ANNEX 1

Healthy Streets for Surrey: creating streets which are safe and green, beautiful, and resilient

June 2022

Foreword – to be completed

Contents

Introduction

Aim and purpose of guide

This design guide's intent is to 'raise the bar' for new streets and to guide the retrofitting of existing streets within Surrey. For too long street design has overly focused on streets' function of facilitating movement between places at the expense of their function as places. *Healthy Streets for Surrey* broadens the focus of street design to include health, happiness, prosperity and sustainability.

This design guide will allow a range of users, from curious residents to master-planners to highways engineers quickly and easily to access and understand design guidance to help them create healthy streets which are safe, green, beautiful and resilient. Aimed for use in both new build and retrofit situations, this guidance document covers the main stages of pre/planning and delivery through to Section 38 and 278 agreements.

How to use this guide

This guide uses three levels of instruction for design guidance;

- *Must:* Mandatory design practices that must be abided by;
- *Should:* Design practices which are strongly encouraged due to the benefit that it will have on the neighbourhood, except in situations where the design practice cannot be applied for specific reasons; and
- *Can:* Design practices which are recommended but whose absence will not drastically affect the overall quality of the development.

Context

Making use of empirical research into the links between street design with health and wellbeing as well as relevant national guidance including the *National Planning Policy Framework* (NPPF), *National Model Design Code* (NMDC), *Local Transport Note 1/20* (LTN 1/20), and *Manual for Streets 1* and *Manual for Streets 2* (MfS), this guide, is intended to deliver Surrey's wider strategic aims as set out in:

- Surrey's *2050 Place Ambition*;
- *Community vision for Surrey 2030*;
- *Surrey Climate Change Strategy*;
- *Surrey Local Strategic Statement 2016 – 2031*; and

- Surrey's draft *Local Transport Plan* (LTP4).

Specifically, The *Surrey 2050 Place Ambition* aims to facilitate good growth which;

- Is proportionate and sustainable, focusing on the places where people both live and work;
- Supports overall improvements to the health and wellbeing of our residents;
- Is supported by the necessary infrastructure investment - including green infrastructure;
- Delivers high quality design in our buildings and public realm;
- Increases resilience and flexibility in the local economy;
- Builds resilience to the impacts of climate change and flooding; and
- Is planned and delivered at a local level while recognising that this will inevitably extend at times across administrative boundaries.

In addition to this, the *Community Vision for Surrey 2030* aims to:

- Help residents live in clean, safe and green communities, where people and organisations embrace their environmental responsibilities;
- Help residents take journeys across the county which are easier, more predictable and safer;
- Support everyone to have a place they can call home;
- Encourage Surrey's businesses to thrive; and
- Support well-connected communities with effective infrastructure which can grow sustainably

Section A: Process, principles and governance

Chapter 1: Process

1.1. Community engagement

- *Community engagement is a crucial part of the design and planning process*. It is enshrined within the NPPF and Local Plan, as well as in neighbourhood plans on the borough level.
- *Communities can have a range of different views*. The aim of engagement is not to convince people but rather to reach a consensus.
- *The earlier you start the engagement process, the better.* Communities are more likely to positively engage when they are involved early on. Presenting final plans and designs to community groups signals that their feedback on key elements of the design won't be accepted.
- *There are many different community engagement tools*, including walkabouts, info sessions and co-design workshops. The more interactive the tool, the better.

1.2. Design coding

- *National Model Design Code.* The *National Model Design Code* has signalled the importance of developing design codes on the local level. This is also supported by the 2021 reissue of the *National Planning Policy Framework.*
- *Design codes help local authorities and communities.* They are a useful tool to define the developments that are built in their areas and highlight the priority issues for that area.
- *Design codes can cover a wide range of issues*, including new developments, infill sites, conversions and extensions, street design, historic conservation, shopfront design and more.
- *The length and level of detail that goes into a design code depends on the size of the area* and the type of development that is expected to go up. Codes for areas with new large-scale development can focus on street layouts and hierarchy and connectivity, while areas with existing developments can look improving streetscapes.
- *Can, should or must.* Design codes often distinguish between what *must* be done (mandatory design practices), *should* be done (design practices which are strongly encouraged except in situations where the design practice cannot be applied for specific reasons) and *can* be done (design practices which are recommended but whose absence will not drastically affect overall quality).

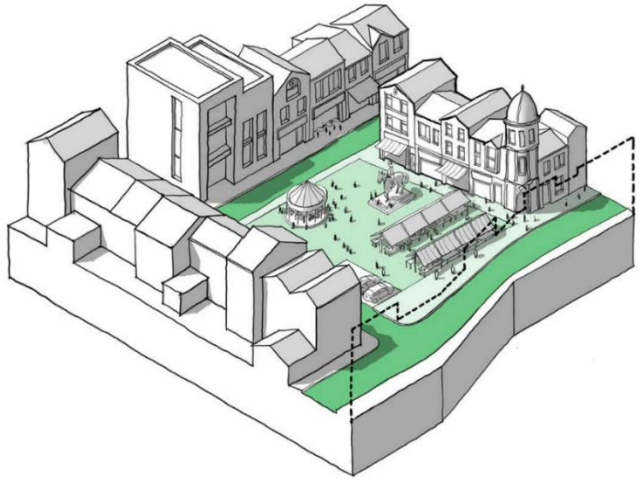


Figure 1-1: Highways and planning should work as an integrated team. As such the new *National Model Design Code* has been integrated within this guide.

1.3. Context of Surrey's governance structure

Surrey County Council (SCC) is the highways authority on all roads excluding motorways and trunk roads. Most planning, however, falls under the authority of the borough and district councils. Highways and planning are both tightly interconnected when it comes to producing high quality and sustainable places. The integration of workflows from these two levels of governance is crucial in street design. The County Council commits to working in partnership with the Surrey Boroughs and Districts to ensure high quality street design.

1.4. Existing guidance

While this document provides context-specific guidance on street design for Surrey, it builds on existing national guidance including the *National Planning Policy Framework* (NPPF), the *National Model Design Code* (NMDC) and *Manual for Streets 1 and 2* and the forthcoming update. It has also learnt from and the draft *SCC Local Transport Plan* (2022-2032), Transport for London's (TfL) *streetscape guidance* and London's *Healthy Streets manual* and is in line with the *Movement for Change* principles shaping the work of Active Travel England and Active Travel Surrey. This document should be read in parallel with Surrey County Council's relevant Technical Guidance including the *Developers S278/S38 Guidance Notes*.

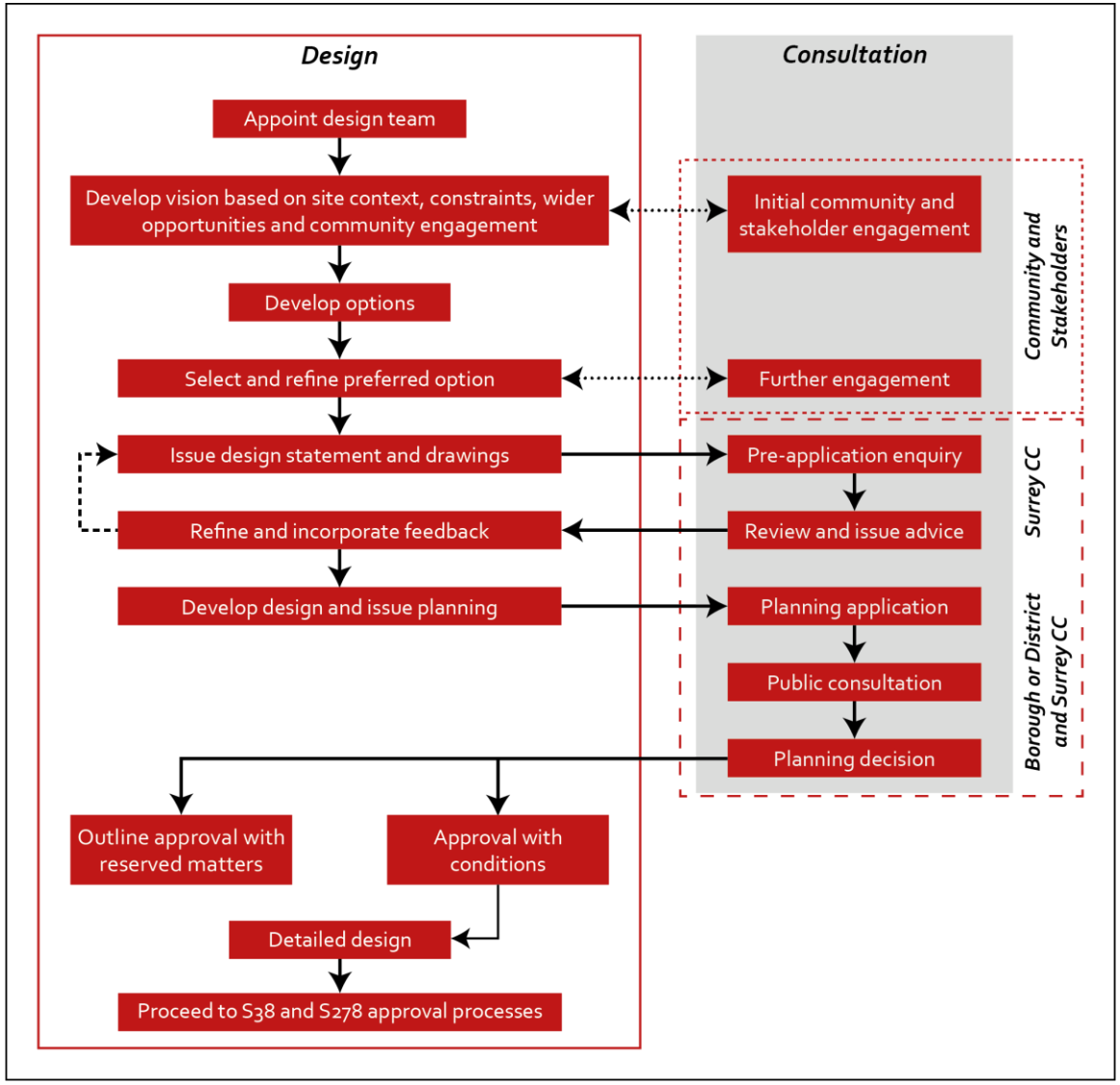


Figure 1-2: Design Process. (Credit - Create Streets)

Chapter 2: Streets for Surrey core principles

2.1. Surrey street core design principles

1. *Streets in which it is easy for everyone to move.* Streets must be designed with a clear 'hierarchy of users' in mind, designed firstly for pedestrians, cyclists, public transport and then private vehicles.

2. *Streets in which it is safe, enjoyable and easy to walk for everyone.* Streets should have direct routes and be designed as pleasant places that are attractive and that feel safe to use for pedestrians and cyclists, not drive-to cul-de-sacs.[1]

3. *Green streets that enrich Surrey's biodiversity, enhance the environment and improve air quality.* Streets should have regular trees and green public spaces not deserted lanes of asphalt. Wherever possible, streets should make positive use of existing natural features (trees, water and topography).

4. *Streets that connect seamlessly to existing places allowing natural movement.* Streets should link to existing roads and local services and not turn their back on neighbours.

5. *Streets that are beautiful.* Streets should be ones in which people want to spend time, raise their children and grow old, not streets that people avoid.

6. *Streets that support happy, healthy and sustainable lives for all.* Streets must be 'tight' and finely grained, not a series of large winding bends, providing direct and pleasant routes for walking and cycling.

[1] . N.B. This is not always possible to avoid, for example if one large plot is being infilled within an existing urban area

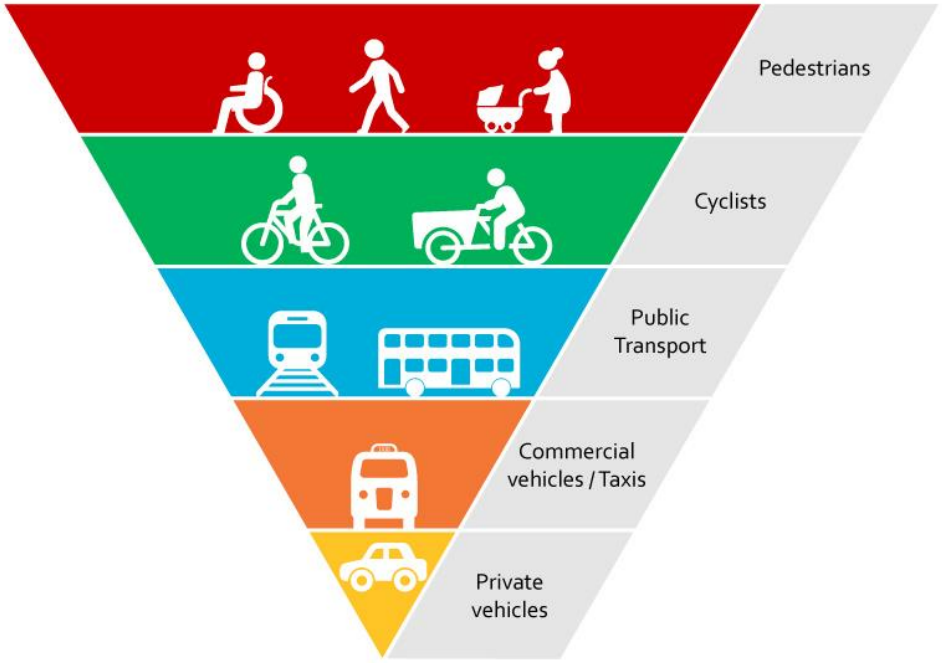


Figure 2-1: Streets should be designed according to a clear hierarchy of users (Credit - Create Streets)

2.2. *Why is this important?*

Thanks to improving research there is a growing realisation that the street can be an important public space; both an extension of the home and a space for neighbourhoods to come together. The notion that streets are only a means of movement, and that their design should centre on accommodating vehicle traffic does not maximise human wellbeing.

Street design has therefore taken on new importance in the design of our villages and towns. Studies increasingly show that street design can have a significant impact on our physical and mental health, both directly and indirectly. Good street design can promote a healthy lifestyle and encourage community cohesion while bad street design has tangible negative impacts on our health and wellbeing.[2]

Streets which are designed primarily for moving motorised traffic are associated with reduced social connectivity and neighbourliness in residential areas. Car-dominated streets have poorer air quality levels which impacts respiratory health. Car-dependent areas also tend to suffer from higher levels of congestion and traffic collisions.[3] Vehicle-oriented streets are more disruptive, less safe, less socially cohesive[4] and more damaging to physical and mental health.[5]

On the other hand, streets which are designed around people tend to have higher levels of community activity. In town centres this means increased sales in local shops. These are streets with better air quality, and which are safer for people to walk, cycle and play.

Healthy Streets are key to achieving the ambitions of SCC's *Local Transport Plan 2022 - 2023* (LTP4) and carbon reduction targets through the Avoid, Shift, Improve framework. Healthy streets will enable the creation of 20-minute, or liveable, neighbourhoods, where the majority of residents' needs can be met within a 20-minute walk.

2.3. Key components of good street design

- *Street trees*, which are associated with slower cars, better air quality[6], moderated energy usages and happier and healthier residents;[7]
- *Slower traffic* has been linked to fewer accidents, less congestion in urban centres, reduced pressure on parking and increased levels of walking and cycling;

[2] Iovene, M., Boys Smith, N., Seresnhe, C. (2019), *Of Streets and Squares*
[3] RAC Foundation (2011), *Mortality statistics and road traffic accidents in the UK*
[4] Hart, J., Parkhurst, G. (2011), *Driven to excess: Impacts of motor vehicles on the quality of life of residents of three streets in Bristol*
[5] Ewing R, Kreutzer R. (2006), *Understanding the Relationship between Public Health and the Built Environment.* LEED-ND Core Committee Report, p. 4.
[6] Greater Manchester Combined Authority (2020) *Ignition Project: Nature-based solutions to the climate emergency*
[7] Boys Smith, N. (2016) *Heart in the Right Street*

- *High quality paving materials*, which can contribute to better water drainage, require lower long-term maintenance costs and have a lower carbon footprint than asphalt.
- *Active transport*, including walking and cycling for all journey types. Promoting active movement, even if it is just 20 minutes a day, contributes significantly to personal physical and mental health and combats chronic long-term illnesses. This also reduces the number of cars on the street. This requires designing streets in a way that feels safe for pedestrians and cyclists;
- *Streets with multiple uses*. The 2020-21 COVID-19 pandemic has transformed the way that streets are used, and flexible street design has become an increasingly important factor in public health interventions. Streets that accommodate changes such as pocket parks, outdoor dining areas and community activities are accessible by walking and cycling, are provably more popular and allow people to stay local; and
- *Local identity*, which give streets a distinct sense of place. Streets with a local identity can be easier to navigate, foster a sense of community and nourish civic pride.

Trees reduce vehicle speeds by 7 – 8 mph, reduce air temperatures by 3°C and improve air quality

Walking and cycling can save the NHS £1.7b in treatment costs over the next 25 years

Shops on streets with high walkability generate 80% more sales and pedestrians can spend up to £147 more than those travelling by car

Reducing traffic can lead to an up to 30% fall in carbon monoxide emissions

Reducing traffic can lead to a 12.2% increase in non-motorised modes of traffic

Figure 3-1: Some of the well-being advantages of walkable safe streets (Credit - Create Streets)

Chapter 3: Governance

3.1. S106 and Highways Agreement funding

Section 106 Agreements, where they are still secured, or more commonly, funding through CIL payments can provide funding to improve infrastructure. In the case of S106 these must be spent at a specific location relevant to the source funding, whereas with the increasing provision of funding through CIL, there is greater flexibility within a wider community as to where these monies are spent.

Section 38 and S278 Agreements are to provide the improvements/infrastructure in kind, so do not directly involve payments. They do, however, provide prime opportunities for well-designed improvements to the public highway.

