic signs are to become non-illuminated or are due to be removed, all existing cable from the supply, terminations and sub-fuse should also be removed.

In the case of Local Electricity Company supplies the scheme promoter or designer should arrange for the sign to be disconnected by the Electricity Company.

16.13. Mounting of Signs on Grey Backing Boards

Grey backing boards can simplify mounting and improve silhouette but, they can be uneconomic and unsightly and therefore should only be used where:

- The signs cannot be mounted onto common posts because of extreme differences in the widths of the signs.
- By using grey backing board the number of supports used would be minimised and mounting arrangements simplified.
- The sign is of insufficient width to give adequate spacing between posts for pedestrians. In this case a grey plate should be used to increase the width of the sign.

16.14. Yellow Backing Boards

To improve visibility against a complex or dark background, a sign may be mounted on a yellow backing board; however this board should not have with an additional black border.

Yellow backing boards can be very effective in drawing attention to signs in various situations. However, potential disadvantages to the use of yellow backing boards are:

- Environmentally intrusive; and
- Over-use could eventually devalue their attention attracting benefits.

Therefore, it is essential that the use of yellow backing boards be assessed on an individual basis and on safety engineering grounds.

A less obtrusive way of increasing how conspicuous a sign is would be to provide a standard sign of a larger size. This will not only make the sign more noticeable but it will also improve legibility and the reading distance.

16.15. Traffic Signing in Conservation Areas

Route direction signs in conservation areas should be designed using the minimum recommended safe 'x'-height for the given road category as set out in Local Transport Note 1/94 and the TSM Chapter 2.

The backs of signs, posts, channel stiffeners and lighting units should be manufactured to colour conservation grey (BS4800, 18B29).

16.16. Tourist Signs

For a tourist attraction to be eligible for signing, on all roads except motorway and trunk roads, the attraction or facility must meet the following requirements:

- Be permanent and a place to which people make excursions for sightseeing, entertainment, historical or cultural visits;
- Not have retailing or catering as the main purpose of the site operation;
- Be open to people making impulse visits within normal opening hours and not just to those who have made prior bookings;
- Have a significant proportion of people visiting from outside the locality who would be likely to need signing to find their way to the attraction;
- Be open 50 days per year and for at least 200 hours during that period when it should have received a minimum of 1,000 visitors;
- Have adequate on-site parking for both cars and coaches or have suitable arrangements with local providers; and
- Satisfy HCC that the route onto which traffic is being directed is the most suitable link between the attraction and the nearest A or B numbered road.

16.16.1. Approved Tourist Signing

Signs will be provided from the nearest A or B numbered road unless, by exception, there are good traffic management reasons for more extensive signing.

Signs will take the form of either:

- ADS type sign
- Stack type sign
- Flag type sign

A tourist symbol from TSRGD schedule 14 will be used on all signs. The choice of symbol must be determined by its appropriateness to the main function of the attraction or facility. Commercial logos are unacceptable on tourist signs. Commercial names may only be used on signs where it is deemed by HCC to be essential on traffic management grounds.

All costs for the design, erection and maintenance of tourist signs shall be borne by the scheme promoter or designer.

16.17. Temporary Signs

16.17.1. Housing Developments

Larger housing developments may be signed as a destination. Advice should be sought from HCC.

16.17.2. Signing of Roadworks

Roadwork signs should be designed as permanent signs. However, the sizing and siting of roadwork signs is covered in TSM Chapter 8.

Sign faces should be Class 1 reflective material as a minimum, although informatory signs should be manufactured in Class 2 material.

16.18. Bollard Islands

HCC require that bollards which use sign faces and are located on a centre island shall be lit.

All bollards should be assessed for the removal of the sign and hence be un-lit. Only bollards with specific circumstances should retain the sign face.

In the following circumstances the sign face should remain when it has been determined that bollards are required:

- On a dual carriageway (Sign face D610);
- On the entry to a roundabout (Sign face D610); or
- As part of a safety scheme.

Bollards should assessed to ensure they comply with the current DfT illumination policy. Bollards that do not require illumination in this guidance can carry the sign face should it be necessary.

The current DfT requirements for D610 sign faces are:

- The bollard is in front of a traffic signal; and
- The bollard location falls 50m outside of street lighting.

If the installation of supplementary illuminated signage in order to allow a bollard to be un-lit, should be avoided unless a solar powered sign can be used.

If a sign face is necessary and a solar powered supplementary sign is not suitable then an application to DfT through HCC should be made for the site to incorporate un-lit bollards. If this application is rejected then a solar powered bollard should be considered.

For bollard illumination requirements see also Section 5, Chapter 10: Traffic Signs and Road Markings (Series 1200).

16.19. Road Markings and Reflecting Road Studs

Permanent reflective road studs may be required for safety reasons, when stipulated by HCC or where prescribed in DTLR standards.

Guidance on the use and type of road studs is given in the TSM, TSRGD and Circular Roads 5/91.

Road markings and reflective road studs shall comply with the requirements of the TSRGD and guidance in the TSM.

There are a number of additional guidance documents for specific circumstances such as mini roundabouts, pedestrian crossings, or traffic calming. Designers must ensure that they use the latest guidance published by the DfT and HA, which includes the DMRB, MfS, Local Transport Notes and Traffic Advisory Leaflets.

Notes:

1. The example shown is for a 1.54m² sign mounted such that the centre of the sign is 3.75m above ground level. In this example two 114mm diameter posts, or three 89mm diameter posts can be used, however, it is generally good practice to use the least number of posts. In this example two 114mm diameter posts should be used.
2. Wind loading is taken as 1.2kn/m² except in particularly exposed locations. In such circumstances the Highway Authority may require a wind loading of 1.5kn/m² & the sign area multiplied by 1.25 when using the nomograms.
3. For larger signs see sheet 2.