3.2. Beyond the red line

New development must be developed to integrate with its wider context and ensure the coordinated delivery of new routes and connections, for pedestrians, cyclists, public transport, and private vehicles. Proposals should align with the District Local Cycling and Walking Infrastructure Plan (LCWIP) and any relevant local Supplementary Planning Document (SPD), Borough or Neighbourhood Plan to ensure the delivery of a coherent network of infrastructure.

3.3. A developers' forum (bringing landowners together)

Bringing together landowners in a given area to coordinate for development has generally been a successful process to ensure that new developments are linked coherently and take on a similar character. This allows for continuity of work and helps resolve issues that arise.

3.4. Community trusts

A community trust can be a permanent means of funding and managing the revenue costs of the essential elements that make much of this design guidance happen. On larger sites, developers can endow an income generating asset (for example a quantity of residential homes for rent on the private market) that generates permanent income to fund management companies for the upkeep of communal areas or bus subsidies.

Section B: guidance

Chapter 4: General layout principles

4.1. Street vision and strategy

Surrey's streets must be designed in a way that provides a sense of place as well connectivity and accessibility to Surrey's boroughs and districts. Streets must be designed around people, not vehicles. Wherever possible, they should bring communities together and enhance their quality of life. Streets must be designed with flexibility and sustainability in mind, so that they will last for future generations.

Design Manual for Roads and Bridges (DMRB) standards must only be applied to the trunk road network outside towns and villages. When a strategic road is within a town or village boundary, DMRB must not be used. Refer to the diagram in Figure 4-1 below.

DMRB must not be used for streets with any component of residential or commercial activity, or where you would expect people to be walking or cycling. The only exception to this should be industrial or large-scale commercial developments, such as warehouses, where it can be shown that streets are limited to movement functions only. Consideration must still be given to sustainable transport modes in such places, including segregated cycle infrastructure and public transport provision.

When a settlement expands, and development takes place off a trunk road designed to DMRB, this road must be upgraded from a DMRB road to a street in line with the principles in this guide.

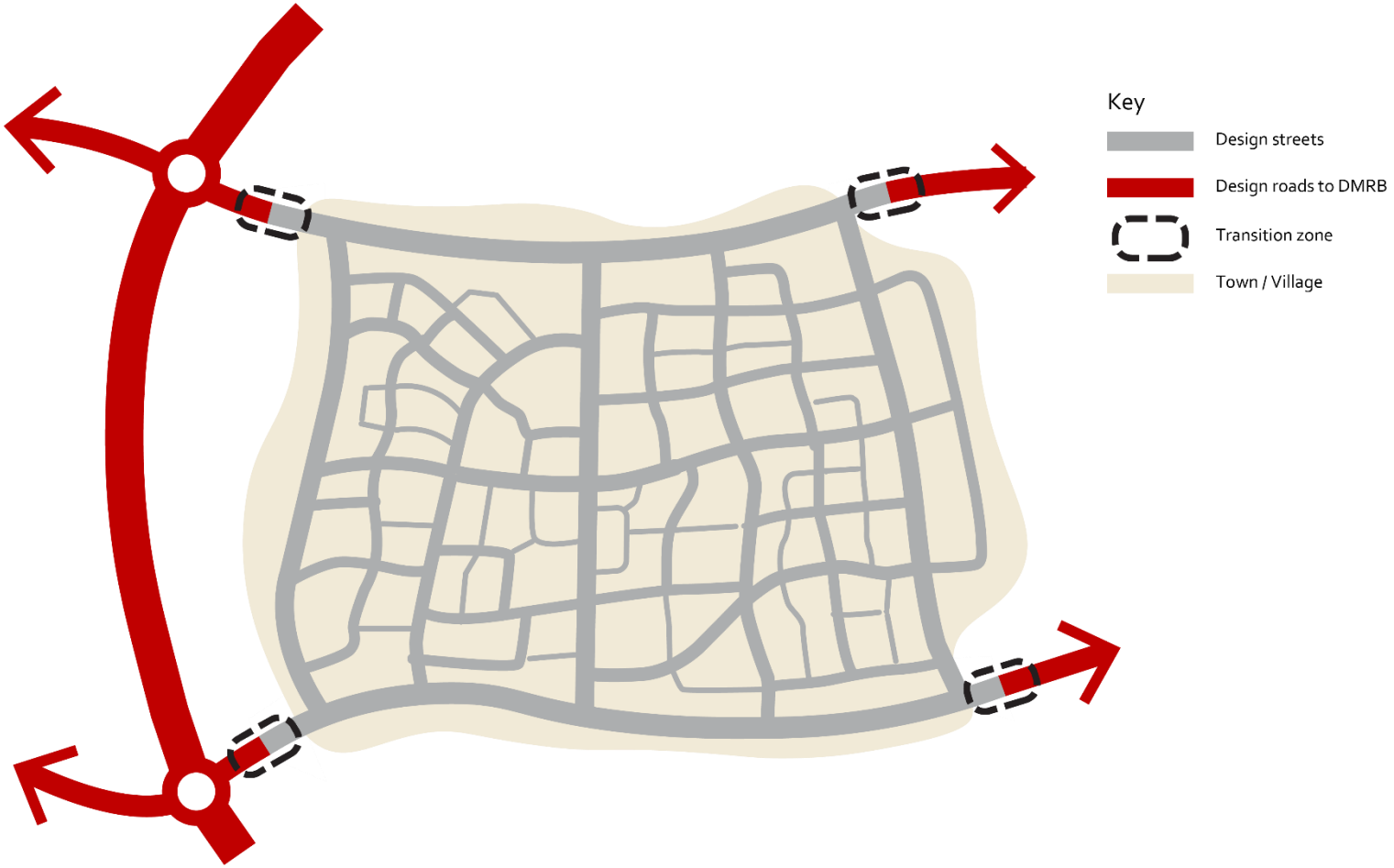


Figure 4-1: DMRB design standards are only appropriate for trunk roads or roads outside of towns and villages (Credit - Create Streets)

4.2. *Street typologies*

The following street types provide a framework for planning development layouts in Surrey. They are based on the *National Model Design Code* street types, with additional sub categories, and adjusted for Surrey's context.

Street types should be determined by the importance of their place and movement functions, not their desired capacity or design speed. The decision on street typology should be a collective decision with designers, planners, transport engineers and the local community. It must not be the sole decision of transport engineers.

1. Primary Streets		**2. High Streets**			**3. Secondary streets / Local High Streets**	**4. Local streets**	**5. Tertiary Streets**		
a) Link Road / Bypass	*b) Avenue*	*a) High Activity / Arterial*	*b) Low Traffic*	*c) Traffic free*			*a) Shopping Mews / Courts*	*b) Residential Mews / Back Streets*	*c) Rural Lanes*

Type 1: Primary streets

The highest order street in the network, these are primary arterials designed to take through traffic and public transport. These should be split into the following sub-categories depending on location.

- *Type 1(a) - Movement only function* - trunk road, arterial roads and bypasses with no place function. These should be designed to DMRB and are outside the scope of this document. These should only be used in very specific circumstances as shown in figure 4-1.
- *Type 1(b) - Avenue* - Tree lined primary street on the edge of towns that includes pavements and cycle lanes. These streets should accommodate buildings and allow future intensification and development. Trees could be provided in a central reservation as well as on the footway. Parking may also be providing centrally. Design speeds will be lower than the trunk road network, with a recommended maximum of 30mph. Conventional DMRB standard roundabouts must not be used.

  These streets can transition to a High Street typology in an urban setting, including village centres. This transition is important and will need careful design to encourage speed and behaviour change between the typologies. This could be achieved by bringing in the building line, splitting the carriageway, or through other gateway features.

Type 1 - Primary streets	
Precedent Images	
Type 1(a) - Movement only function	**Type 1(b) - Avenue**
	
Figure 4-2: Typical link road, Kent (Credit - David Anstiss CC BY-SA 2.0)	*Figure 4-3: Peverell Avenue, Poundbury (Credit - Andy Cameron)*

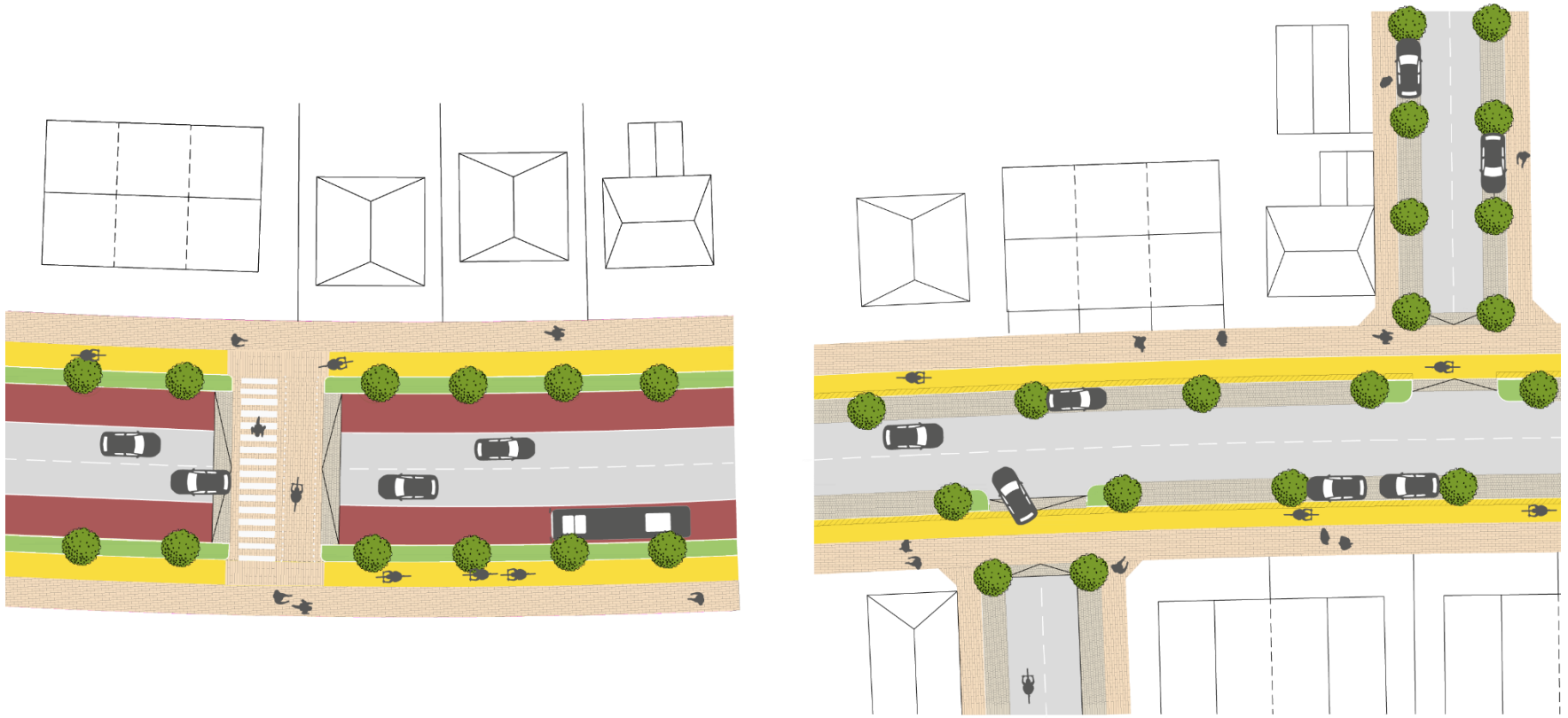
Type 1(b) - Primary streets - avenue
Typical Layout Diagram (not to scale)


Figure 4-4: Typical Layout Diagram - Type 1 (b) - Primary streets – Avenue

Type 1(b) - Primary streets - avenue

Typical cross section

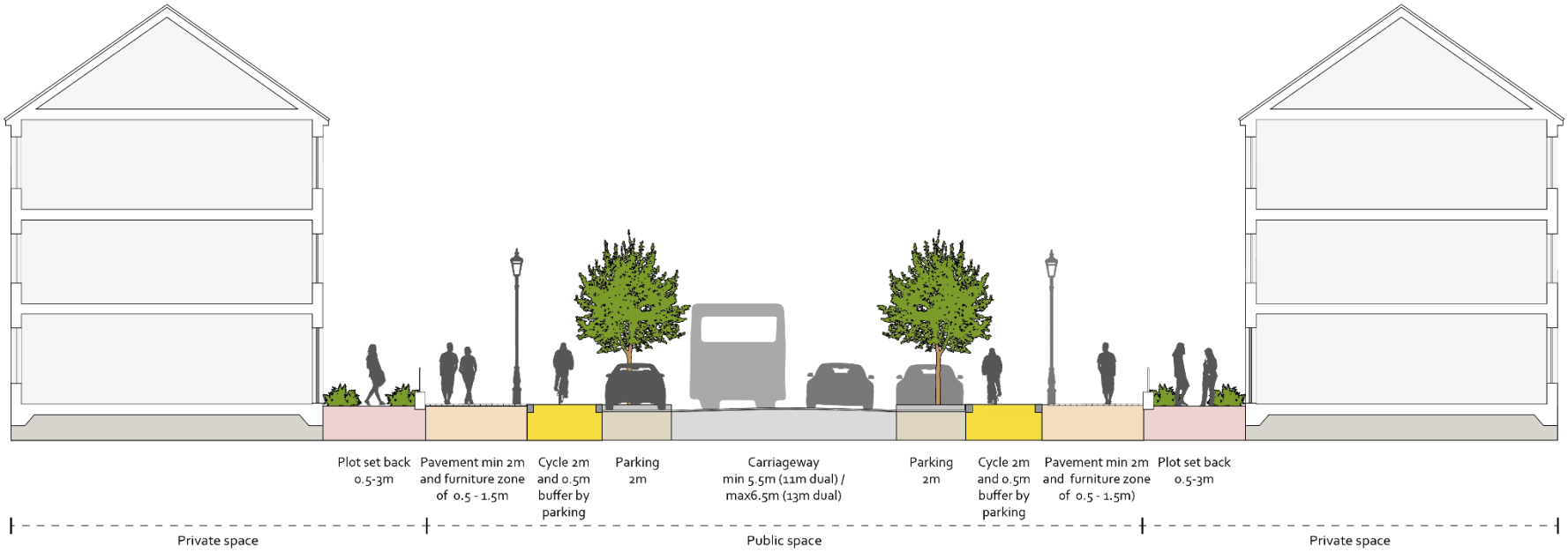


Figure 4-5: Typical cross section - Type 1(b) - Primary streets

Type 2 - High streets

The main business street of a town, normally with the highest density. Will typically have shops and businesses on the ground floor with flats or offices above, often with public spaces. It can have on-street parking. Design speed must be a maximum of 20mph. It is important to move away from thinking of these streets in terms of a regular cross section, something which is difficult to achieve when using highway alignment design software. Instead aim to create more irregular, organic forms that provide space for different activities. We distinguish three variants of high street.

- *High activity or arterial (through route).* A formalised layout with pavements, cycle lanes, parking, trees and planting. The overall width will vary, determined by building scale (enclosure) and need for public space. The width should vary along the length, allowing the space to open up into squares and form junctions with Secondary streets. The carriageway can split to create island buildings and space: this arrangement is common in market towns, such as Reigate, and help create terminating views and gateways. Irregularity helps define the street as a different type of space.
- *Low traffic.* A more informal arrangement without separate cycle lanes. The pedestrian or wheelchair user 'comes first' in these streets. Vehicles are a guest. Low traffic streets will have the same spatial characteristics as above with the opportunity to create squares and public space.
- *Traffic free.* Pedestrian only, with potential service-access allowed at certain times. The minimum width may need to allow for vehicles, taking into account any protruding signs and overhangs, but otherwise the width is determined by building scale, the need for public space and the need for overspill areas for shops and cafes, such as seating and displays.

Type 2 – High streets		
Precedent Images		
Type 2(a) – Arterial or high activity	**Type 2(b) – Low traffic**	**Type 2(c) – Traffic free**

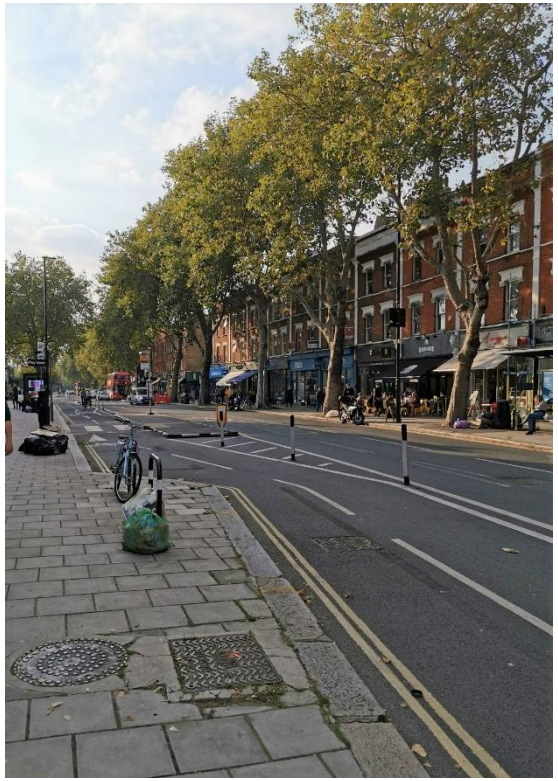



Figure 4-6: Chiswick High Road (Credit - Create Streets)	*Figure 4-7: Guildford, Surrey (Credit - Create Streets)* *Figure 4-8: Rochester, Kent (Credit - Create Streets)*	*Figure 4-9: Tunsgate, Guildford (Credit - Create Streets)*

Type 2(a) - High streets - Arterial or high activity
Typical Layout Diagram (not to scale)

Figure 4-10: Typical Layout Diagram - Type 2(a) - High Streets - Arterial High Activity

Type 2(a) - High streets - Arterial or high activity

Typical cross section (not to scale)

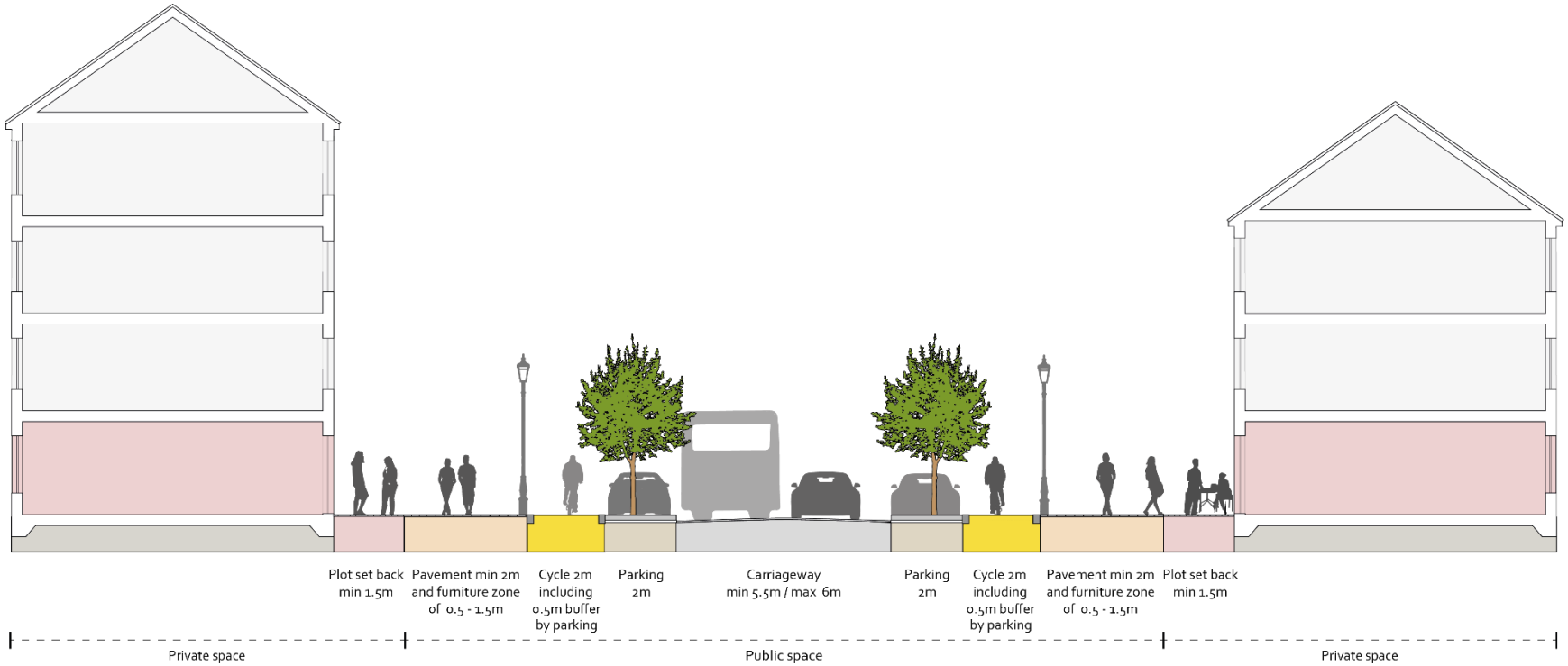


Figure 4-11: Typical cross section - Type 2(a) - High Streets - Arterial or High Activity

Type 2(b) - High streets – low traffic

Typical cross section (not to scale)

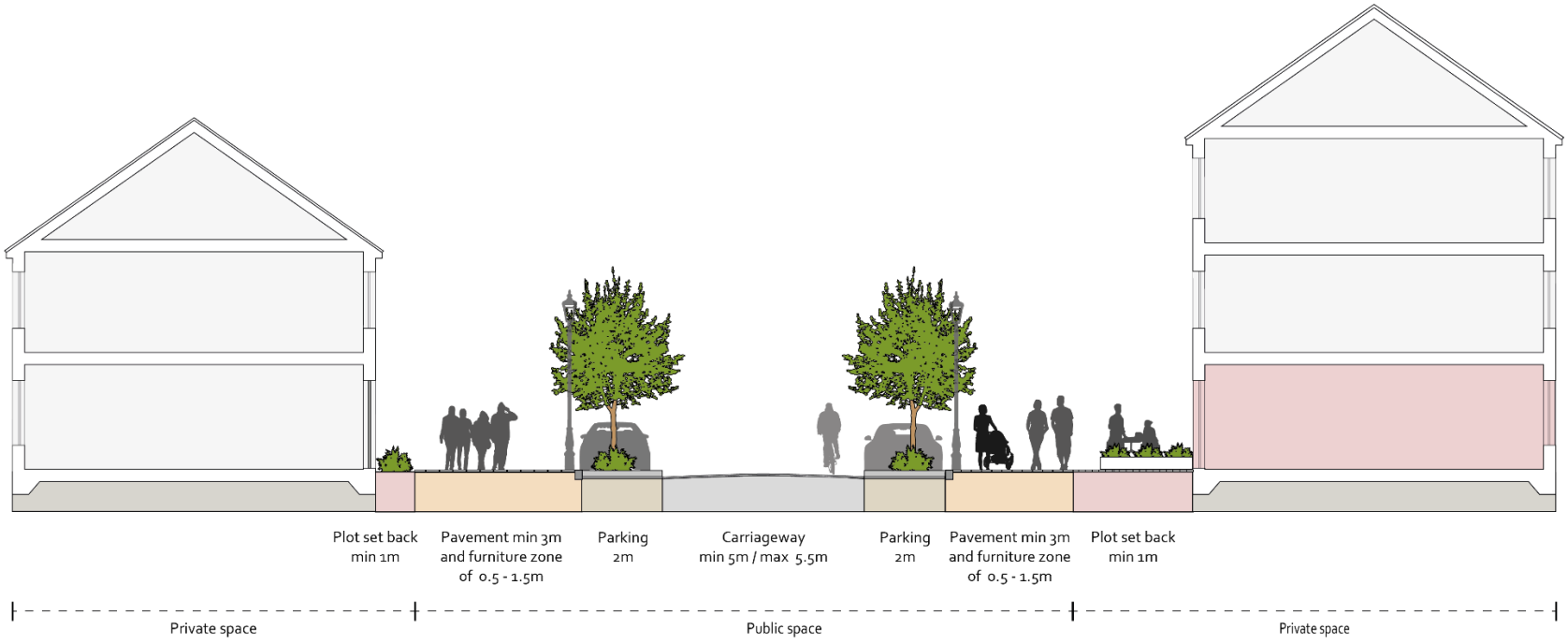


Figure 4-12: Typical cross section Type 2(b) - High Streets – Low Traffic

Type 2(c) – High streets – traffic free
Typical cross section (not to scale)

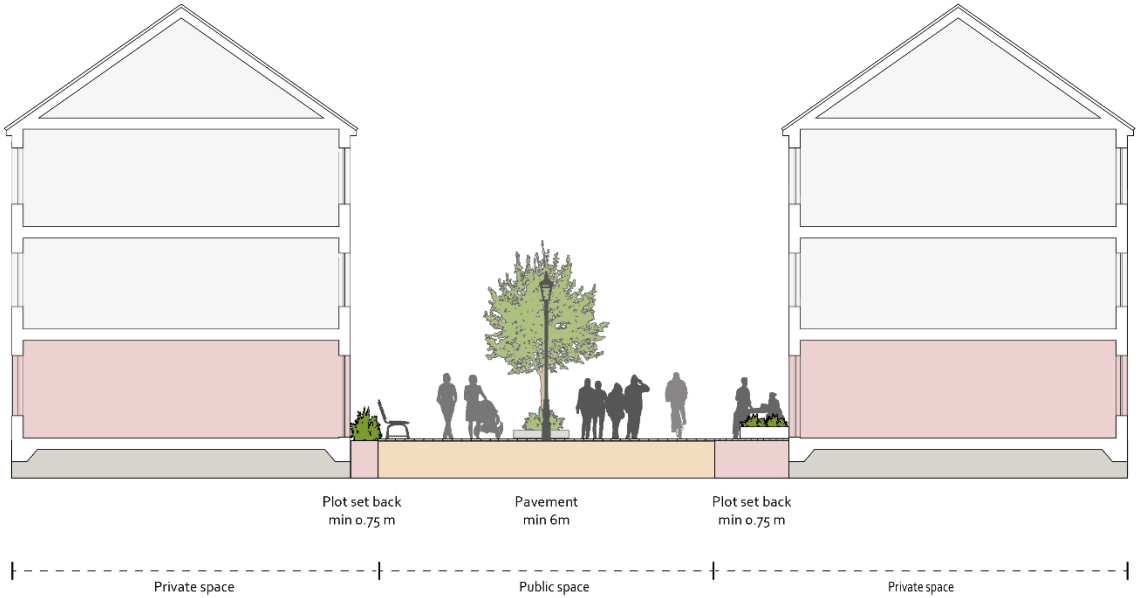



Figure 4-13: Typical cross section -Type 2(c) - High Streets – No Traffic

Type 3 – Secondary streets

These normally link to Primary Streets or High Streets and provide access to neighbourhood streets, such as Local streets and residential mews. Secondary streets can accommodate shops and retail space. They can also be good locations for cafés and restaurants as well as community facilities such as schools, health service and community centres. The characteristics of the street, such as carriageway width, enclosure and junction spacing will be used to lower speeds. While similar in appearance to Local streets (Type 4) they serve a different function, connecting Local streets to Primary streets, and will have higher traffic flows.

Type 3 – Secondary streets		
Precedent Images		
		
Figure 4-14: Chapelton, Aberdeenshire (Credit - Andy Cameron)	*Figure 4-15: Hounslow, London (Credit - Create Streets)*	*Figure 4-16: Poundbury, Dorset (Credit - Andy Cameron)*

Type 3 – Secondary streets
Typical Layout Diagram (not to scale)

Figure 4-17: Typical Layout Diagram – Type 3 – Secondary streets

Type 3 – Secondary streets
Typical cross section (not to scale)

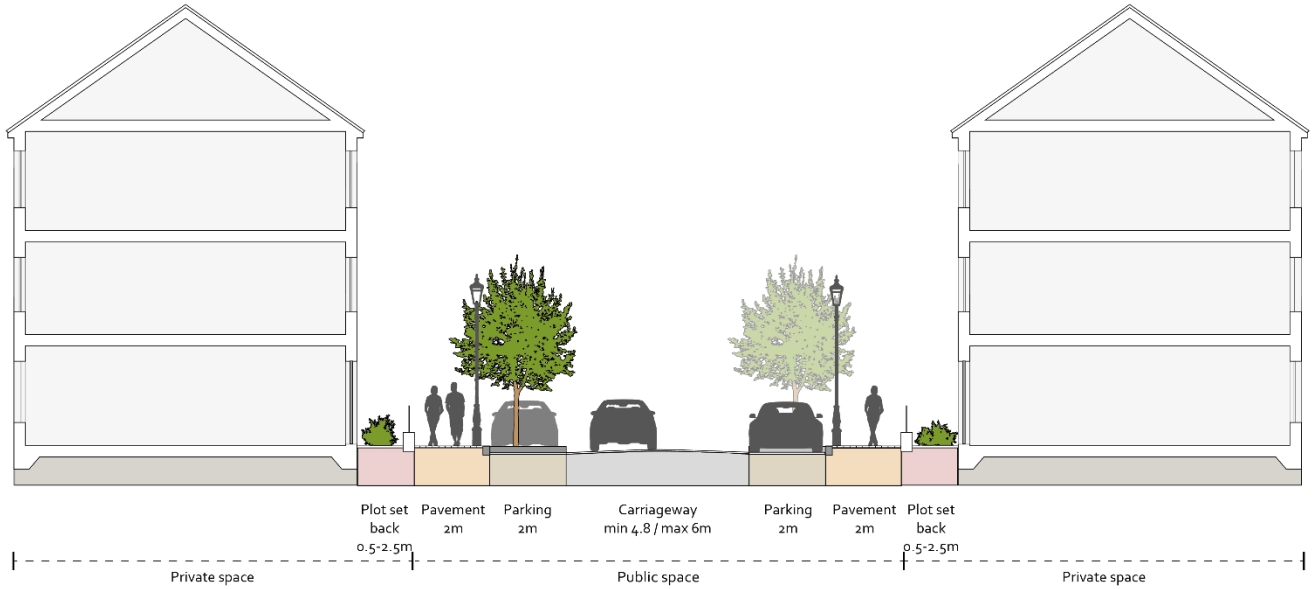



Figure 4-18: Typical cross section – Type 3 – Secondary streets

Type 4 - Local streets

These will probably form most of the streets within the network. They should be attractive places to live, and safe and convenient places to walk and cycle. They should accommodate low levels of slow traffic. Filtering may be necessary to reduce through running on these streets while maintaining a conventional grid pattern with good connectivity. The carriageway does not need to be wide enough to allow vehicles to pass. The junction between Secondary streets and Local streets can be good locations for small local centres and amenities.

Type 4 – Local streets		
Precedent Images		
		
Figure 4-19: Goldsmith Street, Norwich (Credit - Create Streets)	*Figure 4-20: Derwenthorpe, York (Credit - Andy Cameron)*	*Figure 4-21: Nansledan, Cornwall (Credit - Create Streets)*

Type 4 – Local streets
Typical Layout Diagram (not to scale)

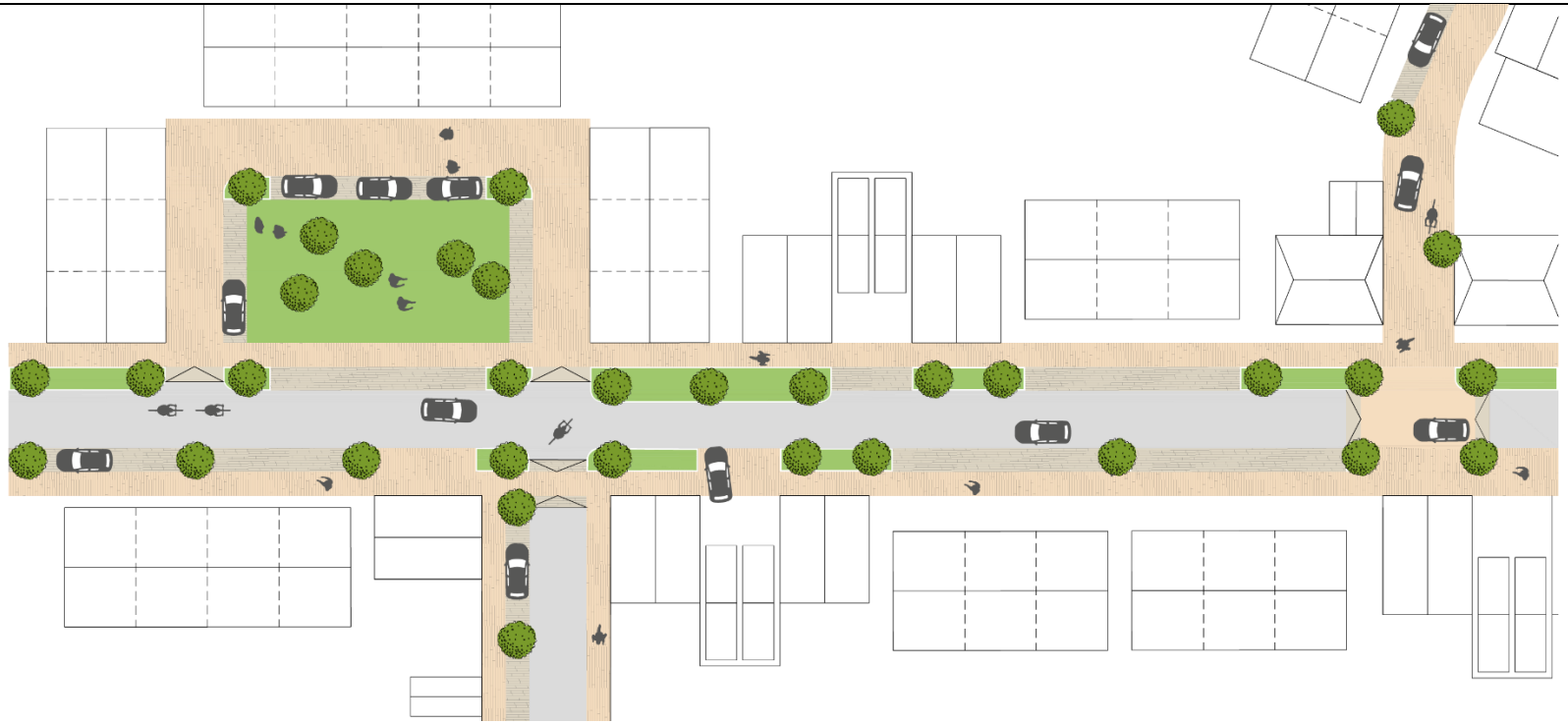



Figure4-22: Typical Layout Diagram – Type 4 – Local streets

Type 4 – Local streets
Typical cross section (not to scale)

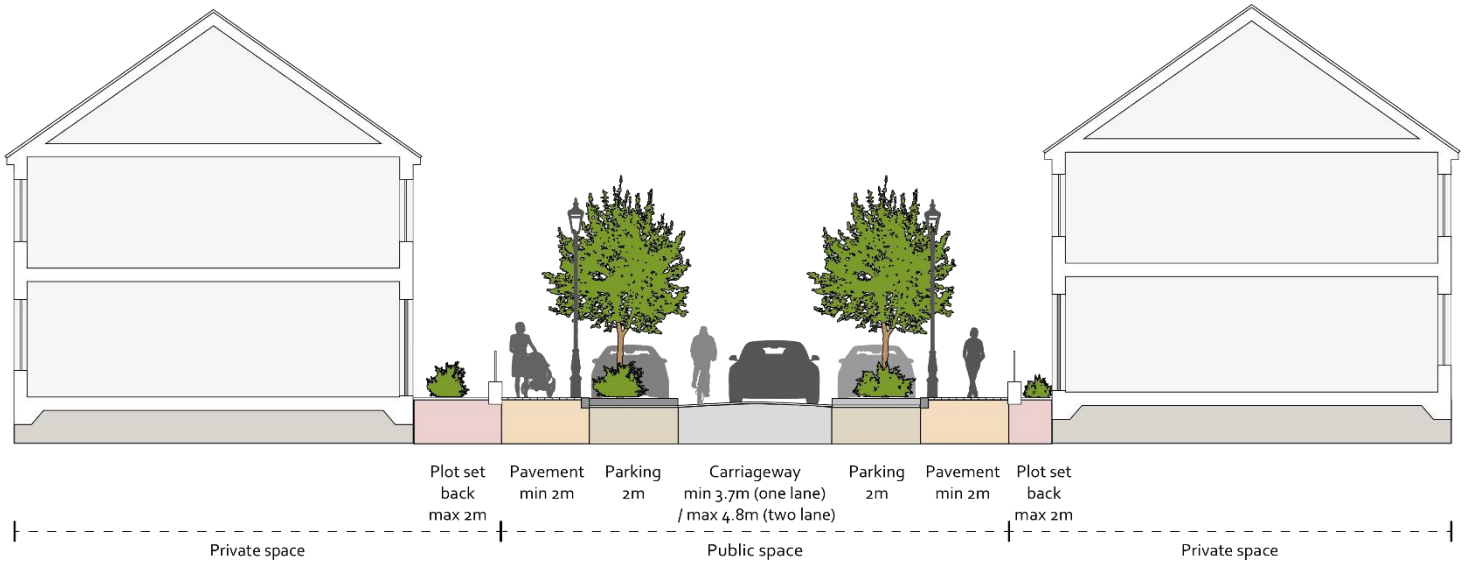



Figure 4-23: Typical cross section – Type 4 – Local streets

Type 5 - Tertiary streets

These are minor streets that may perform a variety of functions: some only provide access to homes, some have both movement and access functions and some have commercial uses. They can link to secondary or Local streets or sometimes to high streets.