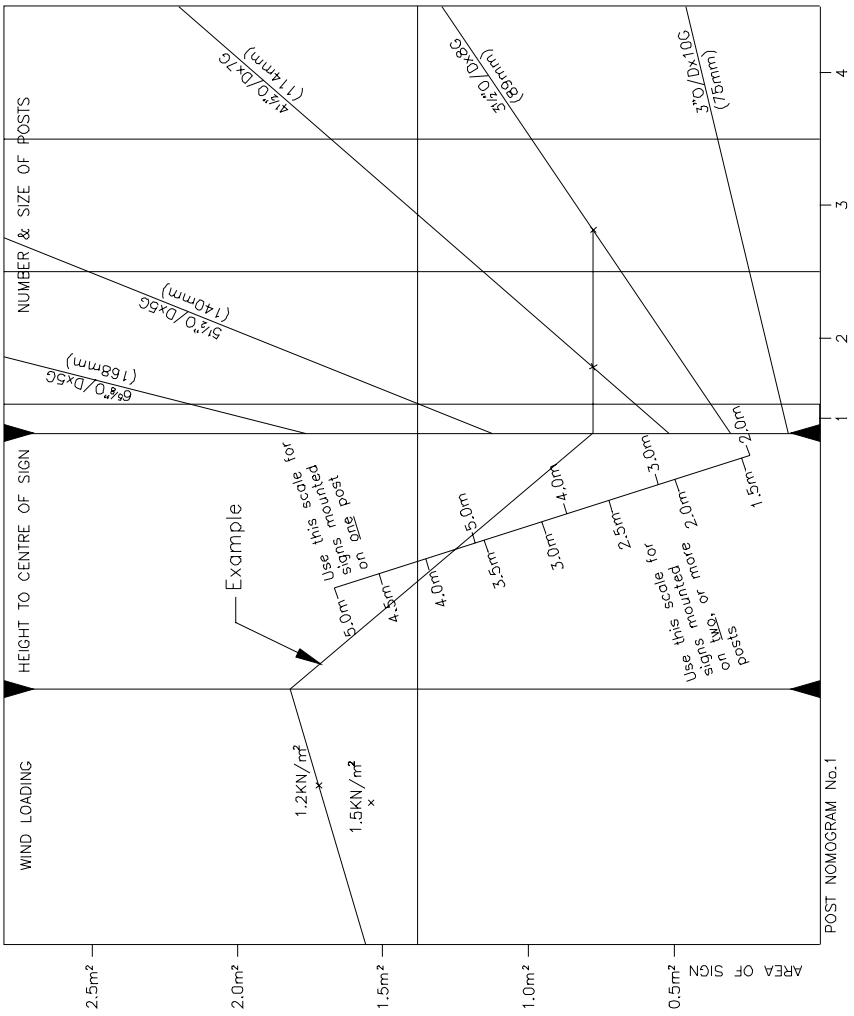

Figure 4.16.12.1: Sign post Nomogram - Sheet 1 of 2.

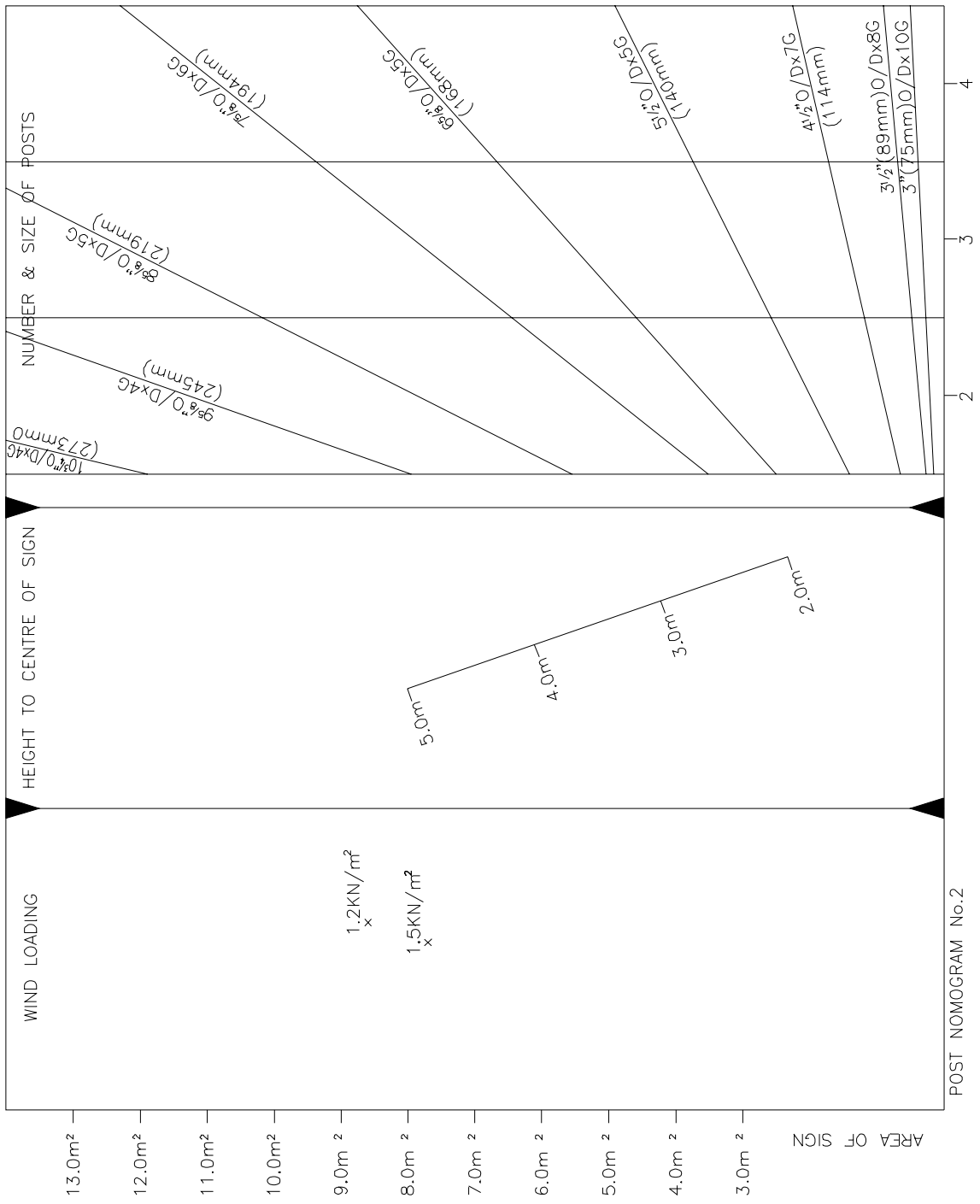

Figure 4.16.12.2: Sign post Nomogram - Sheet 2 of 2.