- *Type 5(a) – Shopping alley.* Short, pedestrian-only mews or alley lined with shops and other commercial uses in town centre settings. A more informal space, wide enough to allow overspill from shops or cafes while maintaining a good enclosure ratio. These can provide through routes for pedestrians, linking key streets (mews or alley), or be closed off (courts).
- *Type 5(b) – Residential mews or back streets.* A narrow road lined by homes, often to the rear of large houses, using a level surface with no pavements. May need to be filtered if through access is provided. Communal bin storage preferred so that refuse vehicle access is not required. A narrow strip of private land can be included to accommodate foundations, drainage, etc, but this should have the same appearance as the public street surface.
- *Type 5(c) – Rural lanes.* They may not have separate footpath or street lighting and may have constrained vehicular access, depending on local character.

Type 5 – Local streets		
Precedent Images		
Type 5(a) – Shopping alley		***Type 5(b) – Residential Mews***
		
Figure 4-24: Shopping lane, Richmond (Credit - Mark Shepherd)	*Figure 4-25: Shopping lane in Bradford-on-Avon, Wiltshire (Credit - Create Streets)*	*Figure 4-26: Residential mews / backstreets: The Hague, Netherlands (Credit - Create Streets)*

Type 5(b) – Residential mews		*Type 5(c) – Rural lane*
		
Figure 4-27: Residential mews: Accordia, Cambridge (Credit - Create Streets)	*Figure 4-28: Residential mews: Ware, Hertfordshire (Credit - Create Streets)*	*Figure 4-29: Rural Lane, Oxfordshire (Credit - Create Streets)*

Type 5(b) – Tertiary streets - residential mews
Typical Layout Diagram (not to scale)

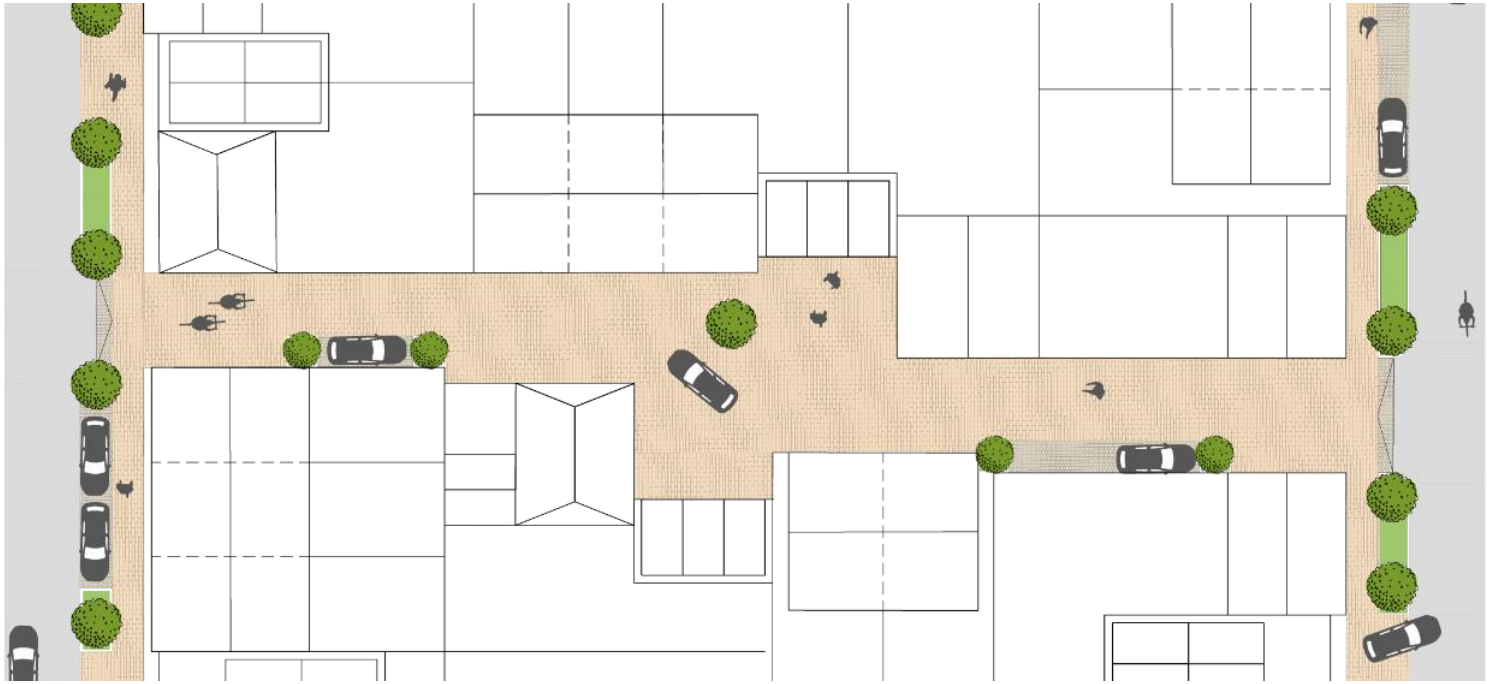



Figure 4-30: Typical Layout Diagram - Type 5(b) – Tertiary Streets - Residential Mews

Type 5(a) – Tertiary streets - shopping alley
Typical cross section (not to scale)

Figure 4-31: Typical cross section - Type 5(a) – Tertiary Streets - Shopping Alley

Type 5(b) – Tertiary streets - residential mews
Typical cross section (not to scale)

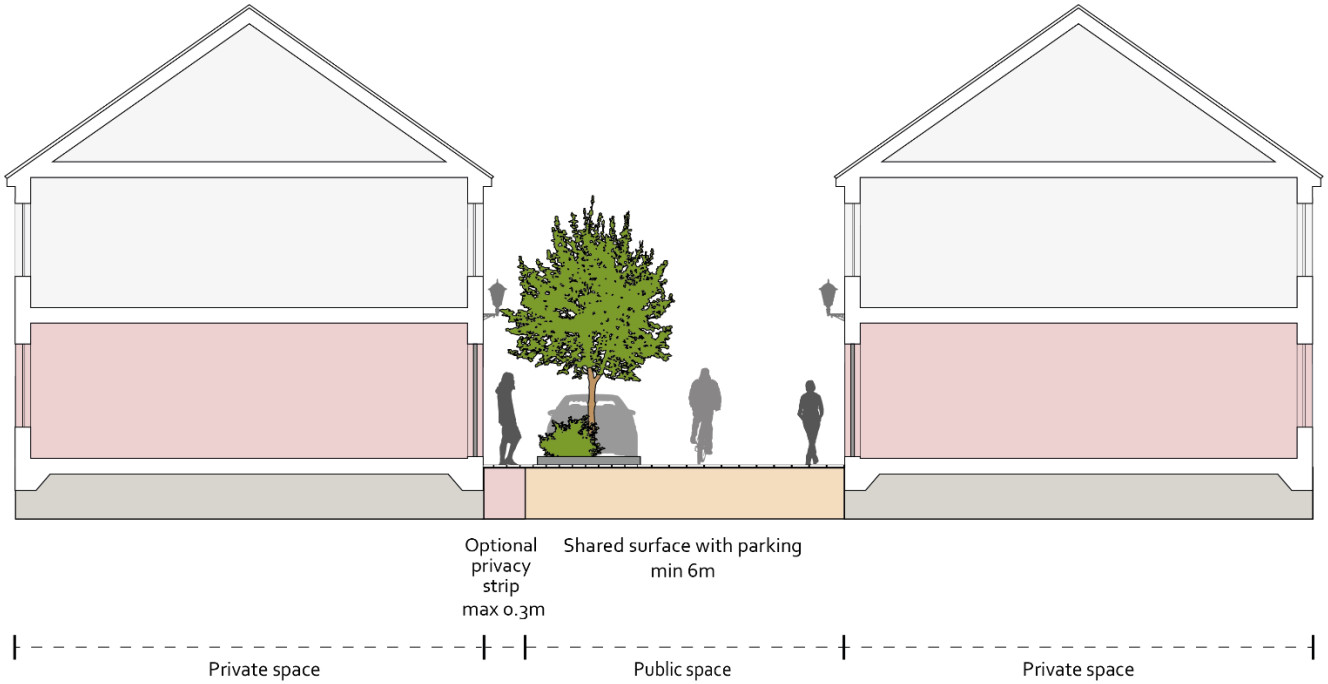



Figure 4-32: Typical cross section - Type 5(b) – Tertiary Streets - Residential Mews

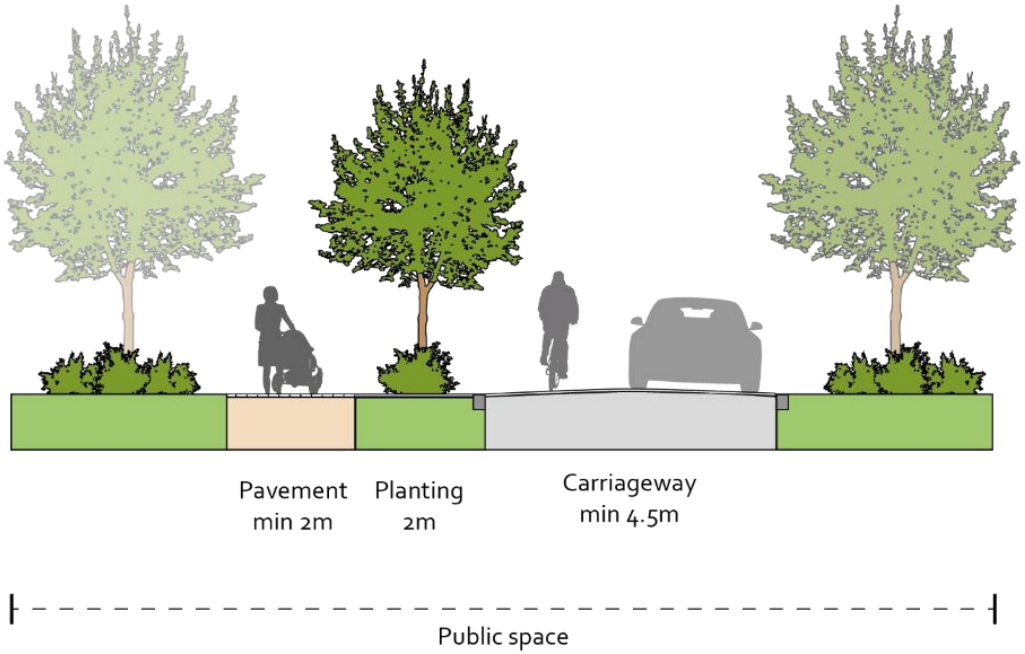
Type 2(c) – Tertiary streets – Rural lanes
Typical cross section (not to scale)


Figure 4-33: Typical cross section Type 2(c) – Tertiary Streets – Rural Lanes

4.3. *Creating a street network*

The choice of street type will largely depend on a street's position within the wider network, known as 'arteriality'.[8] For example, a *primary street* must always connect to other *primary streets*, or the trunk road network; *Secondary streets* should always connect from *primary streets* or *high streets*, and so on.

The type of junction used to connect the different street types is also important, as well as the distances between different street types which defines the urban block. These different rules form a code which can be used to generate street patterns that are functional and legible. This should not lead to a tree-like, or 'dendritic', form of street network as is common in modern suburban development. Street network permeability and connectivity must be achieved.

The table below shows how different street types can interconnect, it shows which road types must, can and cannot connect, as represented by the following symbols:

✓✓ - MUST ✓ - CAN ✘ - CANNOT

[8] Marshall, S. (2004) *Streets and Patterns*

	1. Primary Streets		2. High Streets			3. Secondary streets	4. Local streets	5. Tertiary Streets		
	a) Link road (movement only function)	b) Avenue	a) High Activity / Arterial	b) Low Traffic	c) Traffic free			a) Shopping Mews / Courts	5. Residential Mews / Back Streets	6. Rural Lanes
1 a)	✓✓1	✓	✓	✗	✗	✓✓2	✗	✗	✗	✓
1 b)	✓	✓	✓	✓	✓		✓	✗	✗	✓
2 a)	✓	✓	✓	✓	✓	✓	✓	✓✓3	✓	✗
2 b)	✗	✓	✓	✓	✓	✓	✓		✓	✗
2 c)	✗	✓	✓	✓	✓	✗	✗		✗	✗
3	✓✓2		✓	✓	✓	✓	✓✓		✓	✓
4	✗	✓	✓	✓	✗	✓✓	✓	✗	✓	✗
5 a)	✗	✗	✓✓3				✗	✓	✗	✗
5 b)	✗	✗	✓	✓	✗	✓	✓	✗	✓	✗
5 c)	✓	✓	✗	✗	✗	✗	✗	✗	✗	✓

Notes

1) Link roads (1a) must connect to either another link road, or to the trunk road network (motorway, county, etc)
2) Secondary streets must connect to one sub type of primary street
3) Must connect to one sub type of high Street (2) or a secondary street (3)

Table 4.1 – Street type connections

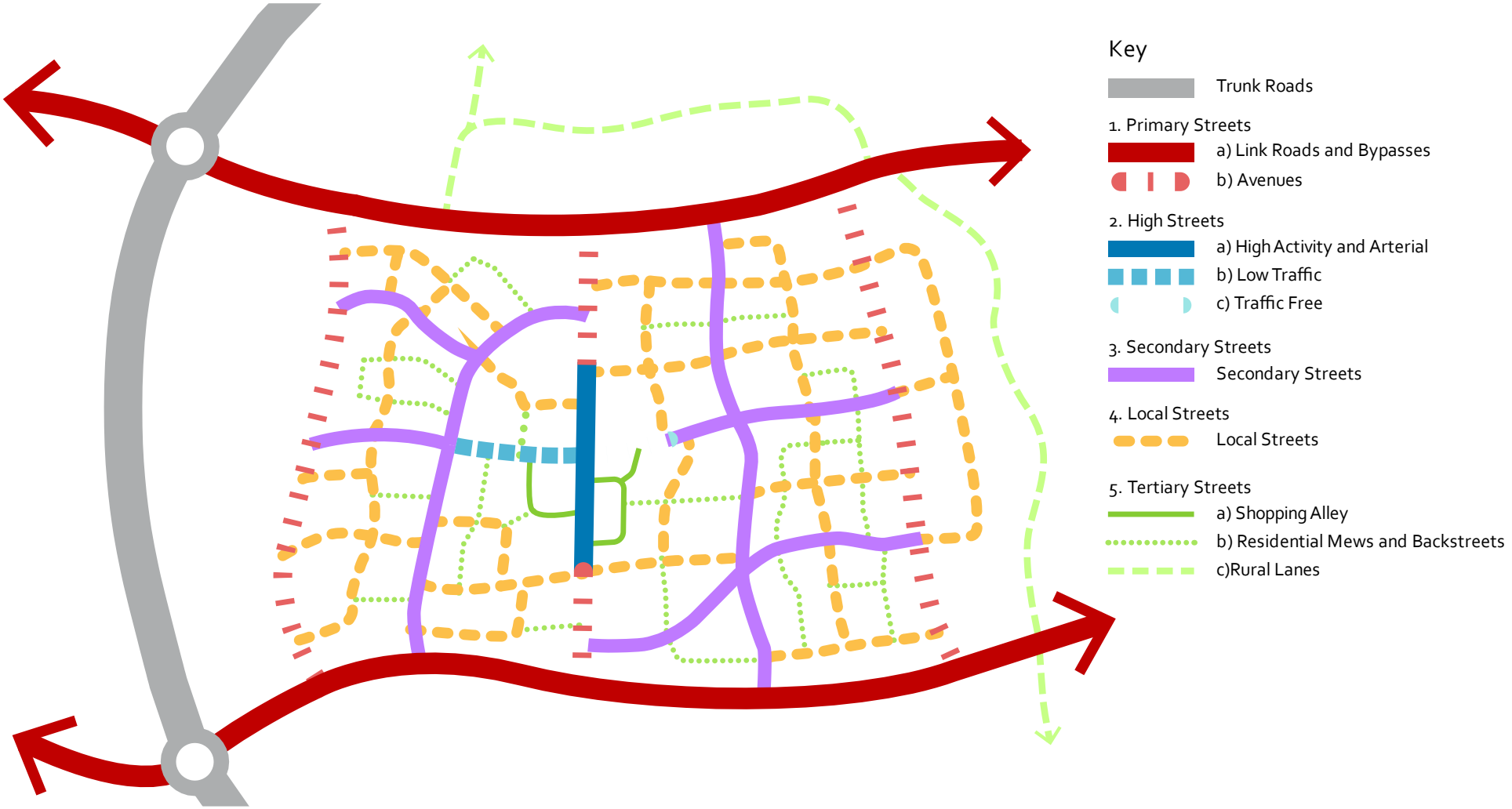


Figure 4-34: The Surrey Street Hierarchy (diagrammatic, not idealised, layout)

First and foremost, the spacing between junctions, and therefore streets, should be determined by urban design considerations such as permeability, walkability and the need to create blocks that are in keeping with the surrounding context and tie into existing street patterns. This means junction spacing should be limited, using crossroads and short stagger distances, and keeping block sizes short (ideally between 50m and 150m,: see 4.5 below). On new build developments these should generally be smaller toward the centre in areas of high footfall resulting in junctions at more regular intervals as seen in many historic places, as shown in the examples below.

Fig 4-35: Town centres within Surrey tend to have a historic, informal street pattern with varying widths, junction spacings and block structures. Formal residential blocks with clear fronts and back are also evident (Guildford, Weybridge and Reigate).(Credit - © OpenStreetMap contributors CC BY-SA)

4.4. *Connectivity and thinking 'beyond the red line'*

When designing new developments, it is crucial to think 'beyond the red line' of a given land plot of land and understand how a development will integrate with its surroundings. A well-designed place is well connected and integrated with its surroundings, making it easier to travel by foot, bike or public transport. This aligns with *Surrey County Council Draft LTP4*, and Active Surrey's *Movement for Change*. Both aim to encourage sustainable, low carbon travel whilst supporting residents' physical and mental health. Creating new 20-minute neighbourhoods with a middle and which are connected by a permeable network of streets can help residents can meet more of their needs locally. Routes between home, town and village centres, amenities and workplaces should be safe, direct, and enjoyable so that sustainable travel is a convenient and appealing choice.

The layout of new developments must consider the following key principles:

- To integrate successfully with its surroundings a development must 'plug in' to the existing street network. Designs must include a clear and permeable street hierarchy that connects to the existing street network and provides good internal connectivity. This should be based on the street typologies set out above (4.2).

Figure 4-36: Integrating new developments into the existing urban fabric is essential (Credit - NMDC)

- Opportunities to connect development with neighbouring communities and facilities must be maximised and major connectivity gaps beyond the site boundary should be identified and addressed. This could be through the creation of new links, strategic corridors or by improving existing connections through the site and the wider area, including footpaths, bridleways, unofficial 'desire lines' and cycle routes. Where possible, proposed routes should adhere to those outlined in existing or draft neighbourhood plans. Community consultation should also be used to identify wider opportunities for connectivity early in the design process.
- Particular attention should be given to how new and existing schools are accessed, in line with Surrey's 'Safe Routes to School' scheme which aims to prioritise sustainable, healthy and safe travel to schools and reduce congestion and air pollution.
- Developments should provide at least two vehicle access points if there are more than 50 homes. It is recognised constraints of topography and ownership will mean that this is not always feasible, and this requirement should be assessed on a site-by-site basis. Where secondary vehicle access is not feasible, additional pedestrian and cycle access should be provided wherever possible to maximise permeability for sustainable transport modes.
- Layouts should not prevent future connectivity, and where potential for future connectivity exists, such as where an adjacent site is allocated for development or redevelopment, a passive provision should be made in the site layout for future access point. This will enable the creation, over time, of a connected, permeable, and coherent urban fabric. Access points can be filtered to reduce vehicular through traffic on residential streets, however these should be designed to accommodate emergency vehicular access.

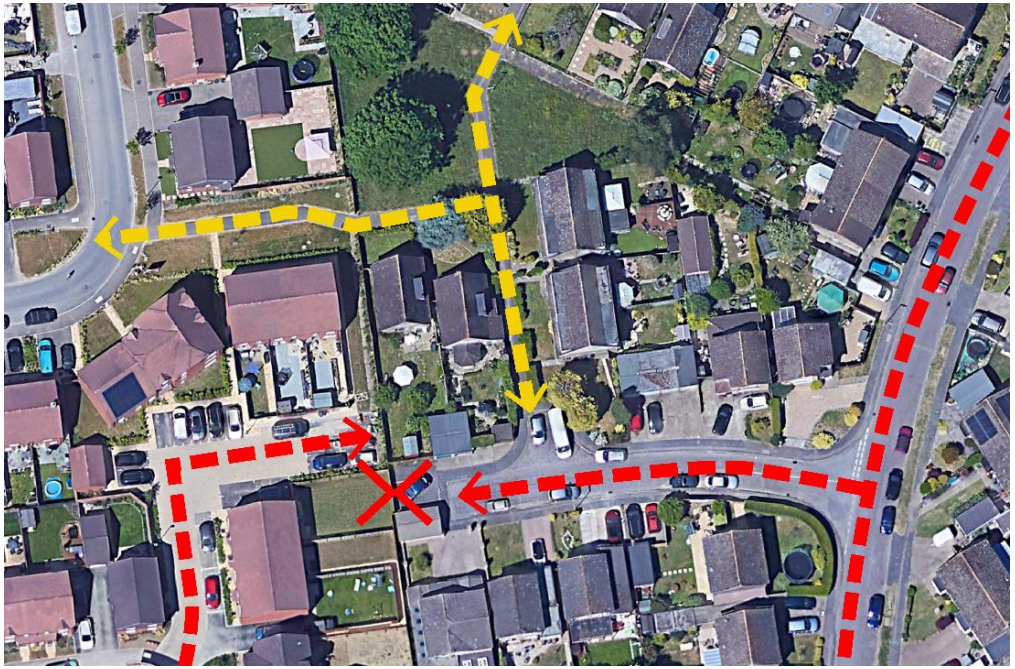


Figure 4-37: In this example, new streets do not connect into the existing street network. However, pedestrian and cycle permeability has been maintained through a well paved and overlooked route providing convenient active travel links into the wider area. (Credit: Google Earth (base)).

- Pedestrian and cycle routes must be well-lit, hard surfaced and well-maintained. Routes must be overlooked and integrated into landscape corridors where possible. Narrow, unlit routes with 90° bends, flanked by high walls, fences or hedges must be avoided. Benches and resting points must be provided frequently along pedestrian links. These measures will benefit new and existing communities and increase the appeal and convenience of active travel.
- Existing Public Rights of Way which run through sites must be maintained but can be diverted under to better integrate them into the new site layout, subject to statutory consultation and legal processes. Rights of way should be appropriately managed during construction to ensure they remain accessible. Where a closure is required, an alternative route must be provided.

- A connectivity assessment must be undertaken for each site to understand the site context, local pedestrian / cycle connections, bus routes and walking and cycling proximity to the location of key facilities. This assessment should be based on isochrones, which should the actual catchments based on available walking routes, and not indicative circles that only show a straight-line distance (see figure 4-48 below). While it is recognised that the detail of proposals changes through the lifetime of project, the proposed street network of a masterplan should be used as a basis for walkability assessment to provide a more detailed reflection of the site's accessibility.
- A facility is considered accessible by foot if it is within a 10-minute, and ideally 5-minute, walk. Similarly, a convenient cycle is around 5 – 10 minutes. In line with the principles of the 20-minute neighbourhood, most people's needs should be available within a 20-minute walk or cycle. The following distances should be used for assessments.
  - Typical walking speed of 80m per minute. A 5-minute walk = c.400m, 10-minute walk = c.800m and 20-minute walk = c.1600m.
  - Typical cycling speed of 240-400m per minute. A 5-minute cycle = 1,200m – 2000m. However, e-bikes could be used to unlock permeability and sustainable travel choices, particularly where topography may otherwise make such journeys unattractive.

Figure 4-38: Accessibility assessment using walking isochrones, this gives a more accurate reflection of an areas pedestrian and cycle permeability than relying on 'as the crow flies' distances (Credit – NMDC)

4.5. *Permeability and walkability*

New developments must be designed to well-established principles of good urbanism, creating legible, walkable mixed-use neighbourhoods with a clear heart. Residents must be able to have quick, easy, and safe access to a range of facilities and services from their home through walking, cycling or public transport. New town, village or local centres must be in convenient locations and designed as places that people have a reason to visit, gather and come together. There are many ways of doing this, with and without a mixture of uses, depending on the development's size:

- For the smallest sites, developments should 'signal' a middle not through use but through urban shape with a confluence of routes and a modest central square, space or village green depending on context.
- For slightly larger sites, the middle should also have flexible commercial, employment or community uses in addition to being at the confluence of routes and well connected on foot, cycle or via public transport.
- Larger sites should have a middle by use as well as by design with a commercial or community use (e.g. corner shop, café, community hall) and a public green or square. Wherever possible, these should be co-located with schools to take advantage of parent and student footfall.

4.6. *Streets and block patterns*

The establishment of a good street and block pattern is key to achieving a connected, permeable, walkable and legible development. A good block pattern will make efficient use of land while helping to delineate public space and private space. Layouts should consider the following:

- Development blocks must have clear backs and fronts and separation between private and public areas. Buildings must front onto the street and blank facades should be avoided. This creates strong frontages onto the street, provides overlooking, makes navigation easier and gives the area a more distinct character. Further guidance on appropriate setbacks is outlined in the street typologies table (4.14)
- Blocks should be between 50m and 150m in length to create a walkable network of streets with multiple connections. These could have an informal or formal character depending on the location and scale of development.

- The arrangement of streets and blocks should respond to the existing topography to avoid steep gradients, or the need for excessive earthworks. In line with inclusive mobility requirements, this means no greater than 5% (1 in 20). [9]

- Building lines and setbacks of homes will have a distinct impact on a street's character and its sense of place. These could be continuous, broken, informal or formal in nature but a consistent approach to design must be taken within in a character area or street. New communities and urban extensions should include a range of character areas within the site while brownfield / in-fill sites must respond to their surrounding context.

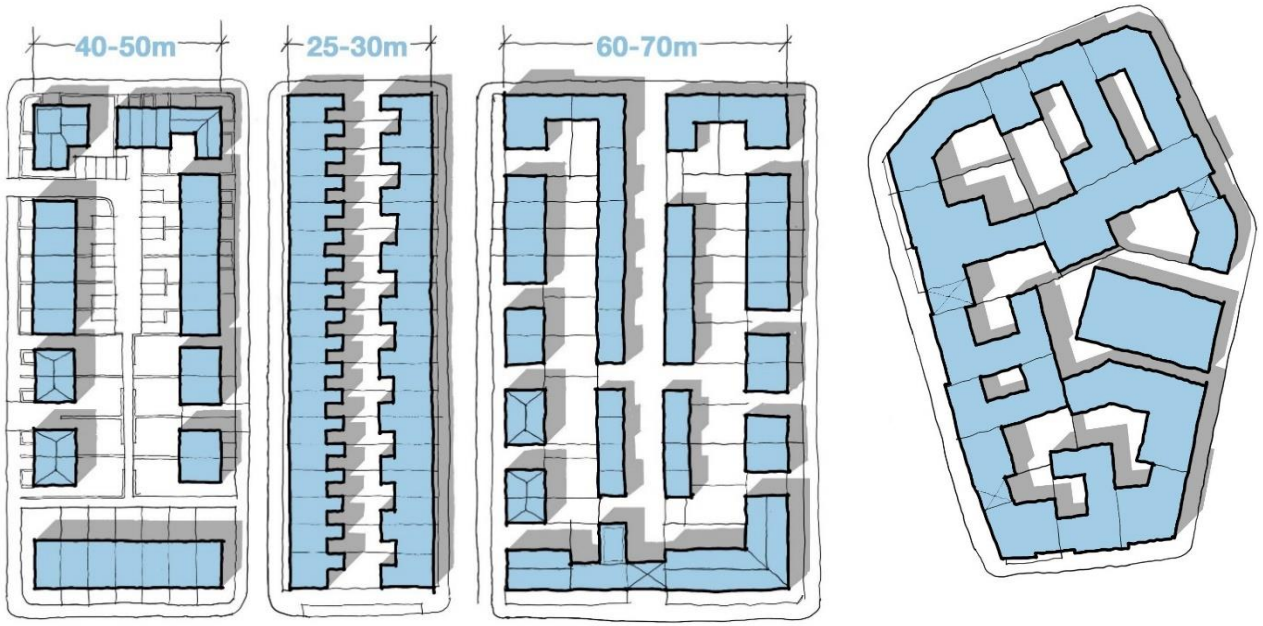


Figure 4-39: Variety in character can be achieved will adhering to the fundamentals of urban blocks. Left to right: Perimeter block, terrace, mews, and courtyard block (Credit – NMDC)

[9] Department for Transport (2021) *Inclusive Mobility A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*

4.7. *Cul-de-sacs*

Cul-de-sacs reduce an area's connectivity and usually increase journey distance and times, making walking and cycling less convenient and increasing the private car use. They must not be used except where a site cannot be serviced any other way. If they must be used, cul-de-sacs should include well-designed, lit, and overlooked pedestrian and cycle links through to neighbouring areas to maintain connectivity. They should also be designed as shared courtyards that can enhance the public realm and include greenery, rather than simple turning heads. Where cul-de-sacs already exist, opportunities to improve their connectivity for walking and cycling should be explored.

Figure 4-40: Modal filter removes through traffic, allowing walking and cycling and improving public real (Credit – Create Streets)

The advantages of cul-de-sacs, such as the removal of through traffic, can be achieved on conventional, permeable street patterns using filtered permeability. Modal filters, such as bollards or trees that allow pedestrians, wheelchairs, and cyclists to pass, but not motorised vehicles can be installed on any street. This allows the creation of traditional streets, with consistent frontages and legible, flexible, and efficient layouts, as well as providing opportunities for additional green infrastructure and public space. Permeability should be greater for active and sustainable modes of travel. People walking and cycling should be able to move *quickly*, *freely* and *safely* through an area with greater priority than vehicle traffic, linking to the primary and secondary street network.

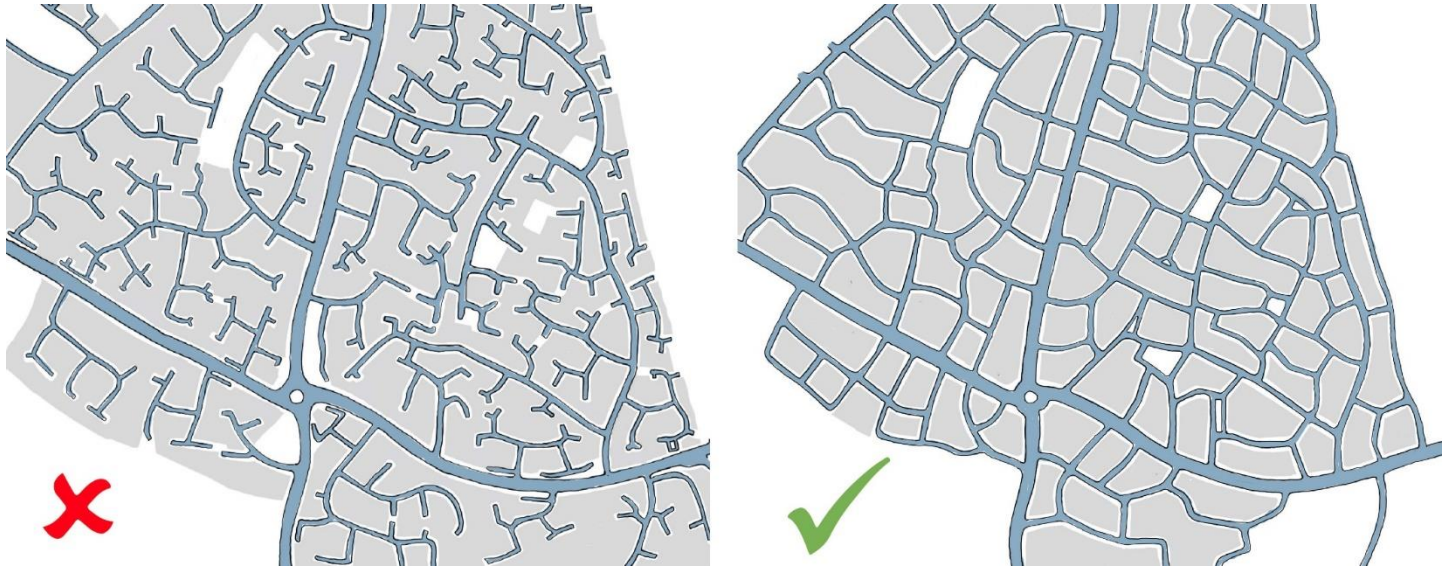


Figure 4-41: L: A poorly connected street pattern with cul-de-sacs R: A well-connected street pattern (Credit - NMDC)

4.8. 20-minute neighbourhoods

The SCC *Draft Local Transport Plan* (LTP 4) has introduced the concept of the 20-minute neighbourhood.[10] The aim is to create thriving local neighbourhoods by ensuring that everyone can access, without a car, services and opportunities within 20-minutes, reducing the need to travel by car and making sustainable modes the preferred choice for most journeys.

Ultimately, this is about creating happy, liveable places where people spend less time and money on travelling and more on enjoying the place they live. 20-minute neighbourhoods will have well defined, thriving town and village centres providing a range of service opportunities, with safe, attractive and convenient routes to get there.