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 17 – Traffic Signals

Hertfordshire

17. Traffic Signals

17.1. General

This chapter relates to permanent signals. Temporary traffic lights are covered in Section 2, Chapter 10: Network Management. All designs should follow current national standards, specifications and guidelines but it will be the responsibility of the designer and contractor to check that all relevant and current standards are adhered to.

All systems shall be designed to minimise energy consumption. Extra Low Voltage (ELV) systems to include ELV controller, ELV pedestrian demand units and CLS ELV LED type heads should be used.

All designs shall be subject to formal Safety Audits in accordance with current DfT guidelines and HCC policy.

The installation of the traffic signal equipment shall only be undertaken by a contractor certified to BS EN ISO 9000: 2000 and in line with the current edition of the IEE Wiring Regulations for Electrical Installations.

Installers shall conform to Health & Safety at Works Acts, Electrical at Work Regulations, Construction Design and Maintenance Regulations and all other relevant legislation at all times.

Installers shall also ensure that installation procedures conform to all relevant DfT advice notes and directives, in particular, roadworks and temporary situations shall conform to Chapter 8 of the Traffic Signs Manual.

17.2. Traffic Signal Design Guidance

17.2.1. Signal Layout

All designs should be prepared using AutoCAD and KeySIGNALS. On completion of works an 'As Built' drawing should be supplied in AutoCAD format.

The drawing should be 1:200 scale and use standard BS:EN12368 (formerly BS 505) symbols. The drawing should include:

- a north point;
- road names;
- signal head phases;
- pole numbers (starting at the controller and preceding clockwise);
- cable schematic diagram;
- staging diagram;
- ducting and inspection chamber schedule;
- controller;
- feeder pillar;
- earth rod, poles;,
- sockets manufactured by NAL Ltd;

- all signal heads;
- pedestrian demand units;
- photoelectric cell;
- all detectors;.
- all ducting;
- inspection chambers;
- loop pit boxes;
- crossing studs;
- tactile paving; and
- anti-skid surfacing.

All detection (including MVD's, on-crossing and kerbside detectors) should be labelled appropriately to include phase letters..

Special requirements relating to street furniture and signalling detail (special mounting, four in line heads, long cowls, louvres, etc.) should be detailed on the drawing.

The drawing should also include:

- A 'Key' which shows equipment related to the design and depict all the symbols shown on the drawings; and
- A 'Notes' section including additional detailed information related to the design.

Specific reference should be made to any design details that does not comply with DfT design standards, etc.

17.2.2. Controllers

The controller should be to the latest specification of the TR2500A and related Appendices. All traffic signal designs must be accompanied by a TR2500A Controller Specification.

Provision should be made for a 2nd and 3rd EPROM within 6 and 12 months respectively of the original traffic signal commissioning.

The controller and street furniture should be grey in colour unless the site is within a conservation area, where all equipment should be black.

17.2.3. Signal Poles

All traffic signal poles should be installed using NAL retention sockets or similar as approved by HCC; and should be positioned to ensure there is a minimum 1.2m footway width and that all equipment has a minimum 450mm clearance to the carriageway.

All traffic signal poles should be hot dipped galvanised and plastic coated and grey in colour unless the site is within a Conservation Area.

The Design Manual for Roads and Bridges Volume 8 Section 2 Part 2 TA 89/05 should be adhered to when designing for Passively Safe Signal Poles.

17.2.4. Signal Heads

All traffic signal heads should be compatible with the controller in respect of lamp monitoring.

The lowest part of the signal head should be 2.3m from finished ground level for pedestrian routes and 2.4m for cycle routes.

Retro-reflective backing boards should be provided on all aspect signal heads with the exception of pedestrian signal heads. Regulatory box signs and green arrows should be specified on the design drawing.

17.2.5. Pedestrian Demand Units

All push button units should include tactile devices; audible signals should only be specified when safety reasons permit their use. Tactile devices should be located on the right hand side of the pushbutton, audible signals should be on the left hand side.

All push button units should be positioned in accordance with the orientation shown on the approved contract drawings.

The bottom of standard height pedestrian demand units should be 1m above finished ground level. The bottom of high level repeater units where pedestrian flows are high, should be 1.8m above finished ground level.

17.2.6. Pedestrian Detection

On-crossing and kerbside detectors should be detailed on the design drawing and should be Type Approved and comply with TR 2506 Issue A and TR 2507 Issue B respectively.

17.2.7. Vehicle Detection

System 'D', Stop Line, Speed Discrimination and Speed Assessment loops should be designed in accordance with MCE 0108 Issue C. SCOOT loops should be designed in accordance with MCH 1352 Issue D. MOVA loops should be designed in accordance with MCH 1542 Issue C.

Call Cancel, Presence, All Red, Bus Priority, Emergency Priority and Red Light Camera loops should be detailed on the design drawing and approved by HCC.

MVD and Infra Red detectors should be detailed on the design drawing and should be Type Approved and comply with TR 2505 Issue A.

Loop detector cards should be automatic self tuning multi channel microprocessor type and should be fully type approved in accordance with TR 2512 Issue A.

17.2.8. Road Markings

All road markings should comply with the latest edition of TSRGD and have been laid before any slot cutting is carried out.

Advance Stop Lines should be provided at all traffic signal junctions where feasible, these cyclists to:

- Position themselves ahead of other traffic;
- Assist turning manoeuvres;
- Be more visible to motorists; and
- Clear the junction before other vehicles.

17.2.9. Tactile Paving

Tactile paving layouts should comply with DfT 'Guidance on the use of Tactile Paving Surfaces'.

17.2.10. Anti Skid Surfacing

Buff anti skid should be provided in advance of the all stop lines and grey anti skid should be provided between the all stop lines and crossing studs. All road markings should be laid on top of this anti skid.

17.2.11. Cabling

All cables should be ELV, PVC insulated, PVC bedding, galvanized steel wire armour (except twin-flex), PVC outer sheathed, orange in colour and marked with 'traffic signals' to BS 6364/87.

Cable between the controller and signal poles should be a minimum of 16 cores except pushbutton drops, which can be a minimum of 8 cores. There should be a minimum of four spare cores per signal pole and each signal head should have two separate neutral conductors.

17.2.12. Ducting

All ducting should be 50mm or 100mm Medium Density Polythene (MDPE), be orange in colour and marked with the words 'Traffic Signals'.

Carriageway ducting must be laid at 750mm (minimum) below finished ground level and footway or verge ducting must be 450mm (minimum) below finished ground level.