The creation of liveable, 20-minute neighbourhoods, with well-defined and thriving town and village centres, brings a wide range of benefits, including:

- Reduced vehicular traffic and associated emissions;
- Equity of access to services and opportunities, not just those with access to a car;
- Reinvigorated town centres and local economies; and
- Improved quality of life and convenience for residents.

Good connectivity and permeability are key to achieving this for both new and existing neighbourhoods, and new developments can play an important role in expanding the range and quantity of amenities and services available locally. As such, the design principles set out in this guide will encourage the creation of 20-minute neighbourhoods.

Further guidance on the 20-minute neighbourhood concept can be found in the following documents:

- SCC (2021) *Fourth Local Transport Plan* (Draft for consultation); and
- Town and Country Planning Association (2021) *20-Minute Neighbourhoods – Creating Healthier, Active, Prosperous Communities: An Introduction for Council Planners in England.*

[10] Surrey County Council (2021) Fourth *Local Transport Plan* (Draft for consultation)

Figure 4-42: The principles of a 20-minute neighbourhood (Credit - SCC Draft LTP4)

4.9. *Street adoption*

Streets designed in accordance with this guidance should by suitable for adoption by Surrey County Council under *Section 38* of the *Highways Act 1980*, providing that they meet the following additional criteria:

- Are constructed to the council's approved standard
- Connect to an existing public maintainable highway
- Pay commuted sums to provide for ongoing maintenance
- Serve either six or more residential curtilages or equivalent or otherwise have wider public utility

Where new roads are not proposed for adoption and a long term, private management scheme is in place, departure from this guidance could be permitted if proposed designs are consistent with the guide's overarching principles.

4.10. *Utilities and services*

All services should be routed underground where possible. Electricity, water, gas and telecommunications services should be grouped together in a 2m-wide strip under a pavement or service margin and should not be placed under verges and other land reserved for trees and planting. The *National Joint Utilities Group guidelines* provide further information on the positioning of utilities. Substations and other above-ground service infrastructure should be carefully placed so as not to obstruct streets and footpaths.

Alternatively, rear serving can be used to avoiding routing services under the public highway, reducing disruption. This will not however work for all street typologies.

4.11. *Emergency vehicles*

To enable the access and operation of a fire appliance, a clear a width of 3.7m is required that allows a pump appliance to get within 45m of all points in a home.[11] An access route can be reduced to an absolute minimum 2.75 m for short distances points, such as at modal filters and traffic calming features, provided that the vehicle can still meet the 45m requirement. The local fire authority must be consulted where carriageway widths are to be reduced below 3.7m. In all cases, consideration should be given to parking restrictions to ensure clear access.

Blocks of flats over 4 storeys have additional access requirements, further information is provided within Building Regulations Approved Document B and the local Building Control Authority.

4.12. *Refuse collection and servicing*

While refuse collection is managed by the Borough and District authorities, street design should take this service into account. Refuse collection must not dictate the design of a street but should be integrated as part of the servicing plan. A street's geometry must not be dictated by the size of the vehicle and a street must not be designed to take the largest vehicle available, especially when this is larger than the vehicles that can be used in the surrounding streets.

The geometric requirements for large refuse vehicles can lead to large turning radii, wider streets and large turning heads that are contradictory to creating good quality places and healthy streets. Streets and junctions must be designed in accordance with the street types set out in this guide. However, in line with the requirements for emergency vehicle access the absolute minimum narrowing permitted is 2.75m over short distances, such as at modal filters or traffic calming features.

Access should be within reasonable walking distance of a collection point and communal refuse disposal points are strongly encouraged for more efficient collection.

[11] HMG (2020) *Building Regulations Approved Document B, Volume 1 - Dwellings*

4.13. *Character and Local Context*

What people like and where they feel at home matters.

The design of streets within Surrey should be influenced by existing context and elements which are valued by the local community. This can include public spaces, terminating vistas towards landmark buildings or varying street widths and enclosure ratios. These design considerations are often lacking in many new residential developments where streets feel too wide or monotonous in character.

Determining these elements would require a character study, site visits, street design documentation and engagement with the local community. However, in time there may also be a design code in place which will provide necessary detail. Designers should also refer to the relevant district and boroughs' design guides or character assessments.

Elmbridge Borough Council – *Design and Character SPD*	Spelthorne Borough Council – Residential Development SPD
Epsom and Ewell Borough Council (TBC)	Surrey Heath Borough Council – *Area Specific SPDs*
Guildford Borough Council – *Residential Design and Area SPDs*	Tandridge District Council – *Design Guides, Briefs and Village Design Statements*
Mole Valley District Council - *Character Appraisal SPD*	Waverley Borough Council - *Town and Village Design Statements*
Reigate and Banstead Borough Council - *Local Character and Distinctiveness Design Guide SPD*	Woking Borough Council – *Design SPD*
Runnymede Borough Council – *Design SPD*	

Figure 4-43: Local context influencing design and material choices, Watercolour, Surrey (Credit - Create Streets)

4.14. Street types overview table

The following table sets out the geometric and qualitative requirements for each of the proposed street types. This should be read in conjunction with the descriptions and sections in paragraph o above. The typical section shown below explains the various elements of street design as set out in the table.

Key Figures	1. Primary Streets		2. High Streets			3. Secondary streets / Local High Streets	4. Local streets	5. Tertiary Streets		
	a) Link Roads / Bypasses	b) Avenues	a) High Activity / Arterial	b) Low Traffic	c) Traffic Free			a) Shopping Mews / Courts	b) Residential Mews / Back Streets	c) Rural Lanes
Carriageway Width	To DMRB	Min 5.5 (11.00 dual) Max 6.5 (13.00 dual)	Min 5.5 Max 6.0	Min 5.0 Max 5.5	Min 6m, width should vary	Min 4.1 Max 6.5 (Min 5.5 if bus access required)	Min 3.7m (one lane) Min 4.1 Max 4.8 (two lane)	4.5m min (6m for vehicle access)	6m (Shared surface width between buildings)	3.7m
Pavement Width	Min 2.0m	Min 2.0m with tree zone 2.5m without	Min 3.0m	Min 3.0m – allow for wider in areas of high footfall	N/A – shared surface	Min 2.0m	Min 2.0m	N/A	N/A	N/A
Cycle Lanes	To LTN 1/20. Good separation or 'off street' provision required.	2.0m (+0.2m with full height kerb)	2.0m (+0.2m with full height kerb)	N/A – on street	N/A – shared surface	N/A – on street except in specific circumstances.	N/A – on street	N/A	N/A	N/A
Furniture and Separation Zones	To LTN 1/20 if cycle lane is provided	Min 1.5 m (no parking) Min 0.5m (with parking and build outs for trees)	Min 1.5m (no parking) Min 0.5m (with parking and build outs for trees)	N/A – Trees should be accommodated in build outs	N/A	N/A	N/A – Trees should be accommodated in build outs	N/A	N/A	N/A
Plot set back	N/A	Min 0.5m Max 3.0m	1.5m min Allow for signage, and zones for spill out.	Min 1.0m Allow for signage, and zones for spill out.	Min 0.75m Allow for signage, and zones for spill out.	Min 0.5m Max 2.5m	Max 2.0m	Optional 0.3-0.5m private strip to allow for foundations, drainage, etc.	Optional 0.3-0.5m private strip to allow for foundations, drainage, etc.	N/A
Enclosure ratio	N/A	1 : 2 (urban) 1 : 4 (suburban)	1 : 1 (ideal) 1 : 2 (minimum)	1 : 2 (ideal)	1 : 1 (ideal)	1 : 1 (ideal) 1 : 3 (minimum)	1 : 1 (ideal) 1 : 3 (minimum)	1:0.4 (max) 1 : 1 (ideal) 1 : 1.5 (minimum)	1 : 1 (ideal) 1 : 2 (minimum)	N/A
Design Speed	To DMRB and transitioning down in urban areas.	20 or 30 mph	20mph	15mph	N//A	20mph	10 mph	N/A	10 mph	N/A

Characteristics	**Carriageway**	To DMRB	At least two running lanes, may include dedicated bus or transit lanes. Asphalt surface primarily, with different surfacing at crossings, junctions and gateway features.	At least two running lanes, may include dedicated bus or transit lanes. Asphalt surface primarily, with different surfacing at crossings, junctions and gateway features.	At least two running lanes. Block paving preferred, asphalt can be used with regular changes in material for crossings, junctions and gateway features.	A level surface with high quality paving material. Some visual indication of vehicle pathway may be included for servicing	Typically, two running lanes. Passing points where narrower than 4.8. Asphalt surface primarily, with different surfacing at crossings, junctions and gateway features.	Typically, one to two lanes. Passing points to allow vehicular movement in either direction where narrower than 4.8. Usually asphalt but may include different materials.	A level surface with high quality paving material.	Shared surface carriageway. Typically brick / block paving or coloured asphalt with central drainage channel s of a different material.	Asphalt surface
	Central reservation	To DMRB	Can include central tree lined verge.	Irregular central features can be used to create public space, parking or incorporate buildings.	Irregular central features can be used to create public space, parking or incorporate buildings.	N/A	N/A	N/A	N/A	N/A	N/A
	Pavement	Pavement may not be required where off highway links are provided.	2 m wide minimum, good separation from carriageway. May incorporate other features such as bus stops, seating, etc.	3m minimum. Semi – private space for shops, cafes, etc to be provided in set backs.	3m minimum, but should vary to create additional space where appropriate. Semi – private space for shops, cafes, etc to be provided in set backs, but can spill out onto footway where space allows.	N/A – shared surface	Minimum 2m wide on both side of carriageway.	Minimum 2m wide on one or both side of carriageway.	N/A	N/A	N/A
	Traffic calming	N/A	Occasional features to reduce speed are required, such as raised table junctions and crossings and narrowing.	Regular features to reduce speed are required, such as raised table junctions and crossings and narrowing. Gateway features from higher order streets required.	Regular features to reduce speed are required, such as raised table junctions and crossings, material changes and narrowing. Gateway features from higher order streets required. Limit forward	N/A	Intrinsic design characteristics to reduce speed (5.5). Limit forward visibility through horizontal alignment. Modal filtering to prevent through running recommended.	Intrinsic design characteristics to reduce speed (5.5). Limit forward visibility through horizontal alignment. Modal filtering to prevent through running recommended.	N/A	Carriageway narrowing at entry points. Introduce parking, plating, trees, etc to make route arduous.	N/A

					visibility through horizontal alignment.						
	Junction geometry	To DMRB	DMRB roundabouts not permitted. Smaller 'compact' roundabouts can be used where designed in accordance with cycling guidance. Raised table type junctions preferred. Compact radii to encourage low speeds.	Roundabouts not permitted. Corner radii appropriate for large vehicles at low speeds. Raised tables to be included at junctions and side streets access via 'Copenhagen' style crossings.	Roundabouts not permitted. Corner radii appropriate for large vehicles at low speeds. Raised tables to be included at junctions and side streets access via 'Copenhagen' style crossings.	N/A	Roundabouts not permitted. Corner radii appropriate for large vehicles at low speeds. Raised tables to be included at junctions and side streets access via 'Copenhagen' style crossings.	Tight corner radii (1-2m) appropriate for medium sized vehicles at low speeds. Access from secondary / primary street via 'Copenhagen' style crossings.	N/A	Tight corner radii appropriate for car at low speeds. Access from secondary / primary street via 'Copenhagen' style crossings.	Tight corner radii appropriate for car at low speeds
	Street furniture and trees	Trees should be accommodated.	Regular street trees and low-level planting to be accommodated in verge, or in build outs where parking is provided.	Regular street trees to be provided in build outs or in a separation zone between carriageway and footways. Should include regular seating and other furniture, while being mindful of street clutter.	Regular trees and planting to be provided, in more informal manner than busier high streets. Should include regular seating and other furniture, while being mindful of street clutter.	Should include regular planting seating and other furniture, while being mindful of pedestrian comfort and clutter.	Regular street trees and planting to be provided in build outs in carriageway.	Regular street trees and planting to be provided in build outs in carriageway.	May include some furniture where appropriate.	Street trees within carriageway.	Trees should be provided alongside carriageway.
	Cycle provisions	Separate or off-street provision required.	Cycle lane to be separated from carriageway by verge or parking. Lane to be set at carriageway level, or stepped between footway and carriageway.	Cycle lane to be separated from carriageway by parking and set at footway level with suitable separation. Where there is no parking, cycling should be within carriageway with a form of permeable	Separate cycling provision may be required depending on traffic volumes and speeds, and the street's position within the cycling network	No specific provision. Cycling should usually be permitted, to ensure access to services, but through route use should be discouraged by providing safe and convenient space elsewhere in network. Alternatively	No specific provision. Cycling in carriageway to be made attractive through low traffic volume and speed. Separate lane could be provided where street is significant cycle through route or	No specific provision. Cycling in carriageway to be made attractive through low traffic volume and speed.	Cycling not usually permitted.	Cycling within carriageway	Cycling within carriageway

				separation such as trees.		central separated, two-way cycle lane can be provided if space allows.	has particularly high traffic or HGV use.				
	Parking provision	Parking unlikely to be appropriate	On street parallel parking included where required. To be broken up by buildouts with trees.	On street parallel parking included where required. To be broken up by buildouts with trees.	On street parallel parking included where required. To be broken up by buildouts with trees..	N/A	On street parallel parking included where required. To be broken up by buildouts with trees.	On street parallel parking included where required. To be broken up by buildouts with trees.	N/A	On curtilage / on street parking within mews or broken up by trees.	Occasional on street parking.
	Public Transport	May include dedicated bus lanes, particularly at busy junctions to bypass traffic.	May include a dedicated bus or transit lane. Where no lane is provided, bus stops should be of the layby type allow other traffic to pass.	May include a dedicated bus or transit lane. Where no lane is provided, bus stops should be of the layby type allow other traffic to pass.	No separate provision required, but carriageway may be widened at stops to reduce conflicts. Bus stops and shelters should not reduce footway width to less than 2m.	N/A	No separate provision required. Bus stops and shelters should not reduce footway width to less than 2m.	Only suitable for midi / minibus. Bus gates required on filtered routes.	N/A	N/A	No separate provision required
	Electric Vehicle Charging	N/A	Provide on build outs alongside trees and planting.	Provide on build outs alongside trees and planting.	Provide on build outs alongside trees and planting.	N/A	Provide on build outs alongside trees and planting.	Provide on build outs alongside trees and planting.	N/A	Pillar posts in carriageway if space allows, or wall mounted.	N/A

Table 4.3 – Street types overview table

Figure 4-44: Carriageways can be re-imagined as places for people (Credit - Create Streets)

Chapter 5: Carriageway and junction design

5.1. Carriageway vision

Streets should be designed to move people safely, happily, and healthily and minimise the negative impact of traffic such as carbon emissions and air and noise pollution. The aim should be to move *people,* rather than just vehicles, efficiently. Good carriageway design will also help create beautiful, sustainable streetscapes by using quality materials, incorporating abundant greenery and reducing the visual clutter caused by excessive signage and road markings.

5.2. Continuous pavements (often called Copenhagen crossings)

Continuous pavement crossings are extensions of the pedestrian space, and cycle lanes where applicable, across the carriageway of a side street at intersections with primary or secondary streets. They differ from older side entry treatments which raise the carriageway but do not provide a continuation of the pavement. Continuous crossings have numerous benefits, including:

- Providing an uninterrupted route for pedestrians and cyclists;
- Providing a clear visual and tactile indication that pedestrians and cyclists have priority, in line with the movement hierarchy;
- Reducing vehicle approach and turning speeds; and
- Providing a 'gateway' feature to indicate the transition from a primary or secondary street to a local street or tertiary, signalling the need for drivers to behave differently in the new environment.

The crossing should be designed to provide clear visual continuity of the footway across the side street, they should be as simple as possible and avoid any unnecessary changes in material or road markings. The crossing should be the same width as the main pavement and use the exact same surfacing material. If the existing pavement comprises asphalt in the same colour as the carriageway, a contrasting pavement material should be used for the crossing a short section either side (typically 3.0m) to differentiate. Asphalt footways should not normally be used on new streets, modular block or flag paving is the preferred standard. Where appropriate, some space may be required for turning vehicles to give way, however consideration should be given to maintaining pedestrian desire lines.

The crossing should include a ramp up to the level of the pavement, to provide a level surface for pedestrians and reduce vehicle speeds, with dedicated kerbs now available in the UK to facilitate this. It might be also appropriate to narrow the carriageway of the side street at the entrance and include traffic management features to reduce vehicle movements.

Continuous crossings must be used whenever a lower order street, such as a local street connects to a higher order street, such as a primary street.