17.2.13. Electricity Supply

A Single Phase Regional Electricity Company supply (230v 50Hz) should be provided to a feeder pillar located beside the Controller.

Fuse ratings should be 60 amp cut-out and 25 amp fuse for traffic signals and 25 amp cut-out and 16 amp fuse for Pedestrian crossings in accordance with BS 88 Part 2.2.

A supply may be fed from an existing HCC private network, in which case a separate marked and identified secondary cut-out must be provided within the existing equipment. Prior agreement with HCC must be required in this instance.

An earth rod should be provided and comply with the 16th Edition IEE Wiring Regulations and/or BS 7671.

17.2.14. Telecommunication Link

Remote Monitoring and MOVA sites will require a BT PSTN line provided into the feeder pillar.

Prior approval with HCC must be required for the use of GSM at Remote Monitoring and MOVA sites.

A UTC site will require a data-enabled BT PSTN line and HCC must be contacted to provide a Router.

17.2.15. UTC Design

UTC designs should comply with 'Hertfordshire County Council - UTC Design Guide'.

17.2.16. MOVA Design Requirements

MOVA designs should be comply with TRL Application Guide 44 Issue C, TRL Application Guide 45 Issue C, MCH 1542 Issue C and all other relevant TRL documentation.

All MOVA designs must be accompanied by a MOVA Data Set.

17.2.17. Remote Monitoring System Requirements

The OMU equipment should be Type Approved and be compatible with HCC's Instation system.

HCC current Instation systems are Peek and Siemens but HCC should be contacted to confirm this is still the case.

17.2.18. Appendix 12/5 Specification

All designs must be accompanied by an Appendix 12/5 Specification in accordance with MCHW Volume 2 Series NG 1200.

17.2.19. Method of Control

The method of control will be determined by the location of the signal installation with regard to its proximity to other installations, the operational envelope, traffic patterns, etc.

The method of control used for traffic signals and standalone pedestrian crossings are:-

- UTC (Urban Traffic Control), normally SCOOT. SCOOT (Split Cycle Offset Optimisation Technique) is adaptive and responds automatically to traffic fluctuations. It does away with the need for signal plans that are expensive to prepare and keep up to date. SCOOT has proved to be an effective and efficient tool for managing traffic on signalised road networks;
- MOVA stands for Microprocessor Optimised Vehicle Actuation. Designed by TRL during the 1980s, it is now a very well established strategy for the control of traffic light signals at isolated junctions - i.e. junctions that are uncoordinated with any neighbouring signals. It can also be used at stand-alone pedestrian crossing, i.e. Puffin and Pelicans;
- VA (Vehicle Actuated).

In all cases the method of control should be agreed with HCC at an early stage of the design.

17.2.20. Signal Staging

The staging of the signals should be as simple as possible to avoid confusion and to maximise flexibility of control.

In all cases pedestrian, cycle, emergency and bus priority facilities should be considered and included where appropriate. Local consultation should be carried out to determine the need for such facilities.

17.2.21. Signal Timings

Minimum green times for traffic phases should be 7 seconds apart from indicative right turn green arrows and left turn filter arrows which can be 4 seconds. Dummy phases should be the minimum appropriate to their purpose.

Intergreens should not be less than 5 except for an indicative green arrow gaining right of way.

Pedestrian crossing timings should be in accordance with 'The Puffin Good Practice Guide' and TAL 5/05.

17.2.22. Type of Pedestrian Crossing Facility

LTN 1/95, LTN 2/95 and current HCC policy should be used to determine the appropriate type of pedestrian crossing facility to implement.

17.2.23. Bus Priority

If there is a minimum of six buses per hour on any one approach then Bus Priority is normally included in the signal installation. Its introduction should be discussed and agreed with the HCC Passenger Transport Unit. Advice on electronic bus priority is given in Section 4, Chapter 18: Intelligent Transport Systems.

17.2.24. Traffic Modelling

Linsig or Transyt should be used for junction analysis using relevant traffic flows. Practical Reserve Capacity, mean max queue, delay or equivalent will be used in the analysis process.

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Section 4 - Design Standards and Advice

Chapter 18 – Intelligent Transport Systems

Hertfordshire

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18. Intelligent Transport Systems

18.1. Introduction

In July 2008 HCC published its Intelligent Transport Systems (ITS) Strategy. This is available at http://connect.hertscc.gov.uk/infobase/docs/pdfstore/itsstratcons.pdf.

This Intelligent Transport Systems (ITS) Strategy covers a three year period until 2011 which coincides with the end of the second Local Transport Plan. The objective of the ITS Strategy is to identify ways that ITS can contribute to achieving HCC's Local Transport Plan objectives.

18.2. General

All designs should follow current national standards, specifications and guidelines and is the responsibility of the designer and contractor to check that this is the case.

All systems shall be designed to minimise energy consumption by the use of Extra low Voltage (ELV) equipment where possible.

All designs shall be subject to formal Safety Audits in accordance with current DfT guidelines and HCC policy.

The installation of Intelligent Transport Systems signal equipment shall only be undertaken by a contractor certified to BS EN ISO 9000 : 2000 and in line with the current edition of the IEE Wiring Regulations for Electrical Installations.

Installers shall at all times conform to Health & Safety at Works Acts, Electrical at Work Regulations, Construction Design and Maintenance Regulations and all other relevant legislation.

Installers shall also ensure that installation procedures conform to all relevant DfT advice notes and directives, in particular, roadworks and temporary situations shall conform to Chapter 8 of the Traffic Signs Manual.

18.3. Selective Vehicle Detection (SVD) / Bus Priority

All designs should be discussed with HCC at their inception.

18.4. Automatic Vehicle Location (AVL) / Bus Priority

HCC is procuring an automatic vehicle location technology for buses participating in the real-time passenger information (RTPI) scheme.

Vehicle location is calculated by a computer on board the bus from a variety of inputs including GPS, odometer pulses, door-opening contacts and route data. Vehicle location data are used locally for traffic signal priority, ticket machine stage advance and on-board announcements depending on the equipment fitted to the vehicle.

Buses operating on the AVL platform can be granted priority at signalised junctions through short range communication from the vehicle to the traffic light controller or globally by providing real-time information to the UTC/ SCOOT system.

Decisions about whether to use local or remote management of traffic signal priority are managed by the on-bus computer.

Traffic signal priority messages will use the RTIG format under the UDP protocol. Messages transmitted over PMR are transmitted twice without acknowledgment. It is intended to explore the possibility of transmitting traffic signal priority messages over GPRS.

If this option is pursued, HCC will be seeking to enable bus priority through IP-addressable roadside controllers.

Note that the operation of traffic signal priority is subject to validation and detailed design. All designs should be discussed with HCC at their inception.

18.5. Access Control

18.5.1. Automatic Number Plate Recognition (ANPR)

All designs should be discussed with HCC at their inception.

18.5.2. Rising Bollards

The rising bollards shall be to the latest specification of the TR2510A and the system shall be fully approved by the DfT for use on the public highway.

The rising bollard system shall be a full time automatic hydraulic bollard system controlled using the appropriate Selective Vehicle Detection equipment.

The controller shall be supplied with:

- Operating logic;
- A safety system, incorporating a red and green lamp monitoring;
- The appropriate number of channels of detector loop logic;
- All necessary hydraulic pumps;
- All necessary Selective Vehicle Detection including associated equipment and cable;
- A Siemens OMU/Bus Processor unit; and
- 'Dial Up' CCTV logic.

The system shall control permitted vehicles approaching from either direction and allow a safe controlled passage through the bollard system.

The bollard(s) must include for all necessary hoses and cabling.

Fully retracted and fully raised switches shall be used to confirm the position of the bollard(s).

A red/green traffic indicator column shall be supplied for use on each approach to control the vehicles in that direction.

Each approach shall incorporate a Selective Vehicle Detector and safety loops.

The bollards must have three modes of operation normal, manual and failure.

18.5.3. Signal Control Access

All designs should be discussed with HCC at their inception.

18.6. Vehicle Actuated Sign (VAS) & Variable Message Sign (VMS)

All VAS and VMS shall comply with DfT Traffic Advisory Leaflet 1/03, HCC Speed Management Strategy and TSRGD 2002 and shall be positioned in accordance with Traffic Signs Manual Chapter 4.

All VAS and VMS should be used to reduce speeds where there is a poor safety record or where a speed survey has identified inappropriate speeds. Where sites do not meet criteria set out in HCC's Speed Management Strategy a commuted sum will be required to cover their ongoing maintenance.

Guidance given to the Police by the Association of Chief Police Officers (ACPO) on trigger speeds for VAS and VMS shall be adhered to in all cases. All VAS and VMS sites should have speed measurements taken before and then 3, 6 and 12 months after installation to monitor its effectiveness.

Power supplies for all signs can be via the following methods:

- Mains Supply – A Single Phase Regional Electricity Company supply (230v 50Hz) shall be provided to a feeder pillar located beside the sign. Alternatively and with prior agreement with HCC, a supply may be fed from an existing HCC private network, in which case a separate marked and identified secondary cut-out must be provided within the existing equipment. An earth rod must also be provided;
- Solar – Power is taken from the sun via a solar panel during the day, which charges internal batteries to be used at night;
- Wind – Power is taken from wind energy via a turbine, which charges internal batteries to be used when there is little or no wind;
- Battery – Power is taken from a rechargeable battery pack.

All VAS and VMS shall be positioned a minimum of 2.4m above ground level and must be installed in retention sockets.

All VAS and VMS shall have a facility for collecting and recording data (speeds, time and date, etc.) and should be capable of being remotely monitored by HCC's Central Control System.

Consideration should be given to homes and businesses when finding suitable locations for VAS and VMS. Consultation is not a statutory requirement of VAS and VMS, however homes or businesses, etc. which own land within a 25m radius of the sign shall be informed.

18.7. Close Circuit Television (CCTV)

CCTV systems should be 'Dial Up'.

The 'Dial Up' CCTV camera system is controlled by HeiTel Digital Video currently located in Highways House, Welwyn Garden City, Hertfordshire. CCTV cameras are linked to the control room by ADSL or 3G lines.

If another make of 'Dial Up' CCTV camera system is proposed, which requires different software and/or a different form of communication, details are to be submitted to the HCC for approval and all software for the installation shall be provided and installed by the scheme promoter.

The camera control logic units shall be housed within the controller cabinet(s) and be capable of connecting up to four cameras at each site.

Each 'Dial Up' camera system shall include for:

- Colour camera(s), fixed and/or Pan-Tilt-Zoom according to HCC requirements with suitable lens for the system application;
- Camera control from the control room with configurable pre-determined direction and zoom positions;
- All cables and connectors required for installation and commissioning;
- Any termination panel and termination units required;
- Camera control equipment; and
- A 5m or 6m signal pole (according to Site requirements) to mount the Camera(s).

18.8. Passenger Transport Information Systems

18.8.1. Electronic Passenger Information Systems (ePIPS)

HCC has deployed electronic passenger information points (ePIPs) which deliver scheduled timetable information to a selection of display screens at various locations across the county. There are currently 43 ePIPs in Hertfordshire with some locations having more than one installation.

ePIPs use a 'walled' or restricted internet browser to provide access to the Traveline internet journey planning service and other news and information from external content providers.

Imminent departure information can include rail journeys from nearby rail stations as appropriate to the kiosk location. Rail and coach Information is in real-time. Bus information is currently not in real-time but it is expected that real-time bus information will be provided through a link to a dedicated HCC web-site as the AVL/RTPI project progresses.

The information kiosks can be accessed remotely to repair operating system errors and device driver faults, reboot the system, update software and test components.

The status of ePIPs is continuously monitored at Highways House through a web-based monitoring tool.

Ruggedised keyboards and pointing devices are preferred to touch-screens.

The specification for future ePIPs is under development. However as a minimum it is required that all future ePip cabinets shall conform to requirements of the Disability Discrimination Act 1996 (DDA) (with particular regard to wheelchair users), be equipped with audio speakers, be vandal, dust and water resistant to IP67.

All existing and future ePIPs have or shall have broadband internet connections provided over ADSL or wireless.

18.8.2. Real Time Passenger Information

HCC is procuring an AVL/RTPI system from INIT GmbH.

The system will be make real-time and scheduled information about bus services available to passengers. Information about buses will be combined with information about other modes depending on location and delivery channel.

Real time signs are be installed at bus stops, interchanges and other key locations.

There is an option to deploy on-board information screens in buses, these will be 17 or 19 inch TFT screens with full graphic displays. Graphics are managed through the RTPI system.