Figure 5-1: Examples. L: Lea Bridge Road, Walthamstow London. R: Deflt, Netherlands (Credit - Create Streets)

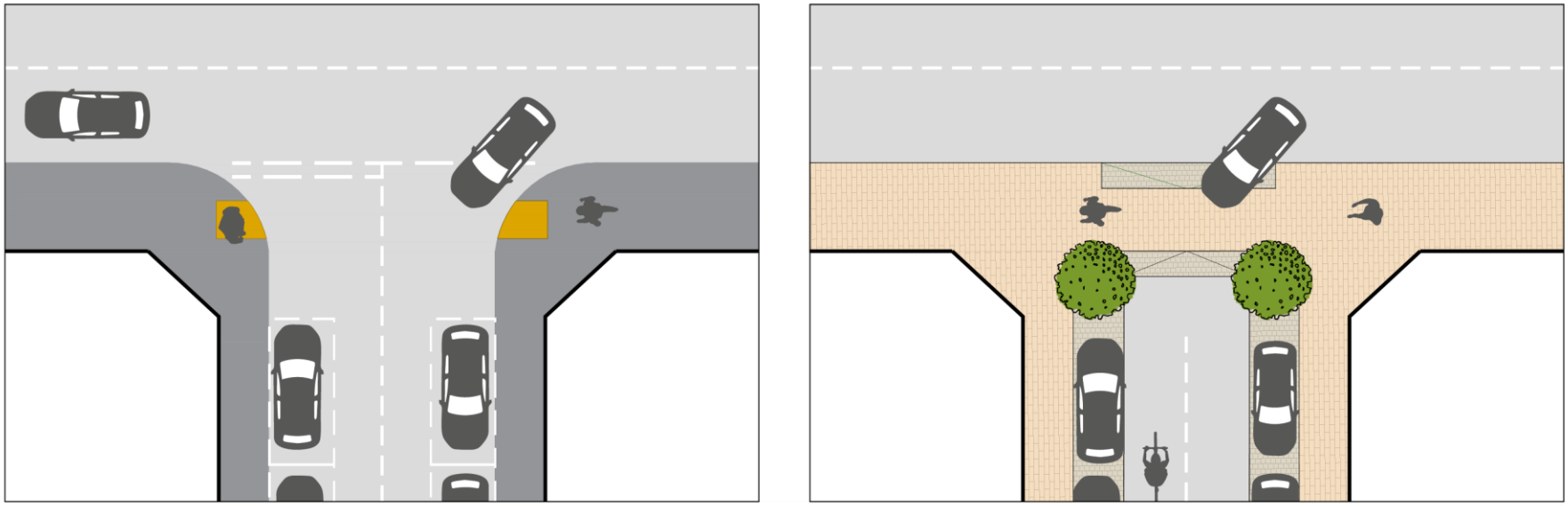


Figure 5-2: Indicative layout showing the integration of a Copenhagen crossing at a street junction (Credit: Create Streets)

5.3. Raised Tables

Raised tables should be used at mid-link crossing points and junctions to calm traffic and provide a safer, more convenient crossing points for pedestrians. They should be constructed on pedestrian desire lines, such as crossing between shops and services or street intersections.

They should be level with the adjacent pavement and constructed in the same material as the pavement to clearly show that the table is an extension of pedestrian space. Where the footway is also constructed in asphalt, the table crossing should be constructed using a different contrasting material such as block paving. Asphalt raised table crossings can be used in conjunction with a 'zebra' crossing on primary streets where pedestrian numbers and traffic levels permit. In all other cases, road markings should not be used on the raised tables themselves.

The ramps either side of the table must be of a shallow gradient, ideally sinusoidal, and constructed in a smooth material to be as comfortable for cyclists. Rough stone setts should be avoided.

At junctions, raised tables act in a similar way to a continuous crossing, giving pedestrians priority over the junction and requiring vehicles to slow and give way. They must not be used at junctions on Primary Streets (street type 1) or high activity High Streets (street type 2(a)) and should not be used on Secondary streets (street type 3) where there are high vehicle movements. This must be assessed on a case-by-case basis. In all cases consideration must be given to how visually impaired pedestrians will navigate the space.

There is no need to continue the kerb line at raised tables junctions in new streets, although this may be necessary for retrofit schemes where retaining the kerb will simplify design and construction. Street furniture and trees can be used to provide some informal, permeable separation between pedestrians and vehicles. The carriageway should be narrowed at raised tables, ideally using street trees or other planting, to reduce the crossing distance and help reduce vehicle speed as much as possible.

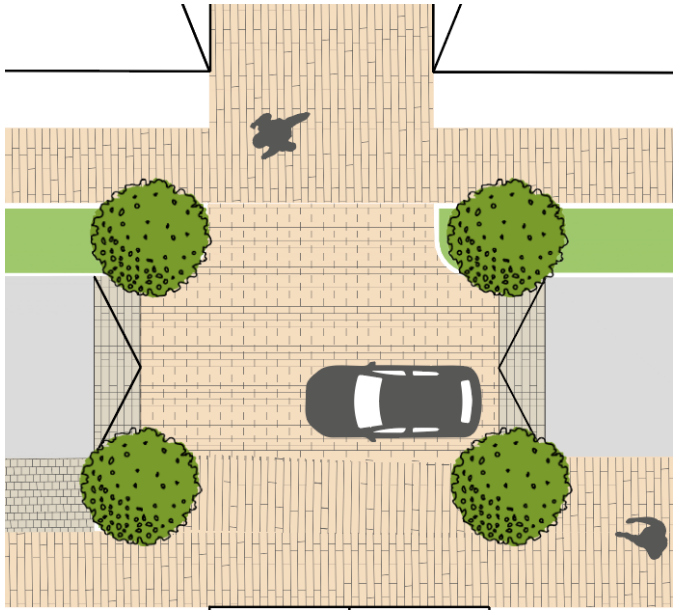


Figure 5-3: L: Diagram showing raised plateau at junctions slowing traffic and providing level crossing for pedestrians (Credit: Create Streets) R: Retrofitted to historic streets in Highbury, London, note the excellent use of trees and greenery to narrow the carriageway and retained kerb lines (Credit – Create Streets)

5.4. *Carriageway widths and tracking (swept path analysis)*

Wide carriageways encourage faster speeds and consume large amounts of land and resources. We must create carriageways no wider than is absolutely essential for vehicles to pass and ensure access for fire appliances (o) Factors that affect the width of a carriageway include volume of vehicular traffic, informal on-street parking, speed limit, demarcation with pavement and the street's curvature.

Designers should be encouraged to vary carriageway widths, particularly where a rural character is desired. This allows for less formal opportunity parking and allows the street layout to respond to the nature of the built form.

Figure 5-4: The built form should determine the carriageway design (Credit – Manual for Streets)

It is important to consider the street beyond the carriageway edge, and width not solely as a function of vehicle space and parking. A street is *a linear space defined by the buildings which enclose it.* The depth of plot frontage (i.e. front gardens) and building height therefore needs to be taken into consideration when determining overall widths. It is recommended that most streets should have an enclosure ratio (building height: width between buildings) of between 1 : 1 and 1 : 3. This will provide a good sense of enclosure that people will find comfortable and pleasant. Streets wider than this may feel like a racetrack, encouraging higher vehicle speeds. Those that are narrower may feel claustrophobic.

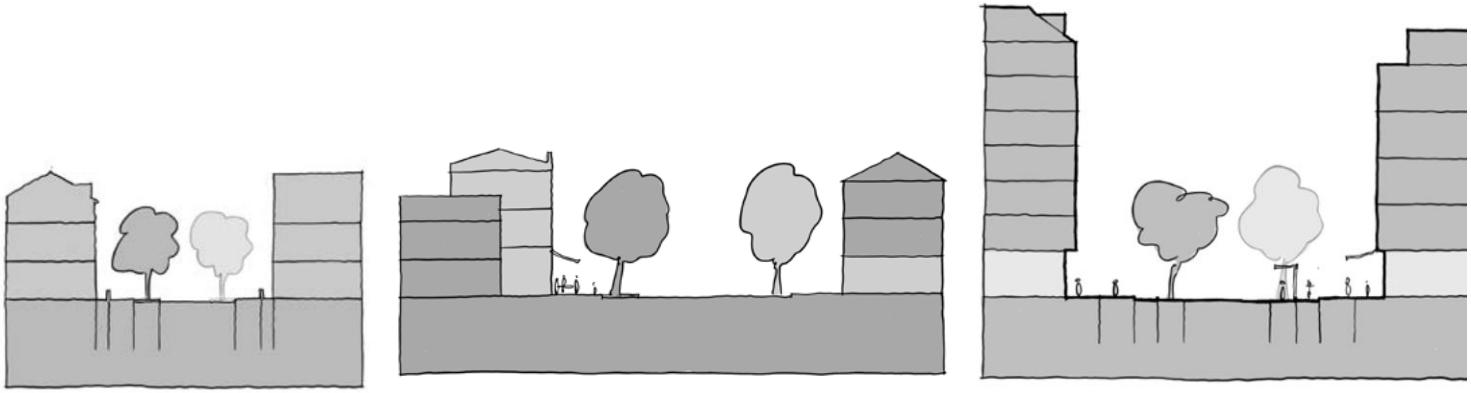


Figure 5-5: Street sections with enclosure ratios of 1 : 1.5, 1 : 3 and 1 : 1 (Credit – NMDC)

Lightly trafficked two-way streets, i.e. secondary streets (without buses) and lower, should have a carriageway width of 4.1m – 5.5m, excluding any on street parking bays. In secondary, local and tertiary streets it is acceptable to have larger vehicles taking up more than one lane, providing cyclists can still pass safely and there are spaces for vehicles to pull in to allow oncoming traffic to pass.

Recommended widths, parking arrangements, materials, etc. are set out in the Street Typology table (4.14).

5.5. *Traffic calming*

Traffic calming should be achieved through good street design. First and foremost, the intrinsic characteristics of the street should encourage slow speeds and careful, considerate driving. Where this is not feasible, such as on long continuous links, the next step should be to introduce horizontal deflections and features to reduce speeds, and lastly vertical deflections should be considered.

- *Intrinsic measures.* This includes making the carriageway just as wide as it needs to be for vehicles to pass, but not wide enough for them to pass comfortably at speed. The use of on street parking creates 'edge friction' which helps reduce speed. Street trees also have a similar effect, as well as improving the sense of enclosure and providing many other benefits. When setting out street trees, a spacing of between 8 and 16m is recommended, but the actual spacing should take into account parking bay and plot frontage dimensions and street lighting. Other design features can help visually narrow the street, such as different surfacing or markings at the edges, and bringing the building line in to create greater sense of enclosure. Reducing forward visibility is a very effective method of reducing speeds and, if feasible, the street layout should be designed accordingly with changes in direction and tight corner radii. The use of road markings should be discouraged on secondary and Local streets to help create a less formal appearance that encourages more cautious driver behaviour. On primary routes, designed for 30mph or under, a centre line is not required. Following a similar rationale, fully shared surfaces are effective at regulating speed and driver behaviour but should only be used in limited circumstances, such as in mews or minor streets that do not have through vehicular traffic.

- *Horizontal deflections.* This includes road narrowing features, such as build outs for trees or SuDS, regular spacing of junctions and crossings, central islands and carriageway deflections to reduce forward visibility. Most of these features will be more effective with the addition of vertical deflection measures, such as raised table crossings (5.3). When designing new carriageways, consideration should be given to bringing in the building line to create narrowing or deflections, rather that solely relying on street design features. This will be more effective and will make better use of the available space, and example of where this has been achieved is shown in Figure 5-9 below.

- *Vertical deflections.* Ideally vertical deflection features should be used in conjunction with other measures, such as raised table crossings and junctions. In retrofit schemes it may be permitted to use speed humps or cushions, where other methods have failed, and provided that any ramps have a 'sinusoidal' profile which is more comfortable for cyclists. Such measures should be considered a last resort. Rumble strips, usually constructed from granite setts, help provide demarcation between street types. Cyclists should be able to bypass any rumble strip, or a channel could be provided.

Traffic calming interventions, such as narrowing and raised tables, should be regularly spaced, depending on the street typology and design speed, in order to break up continuous streets that could otherwise encourage higher speeds. A minimum spacing of 70m is recommended to achieve speeds

of 20mph[12]. Reference should be made to the street typology table (4.14). When designing traffic calming measures consideration must be given on impact on refuse and emergency vehicles and the relevant teams must be consulted at the design stage.

5.6. 20 mph streets

- All urban areas, residential streets, town or village centres and places with significant interaction between pedestrians, cyclists, and motor vehicles (such as schools and markets) must have a limit of 20mph and be designed accordingly.
- This will apply to busy high streets as well as quieter secondary, local, and tertiary streets. Only primary streets can be 30mph. The street hierarchy table (4.14) provides further details for each street type. All speed limits must largely be self-enforcing through good design, using the techniques described above. Existing streets may require retrofitting to achieve lower speeds. The transition between 30mph streets and 20mph streets should be carefully designed. This can be achieved by using continuous crossings on side roads, and gateway features such as raised tables with narrowing, where the change in speed is mid link.
- Department for Transport local government guidance, *Circular 01/2013*, encourages 20mph limits and zones to reduce speeds, improve safety and encourage a modal shift to walking and cycling. Recent research from The University of Surrey recommends that speed limits of 20mph should be used to encourage cycling.[13] Surrey County Council's policy document, *Setting Local Speeds Limits*, provides further information on speed management for 20mph zones.

[12] DfT (2007) *Manual for Streets*

[13] Nick Grudgings, Susan Hughes and Alex Hagen-Zanker (2021) *What aspects of traffic intensity most influence cycling mode choice? A study of commuting in Surrey, UK*

5.7. *Junction geometry and characteristics*

- Junctions must not solely be designed for movement. They are also key places in the street network where people meet and spend time. They can be a focus point, with taller buildings, public spaces, landmark buildings, and local amenities. Junctions between primary streets will generally have greater intensity and opportunities for public interaction. These spaces should be a focus for new developments.
- How the buildings look and interact the junction is of particular importance. They should create a sense of enclosure, have well defined frontages and clear boundaries between public and private space. Opportunities for public space should be encouraged.
- Standard DMRB roundabouts must not be used in areas of pedestrian activity in towns, villages and urban areas. They consume vast amounts of space, encourage higher speeds, are a physical and psychological barrier for pedestrians and dangerous for cyclists. In 2018 20% of all cyclist deaths and serious injury in the UK were on roundabouts.[14] Mini and compact roundabouts, or roundels, are permitted.
- Minor junction types that are appropriate for residential areas include:
  - Crossroads and staggered junctions;
  - T and Y junctions;
  - Formal and informal squares; and
  - Mini and compact roundabouts, roundels.
- Junction radii should be as small as possible to ensure that the pedestrian desire line is maintained and that vehicles turn slowly. It is not necessary to design junctions for large vehicles such as bin lorries that will only use them occasionally. In most streets, it is acceptable for such vehicles to take up both lanes when turning. Vehicle tracking software should be used to check swept paths and verify the design.
- As well as being less safe for pedestrians and cyclists, large radii junctions result in inefficient land use and should be avoided. On existing junctions, the radii can be reduced using kerb build outs, providing more space for public realm and furniture, planting and trees, or parking. On new junctions, buildings should be used to define the junction and create corner buildings. This makes more efficient use of the available

[14] Source: Local Transport Note 1/20 Cycle Infrastructure Design Sec 10.7

space, and provides opportunities for irregular shape building plots, especially on Y junctions, that can add to the character of a development. In some circumstances, it can be possible to use the reclaimed space on existing junctions for new buildings, especially where it provides an opportunity to restore historic street patterns that have been damaged by previous road schemes.

Overrun areas should be avoided on residential streets but may be required on streets with high volumes of large vehicles.

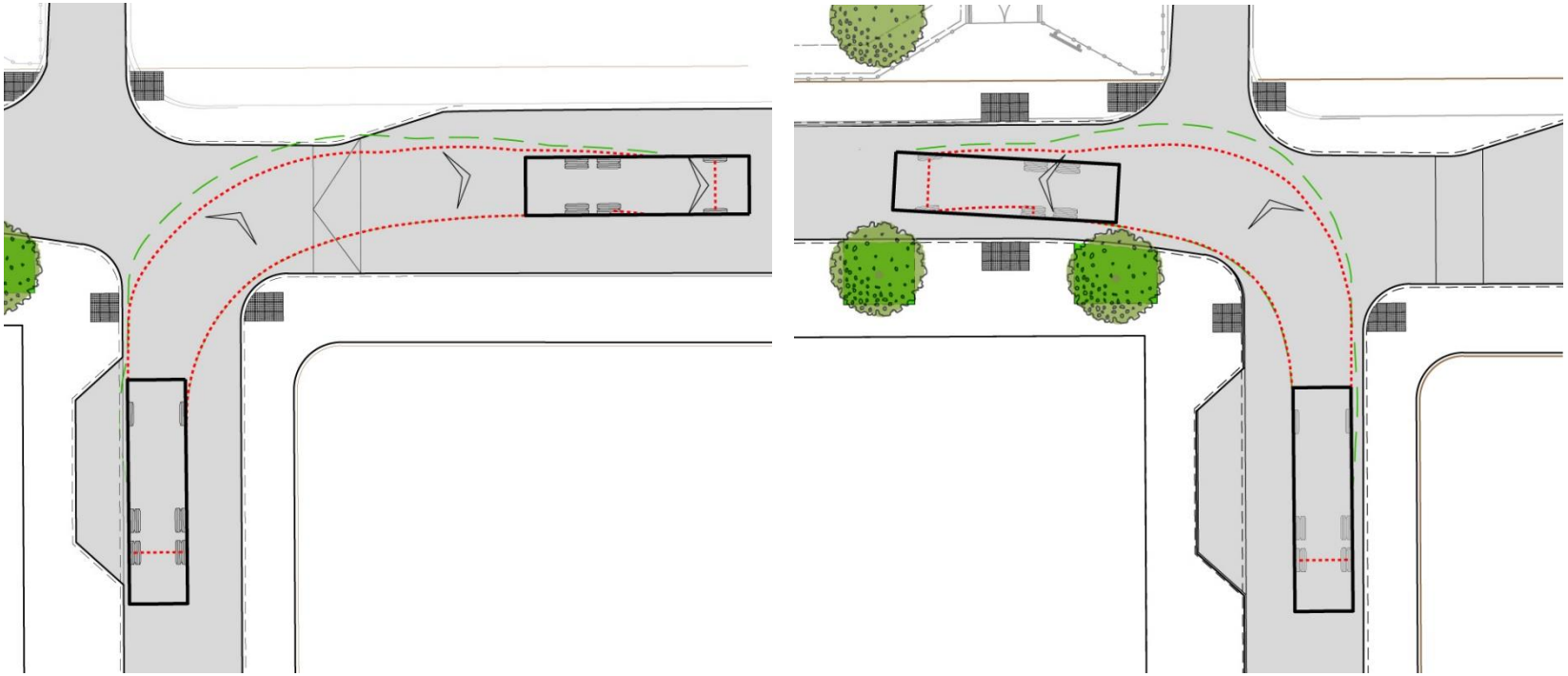
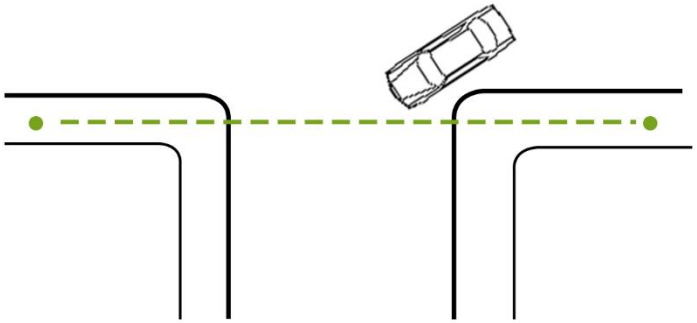
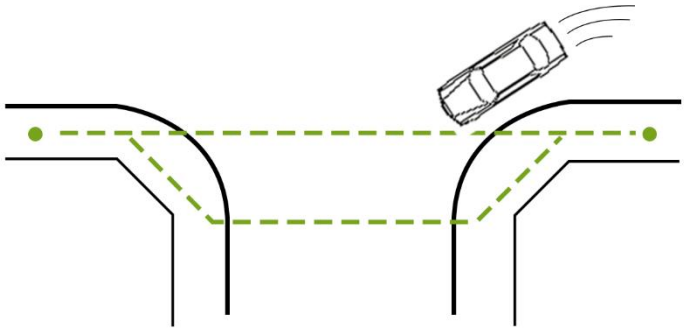