On-street displays will be a mixture of shelter and pole mounted. Displays erected through the AVL/ RTPI project are expected be three-line LED displays.

A number of larger format TFT displays are in use at rail stations and major interchanges. These displays include both travel information as well as moving images such weather and news items.

Power supplies for all signs can be via the following methods;

- Mains Supply – A Single Phase Regional Electricity Company supply (230v 50Hz) shall be provided to a feeder pillar located beside the sign. Alternatively and with prior agreement with HCC, a supply may be fed from an existing HCC private network, in which case a separate marked and identified secondary cut-out must be provided within the existing equipment. An earth rod must also be provided.
- Solar – Power is taken from the sun via a solar panel during the day, which charges internal batteries to be used at night.
- Wind – Power is taken from wind energy via a turbine, which charges internal batteries to be used when there is little or no wind.
- Battery – Power is taken from a rechargeable battery pack.

Bus stop displays will generally be:

- Amber or yellow on black nine-dot high LEDs in 3 rows of 30 characters, 30mm high;
- Single of double sided;
- Capable of displaying upper and lower case text with “true” descenders;
- Able to page through up to five pages of information and to scroll individual lines;
- Viewable from a distance of up to 8m;
- Viewable from an angle 60 degrees horizontal and 60 degrees vertical;
- IP65 rated;
- Able to operating in temperatures between -10 to + 45 degrees Centigrade;
- Able to operating in humidity ranging between 10 – 90% (non condensing);
- Equipped with Environmental Control Systems e.g. heater, cooling fan; impact alarms;
- Pole mounted or on underside of shelter roof;

- Capable of public address; and
- Able to monitoring and reporting faults and diagnostics.

Larger displays for use at bus stations and similar locations will generally be:

- Daylight viewable TFT or similar raster screens;
- Of sizes between 19" and 42" (with options for 70");
- Capable of displaying graphical items;
- Resistant to vandalism and weather damage; and
- Capable of monitoring and reporting operational status and generating maintenance alarms as necessary.

The design and construction of all information dissemination displays should be mindful of the requirements of the DDA and the general requirement to make information accessible to as many users and potential users as reasonably possible.

Signs and their associated fixings, fittings and connections must be designed with due regard for future maintenance requirements. Hidden catches and special fasteners should be used to improve security.

Signs must include the necessary communications hardware. Antennae for stops on-street must be concealed to minimise vandal and tree damage. Concealed antennae are desirable in all other locations.

HCC will arrange any necessary modifications to shelters following consultation and agreement with the Supplier.

Smaller roadside displays (typically three line LED displays) can show:

- Next departures for a specific service;
- Summary of the next departures by service;
- Detailed explanation of the next two departures in addition to the current stand specific and summary configurations; and
- User defined messages via scrolling text at the top or bottom of the screen or in the destination field, alternating with the destination.

It is also possible to alter specific service related information in the event that services are delayed or cancelled or when stand allocations are changed.

Audio announcements from roadside displays can triggered through the use of key-fob or presentation of a ITSO-compliant smart card. The system uses the RNIB React 3 system for spoken output. When triggered the spoken output announces the next departure for a stand or stop. Audio announcement capabilities should be confirmed with HCC. It is also possible to make announcements that are not directly related to services, such as reminding passenger about no-smoking restrictions.

The system holds and manages a library of standard messages for display on all road-side and on-bus displays. Creation, modification and deletion of messages in this library will in future be carried out at within the RTPI system.

Large format displays can display full screen messages and graphics. These items are defined through control system at Highways House. This will be integrated with the RTPI system as part of the AVL project.

The status of displays is monitored from Highways House. All designs should be discussed with HCC at their inception.

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3rd Edition

Section 4 - Design Standards and Advice

Chapter 19 – Traffic Regulation Orders - Detail

Hertfordshire

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19. Traffic Regulation Orders - Details

19.1 Introduction

Also refer to Section 3, Chapter 10: Traffic Regulation Orders.

Highway Authorities in England are empowered under the Road Traffic Regulation Act and all subordinate legislation to make Traffic Regulation Orders (TRO's) to regulate the movement and parking of vehicles and to regulate pedestrian movement. Additionally powers are provided to make Speed Limit Orders (SLO's). The procedures for how TRO's are implemented is further controlled by the Local Authorities 'Traffic Orders (England and Wales) Regulations and the Road Traffic (Temporary Restrictions) (Procedure) Regulations.

It should be understood that the Road Traffic Regulation Act also imposes specific constraints on Highway Authorities and Local Authorities with regards to the reasons that a TRO may be implemented. A proposal that does not fulfil the criteria set out within the Road Traffic Regulation Act will not be promoted.

19.2 What are the types of TRO/ SLO

TRO's/SLO's are divided into 4 main categories

- Permanent TRO's (PTRO's)
- Temporary TRO's (TTRO's)
- Experimental TRO's (ETRO's)
- Speed Limit Orders (SLO's)

Each category is subject to differing procedures and regulatory requirements:

a) Permanent TRO's are used to implement permanent restrictions such as waiting restrictions, prohibitions of turning movements, weight, width and height restrictions, pedestrian zones, controlled parking zones, etc. but not speed limits.

b) Temporary TRO's are used to implement restrictions under specific circumstances but in the main are associated with the safeguarding of works. A TTRO may implement any restriction or provision that may be introduced by way of a PTRO or SLO for up to a maximum of 18 months (or 6 months if affecting a footpath).

c) Experimental TRO's are used under specific circumstances where the Highway Authority seeks to introduce and evaluate an experimental traffic scheme. Any restriction (other than Speed Limits) as may be made by a PTRO may be introduced experimentally.

d) Speed Limit Orders are used to introduce speed limits and make or remove restricted road status (30mph) to street lit roads.

19.3 What is the TRO's/ SLO's process

In Hertfordshire the process is carried out in accordance with the Hertfordshire Highways TRO Guidelines Manual. In general the procedures are as follows:

a) PTRO's /SLO's:

- Informal consultation
- Submission of application
- Drafting of legal documents
- Publication of press notice 1
- Objection period (min 21 days)
- Consideration of objections
- Implementation of works
- Sealing of TRO/SLO
- Publication of press notice 2
- Order comes into effect

Overall process takes approximately 16 weeks as a minimum but in any case must be completed within 2 years of publication of press notice 1.

b) ETRO's:

- Informal consultation
- Submission of application
- Drafting of legal documents
- Sealing of ETRO
- Publication of press notice
- Order comes into effect
- Objection period first 6 months

At 18 months the Order is either made permanent and the latter stages of the PTRO process at (a) above instigated or the experiment ceases and the ETRO is dropped.

(c) TTRO's:

- Consultation with Police
- Consultation with relevant Herts Highways Network Manager and Area Office
- Consultation with directly affected residents/businesses/organisations
- Submission of application
- Drafting of legal documents
- Publication of press notice 1
- Sealing of TTRO.
- Publication of press notice 2
- Order comes into effect

The process to obtain TTRO takes a minimum of 6 weeks from the date of receipt by HCC of a correctly completed application.

19.4 Procedures for PTRO's, ETRO's, TTRO's and SLO's

The procedures for obtaining PTRO's, ETRO's TTRO's and SLO's are contained within the Hertfordshire Highways TRO Guidelines Manual.

Enquiries concerning the obtaining of any type of TRO should in the first instance be made with the relevant Hertfordshire Highways Area Office or the Hertfordshire Highways TRO Team at Highways House, Welwyn Garden City. Tel: 01707 356200.

All applications for PTRO's, ETRO's, TTRO's and SLO's must follow the process as outlined in Para 1.5 above to ensure compliance with relevant legislation. A minimum of 18 weeks must be allowed from the date that the Hertfordshire Highways TRO Team are in receipt of a correctly completed application.

All applications must be supported by documentation as required by the Hertfordshire Highways TRO Guidelines Manual this will also include plans, confirmation and evidence that where required informal consultation has been carried out.

19.5 Road Humps / Pedestrian Crossings

Although Road Humps and Pedestrian Crossings do not require TRO's the implementation of these features are regulated, require public notices and consultation. The process followed is similar to that of TRO's. As far as Pedestrian Crossings are concerned where it is intended to construct alter or remove such a crossing then such action will render the matter so as to fall within required procedures.

The procedure for implementation of road humps, speed cushions, junction tables and all types of pedestrian or shared use crossings is contained within the Hertfordshire Highways TRO Guidelines manual.

Enquiries concerning the implementation of these features should in the first instance be sent to the relevant Hertfordshire Highways Area Office or the Hertfordshire Highways TRO Team at Highways House, Welwyn Garden City. Tel: 01707 356200.

All applications must be supported by documentation as required by the Hertfordshire Highways TRO Guidelines Manual this will also include plans, confirmation and evidence that where required informal consultation has been carried out.

19.6 When PTRO's are required

A PTRO or if relevant an ETRO is required in all cases where restrictions are to be imposed on the movement or parking of vehicles or movement of cycles, equestrians and/or pedestrians. This includes but is not limited to the following:

(a) Prohibition of any specified class or type of vehicle / road:

- Prohibition of all vehicles except non-mechanically propelled vehicles being pushed by pedestrians, including 'Play Streets'
- Pedestrian zones (excluding all vehicles except pedestrians)
- Motor vehicles prohibited

- Motor vehicles except solo motorcycles prohibited
- Solo motorcycles prohibited
- Prohibition on weight of goods vehicles (either for environmental reasons or to protect a structure)
- Articulated or track laying vehicles prohibited
- Horse drawn vehicles prohibited
- Ridden or accompanied horses prohibited
- Towed caravans prohibited
- Vehicles carrying explosives prohibited
- Pedestrians prohibited
- Prohibition on weight of vehicles crossing a bridge or other structure
- Prohibition on width of vehicles (either for environmental reasons or if a width restriction feature has been created)
- Prohibition on length of vehicles
- Prohibition on height of vehicles (either for environmental reasons or if a height restriction exists)
- Prohibition of riding pedal cycles
- Prohibition of buses
- Routes for use by buses and pedal cycles only (taxis can be included)
- Routes for use by tramcars only
- Routes for use by pedal cycles only (recommended routes on a main carriageway do not need a TRO)
- Route for use by pedal cycles and pedestrians only
- Route for use by pedal cycles and pedestrians only using two separately marked ways (e.g. footway with a line along its route to provide for pedestrians and cyclists on separate sides)
- With-flow / contraflow bus lane which may also be used by cyclists and taxis
- With-flow / contraflow cycle lane
- Permitted right or left turn only
- Cycle Track Orders

(b) Permitting only certain vehicle movements or types (thereby prohibiting others).

(c) Prohibition or restriction on vehicle movements:

- Restriction on turning right or left
- Restriction on U-turns
- Width / height and weight limits

- No entry
- One way roads
- No overtaking

(d) Controls of waiting, loading and / or stopping in specified locations and / or at specific times of day or days of week:

- Prohibition on waiting on verge and / or footway
- Prohibition on waiting and / or loading and unloading in a pedestrian zone
- Prohibition on waiting
- Prohibition on loading and unloading
- Restrictions on length of waiting and return period
- Prohibition on waiting by goods vehicles and / or buses over a certain weight
- Providing for an off-highway loading area where waiting restrictions apply
- No stopping on a main carriageway (includes on-slip and off-slip roads, and acceleration and deceleration splays of the main roads included, but not adjoining verges) – 24 hour rural clearway
- No stopping on entrance markings (outside schools, fire stations, etc.)
- No stopping in lay-by except in emergency
- No stopping except picking up or setting down passengers, during certain periods – urban clearway
- Prohibition on stopping other than exempted vehicles e.g. taxis
- Prohibition on waiting other than exempted vehicles e.g. taxis
- Prohibition on specified traffic using verge in mown or ornamental condition
- Parking places reserved for permit holders / residents' permits / business permits / voucher parking, etc.
- Reserving part of the carriageway for loading and unloading (e.g. loading bay)
- Parking places reserved for disabled (blue) badge holders
- 'Pay and Display' ticket-regulated parking place
- Limited waiting with the display or a disc or ticket in a parking zone
- Controlled parking zones (parking permits, etc. or lorry ban)
- Permitting parking partially or wholly on the verge or footway
- Parking places for specified types of vehicle e.g. goods vehicles, motor cars, etc.

(e) Restrictions on vehicle speed – SLO's only:

- Maximum speed limits – including 20mph zones
- Minimum speed limits

Many of the above PTRO's can apply at all times or during certain time periods. Furthermore, certain exemptions may be applied for example to allow for access or to exempt specific vehicle types e.g. buses. Promoters of TRO's shall refer to the current Traffic Signs Regulations and General Directions to confirm how TRO's can be varied.

19.7 When TTRO's are required

Temporary Restrictions may be imposed under specific criteria as set out in the Road Traffic Temporary Restrictions Act. The effect generally is to limit such restrictions to being imposed in support of works on the Highway, Street Cleaning activities under the Environmental Protection Act 1990 or when there is an existing danger on the Highway from which the public must be protected.

The procedure for obtaining a TTRO is regulated and the general process is as given above. The governing regulations impose specific constraints on the Highway Authority's use of its powers and it will not always follow that a TTRO will be automatically granted on request.

A TTRO can remain in effect for up to a maximum of 18 months unless specifically extended by Secretary of State in specific extraordinary circumstances for up to a further 6 months.

A TTRO may impose temporarily any restriction as may be made by a PTRO or SLO and additionally may impose temporary road closures. The effect on the public in respect of such impositions may be severe and therefore serious consideration must be given to alternative ways of achieving the objective if possible.

19.8 Additional information on other relevant Orders

Occasionally restrictions are required to be implemented in circumstances that do not fall within the remit of the Road Traffic Regulation Act e.g Road Closure to permit an event to take place on the Highway. In these instances advice must be sought at least 6 months prior to the event from the relevant Hertfordshire Highways Area Office or the Hertfordshire Highways TRO Team at Highways House, Welwyn Garden City. Tel: 01707 356200 or the appropriate borough or district council within whose area the event falls.

Orders for such events can be considered where appropriate under The Special Events Act or Town Police Clauses Act. However it should be understood that there are stringent restrictions imposed on Highway and Local Authorities as to when these powers may be used. More information is available in the Local Authorities' Traffic Orders (Procedure) (England and Wales) Regulations 1996, the Road Traffic Regulation Act 1984 and the Highways Act 1980, copies of which are available on the Office of Public Sector Information website at http://www.opsi.gov.uk/.

Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 4 - Design Standards and Advice

Chapter 20 – Landscape

Hertfordshire

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20. Landscape

The context for the provision of Green Infrastructure is set out in Section 2, Chapter 2: Local Character and Section 2, Chapter 3: Environment & Landscape.

20.1. Soft Landscaping

20.1.1. General

Also refer to Chapter 1: Road Design Criteria and Chapter 8: Earthworks.

The scheme promoter or designer should consult with the Local Planning Authority at an early stage to discuss details of his landscape proposals as well as with HCC regarding his landscape proposals that are within the adoptable highway.

The scheme promoter or designer's landscape proposals, that form part of the adoptable highway or may affect it, will require the approval of HCC.

All design elements need to be considered together. Gardens, driveways, paths, fences, gates, verges, open space, paving materials, street furniture, trees and shrubs all have an important part to play in achieving the desired effect.

It is important to choose the most appropriate species of plants to minimise future maintenance liability, benefit wildlife and maintain the character of the local landscape.

Plant species should be hardy, able to withstand ill treatment and discourage vandalism. All plants must be supplied, handled and planted in accordance with the Horticultural Trades Association National Plant Specification and relevant British Standards.

Plants should be of varieties that quickly establish themselves to discourage pedestrian short cuts and weed growth. A suitable weed free growing medium will need to be prepared prior to planting.

20.1.2. Trees within the highway

New trees planted within the highway should conform to the following requirements:

- Large enough, or otherwise suitable, to withstand vandalism;
- The location and species of tree should be chosen to avoid future root damage to private or public property, including underground services;
- Have good stability and not be prone to branch drop;
- Do not produce large or messy fruits;
- Should not be copious seeders;
- Species such as Limes that encourage aphids or other insects, should be avoided in built up areas, or where vehicles are regularly parked;
- Robust enough to cope with the range of soil types likely to be encountered, drought conditions and road salt;
- Should not have large leaves that are slow to rot; and
- Are in keeping with the local landscape character and are beneficial to wildlife.

20.1.3. Shrubs within the highway

New ground cover shrubs planted within the highway should conform to the following requirements:

- Readily available for bulk planting and replacement if damaged in the future;
- Not exceed 600mm in height and require minimal pruning;
- Root system or suckering habit will not interfere with underground services or other property;
- Tolerant of occasional trampling;
- Robust enough to cope with the range of soil types likely to be encountered, drought conditions, frost and road salt;
- Resistant to disease and pests;
- Do not produce toxic fruits or thorns;
- Provide ground cover all year round; and
- Are in keeping with the local landscape character and benefit wildlife.

20.1.4. Highway Verges / Landscape

Climbing shrubs should not be used within the highway or adjacent to highway structures.

Hedges planted on private property should be at least 500mm clear of the highway boundary.

Landscape can be used to constrain vehicle speeds. Visually enclosing the highway and keeping visibility to the minimum requirements give drivers given the impression that they are in a low speed, residential area. Care must be taken not to restrict visibility to below the agreed minimum standards, see Section 4, Chapter 1: Road Design Criteria and Section 4, Chapter 2: Junctions.

The minimum clearance to tree branches that overhang any pedestrian facility should be 2.3m. Therefore where possible trees should be crown lifted to 3m to minimise the need for excessive routine maintenance due to re-growth of branches, or any sag from the weight of the foliage.

The scheme promoter or designer should note that some existing verges are designated as 'Heritage Verge' or may have a particular local importance. Such verges exist mainly in rural locations. The scheme promoter or designer should contact HCC or Local Planning Authority for advice if his development affects an existing highway verge.

The scheme promoter or designer should also note that there are specific requirements when working within the Chilterns 'Area of Outstanding Natural Beauty'. Guidance can be obtained from the Local Planning Authority and Highway Authority.

20.1.5. Mowing Stone

Where grassed areas are adjacent to walls, fences or other vertical structures, a mowing stone should be provided.

The upper surface of the mowing stone should be smooth, to avoid damaging mower blades. The stone may be made of pre-cast units or cast from ST4 concrete. The stone should be at least 150mm wide and 50mm deep. It should be laid on 50mm of sharp sand and the upper surface should be 12mm below ground level.

20.2. Hard Landscaping

The materials and construction to be employed in areas of hard landscape must be approved by HCC.

Acceptable materials include:

- Granite setts complying with BS435;
- Concrete block paving complying with BS6717/BS7533; and
- Clay engineering bricks complying with BS3921.

Other materials may be used with the approval of HCC.