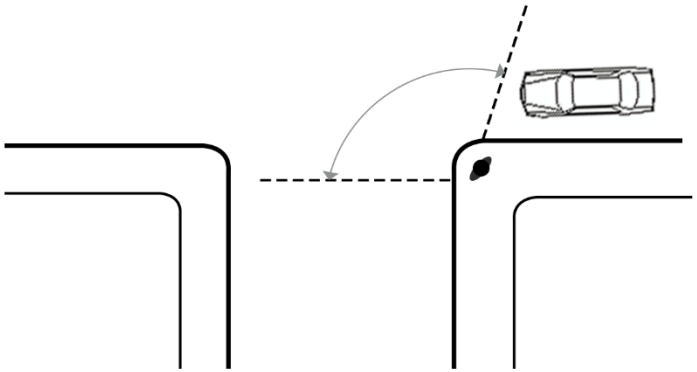
Figure 5-6: Vehicle tracking a refuse vehicle on tight corners (Credit - Create Streets)



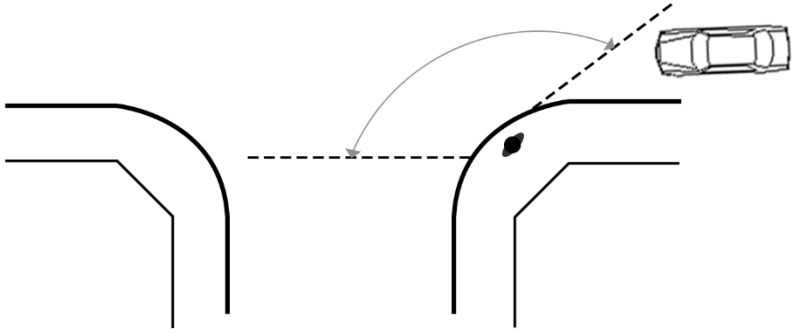
- Pedestrian desire line (---) is maintained
- Vehicles turn slowly (10 mph - 15 mph)



- Pedestrian desire line deflected
- Detour required to minimise crossing distance
- Vehicles turn faster (20 mph - 30 mph)



- Pedestrian does not have to look further behind to check for turning vehicles
- Pedestrian can easily establish priority because vehicles turn slowly



- Pedestrian must look further behind to check for fast turning vehicles
- Pedestrian cannot normally establish priority against fast turning vehicles

Figure 5-7: Reducing junction radii reduces vehicle speeds and improves pedestrian and cycle safety (Credit – Create Streets)

Figure 5-8: Reduced kerb radii improves pedestrian crossing and provides additional space for greening. (Credit - Create Streets)

Figure 5-9: Carriageway deflection, sharp corner radii, street trees and changes in material all help reduce speeds in residential streets. L: Poundbury, Dorset. R: Derwenthorpe, York (Credit - Andy Cameron)

5.8. Staggered Junctions

There is no minimum requirement for junction spacing on opposite sides of the street and crossroads, or slightly staggered junctions, should be encouraged. Staggered junctions reduce conflict and can be useful in breaking up street lines, reducing forward visibility, and creating terminating vistas which help add to the character and interest of a development. The ideal spacing between opposite streets on a staggered junction is one street width. On primary streets, junction spacing should be addressed on a case-by-case basis. Where a significant junction spacing is unavoidable, mid-block pedestrian only routes should be introduced to maintain desire lines and encourage walkability.

Also refer to Chapter 4:

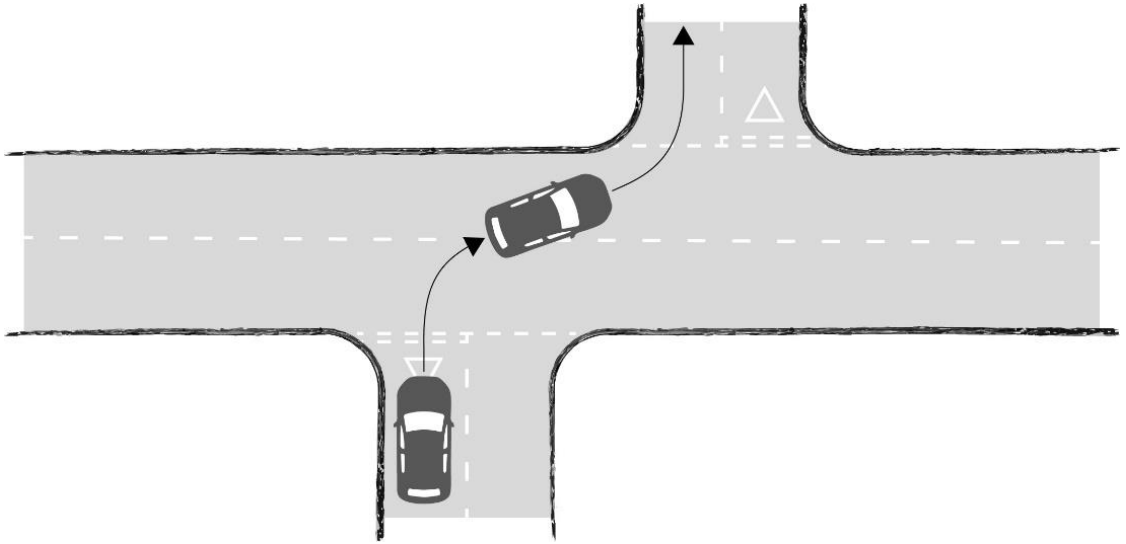


Fig 5-10: Example of a staggered junction alignment (Credit – Create Streets)

5.9. *Turning Heads*

In new developments, turning heads should be avoided as far as is practical. In the first instance, street networks should be designed to be permeable with no dead ends or cul-de-sacs. Streets can be filtered to prevent through traffic, with access given to refuse and emergency vehicles only. Short dead-end streets, such as mews, can be permitted without a turning head where distances are agreed for fire and bin lorries. The layout of the street should not be dictated by refuse or fire but an agreement reached on each specific situation with Surrey County Council.

Where turning heads are unavoidable, they must be designed at attractive courtyards that provide appropriate turning space. This should be assessed on a case-by-case basis, considering fire regulations and refuse vehicle characteristics. The parking arrangements for these courtyards should be adequate to ensure that the turning area can be kept free of parked vehicles.

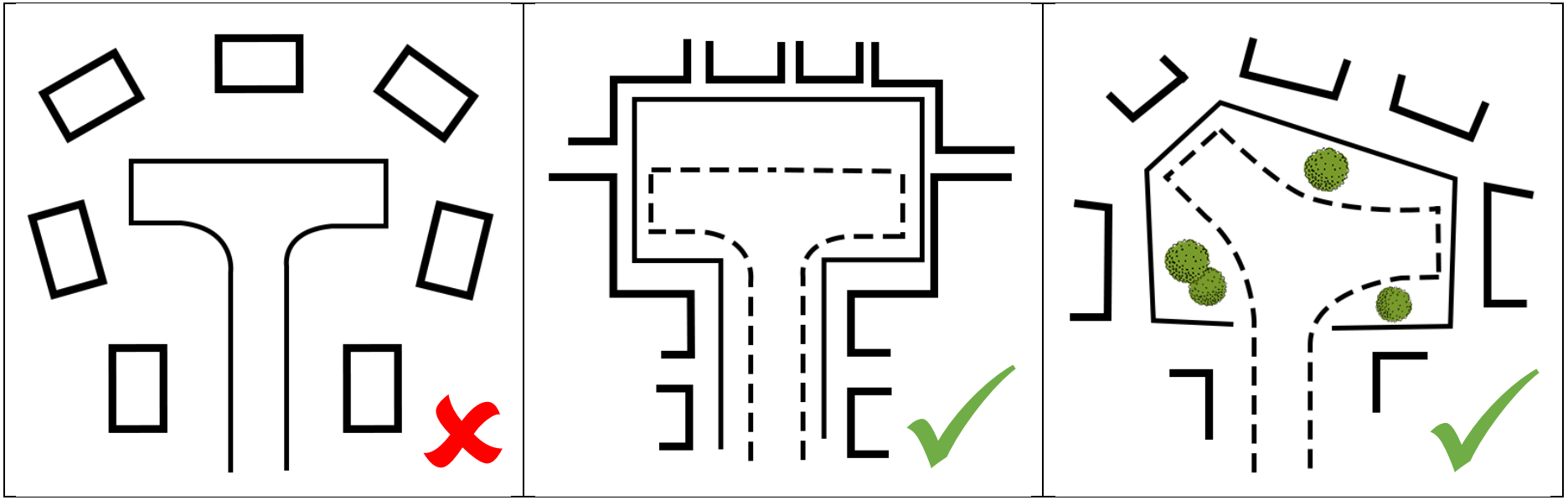


Figure 5-11: Turning head should be designed to relate to the surrounding built form, incorporate parking and where possible, street trees (Credit - Create Streets, images adapted from A Policy Statement for Scotland, Designing Streets 2010)

Figure 5-12: Truro, Cornwall. Example of a turning head designed in such a manner. (Credit: Andy Cameron)

5.10. *Materials guidance*

Paving materials should be easy to maintain and replace, durable and of an attractive appearance that is appropriate to the local character. A simple palette, with a limited number of materials and colours is preferable. Using too many paving types can result in a visually messy and incoherent environment that will be hard to maintain and repair. Consideration must be given to the *whole life costs* of materials when deciding which to be used.

Paved surfaces for most new schemes will be of flexible construction. The following materials should be used:

Carriageways	Primary streets, Secondary streets, high streets (trafficked), Local streets, lanes	Hot Rolled Asphalt (HRA) Proprietary systems, such as thin surfacing systems High friction surfacing where required
	High streets (non-trafficked), residential and commercial mews, shared surface streets	Block paving systems (flexible construction) • Clay pavers or bricks • Concrete block paving Natural stone pavements of a rigid construction can be used in certain circumstances where a very high-quality finish is required. Smaller modular units, such as setts, are less likely to break and are easier to reinstate.
Pavements		Block, slab or flag paving systems (flexible construction) • Clay pavers or bricks • Precast concrete paving flags • Concrete block paving Most utilities will be routed under pavements, so paving systems must be easy to lift and reinstate without the need for specialist contractors or materials.
Secondary streets, high streets (trafficked), Local streets		Block, slab, or flag paving systems (flexible construction) • Natural stone paving flags

	• Clay pavers or bricks • Precast concrete paving flags • Concrete block paving Most utilities will be routed under pavements, so paving systems must be easy to lift and reinstate without the need for specialist contractors or materials.
Cycle Lanes	Dense bituminous macadam Proprietary surfacing systems, such as 'spray and chip' A coloured surface course can be used in limited circumstances where it is necessary to provide contrast with the footway or carriageway. General use of coloured surface courses should be avoided. A high quality, smooth finish must be used for rider comfort.
Raised tables	Block paving systems (rigid construction for high traffic areas, flexible elsewhere) • Clay pavers or bricks • Concrete block paving • Concrete block paving (permeable) Natural stone (rigid construction) should be used where a high-quality finish is required. In some circumstances this may be more economical, as a rigid constructure is more durable and has better resistance to torsion from turning vehicles.
Ramps	Proprietary precast concrete ramp section Granite setts (rigid construction) with smooth finish
Edgings and Channels	Granite setts Natural stone Clay paving
Parking Bays	Hot rolled asphalt (HRA)

	Block paving systems (flexible construction) • Clay pavers • Concrete block paving Permeable paving systems • Permeable concrete block paving • Permeable concrete • Permeable asphalt (TBC)

Table 5.1 – Permissible surfacing materials for streets

While asphalt is one of the ubiquitous and affordable paving materials, it requires more maintenance and upkeep costs in the long term. It is one of the most impermeable materials, and therefore generates more surface water runoff and has a higher impact on drainage. It also contributes more to heat island effects than other materials. The use of natural stone and clay paving materials must be encouraged and should be used wherever feasible. Asphalt should not be used for pavements on non or very low trafficked areas.

The use of permeable paving should be encouraged but will only be adopted in certain circumstances. The most suitable location for permeable paving is in parking bays, low traffic and traffic free streets. If used in parking bays on the street, the impermeable carriageway can be designed to shed water to the parking bays, reducing the need for positive drainage, such as gullies. The main types of permeable paving that will be adopted are:

- Permeable concrete block paving (CBP);
- Permeable clay pavers;
- Permeable asphalt;
- Permeable concrete; and
- Resin bound gravel (only suitable for tree pits and off-street pathways).

Permeable paving should not be laid over any existing or proposed services wherever possible as this will avoid the need for excavating and reinstating the permeable paving if a utility provider needs to repair or replace services. Service stripes and trenches can be created using non permeable paving to accommodate services. Further guidance is available in the Interpave guidance.[15]

Permeable paving can be used in all sites, but the choice of sub-base system will depend on the local ground conditions. The sub-base can either allow infiltration into the ground below, be fully lined and drain to a surface water drainage system or allow both partial infiltration and be connected to the drainage system. Further guidance is provided in Chapter 8 – Sustainable drainage systems.

5.11. Pedestrian and cycle crossings

Good pedestrian and cycle crossings are essential to creating healthy streets. Streets should be easy to cross and pedestrians should have priority in most cases. Well-designed crossings also help calm traffic, improve street aesthetics and provide opportunities for trees and other street greenery. The following crossing types should be used for new streets in Surrey:

Informal Crossings

- *Continuous or 'Copenhagen' crossings.* As described above, these are extensions of the pavement across junctions of local and other tertiary streets from primary or Secondary streets. They essentially reverse the convention of pedestrian crossings; vehicles must instead cross the pedestrian realm and do not have priority. These crossings should be included on all new developments.
- *Uncontrolled crossings or courtesy crossings.* Pedestrians can cross at these when they feel comfortable but have no formal priority. Ideally, raised table crossings, constructed in the same material as the footway to slow traffic and create a level surface. Otherwise, a drop kerb with a maximum 1:12 ramp down should be used to create a level surface, along with coloured or patterned surfacing across the carriageway to indicate the crossing location. The crossing should be the same width as the footway, and a minimum of 2m. Tactile paving, in accordance with the latest DfT guidance, is required on either side.[16] The crossing should also incorporate build outs, where appropriate, to narrow the carriageway. The crossings should be provided along pedestrian desire lines and at regular intervals on long links.

[15] Interpave (2018) *Design and Construction of Concrete Block Permeable Pavements Edition 7*
[16] Department for Transport (2021) *Guidance on the Use of Tactile Paving Surfaces*

- *Informal zebra crossings.* Trials have recently been undertaken in Greater Manchester of non-proscribed zebra crossings on side streets.[17] Wider trials have been proposed and potential regulatory changes will permit wider use of these in the future. Opportunities should be identified for such crossings on new and existing streets in Surrey, ahead of these crossings obtaining regulatory approval.

Formal Crossings – Controlled and uncontrolled

- *Zebra crossing*. Controlled crossing used to provide pedestrians with priority as they cross from one side of the street to the other. Marked with white parallel strips and flashing yellow 'Belisha' beacons. These can be used across the full width of the carriageway or in conjunction with refuge islands to enable crossing in two stages with shorter crossing distances. These should be used in conjunction with a raised table to provide a level crossing and provide traffic calming.
- *Parallel crossing.* Zebra crossings that feature separate space for cycles alongside the pedestrian crossing, demarcated with 'elephant's footprints' markings.
- *Puffin, Pedex and Pelican crossings*. Signal-controlled crossings are used to provide dedicated time for pedestrians to cross one side of the street to the other on wider streets with faster-moving traffic. This crossing is controlled through traffic lights. Multiple stage crossings should be avoided, they must therefore be as short and direct as possible.
- *Toucan crossing.* Similar to other signal-controlled crossings these allow cyclists to cross without dismounting, mixing with pedestrians in the same space.
- *Signal-controlled cycle crossing*. Similar to Pedex and puffin crossings, but for cycles, these usually connect cycle tracks across an intersecting road. These can be used as standalone crossings or run parallel to pedestrian crossings.
- *Pedestrian priority signal.* These controlled crossings should be used in areas of high footfall. These appear green to pedestrians by default until a vehicle is sensed.

[17] TRL (2022) *Published project report PPR1003: Non-prescribed zebra crossings at side roads (Final report)*

- *Scramble crossings.* Usually signal-controlled, these are located at intersections where pedestrians can cross in any direction, including diagonally. These offer a shorter overall crossing for pedestrians in both time and distance. They require a dedicated pedestrian phase in traffic signals and are best suited to busy town centre streets with high foot traffic.

5.12. Artwork on crossings

- Using colourful artwork on formal crossings, rather than different coloured tarmac or paving, has been trialled in several areas in the UK and internationally. This is a cost-effective way of making a crossing more prominent, bringing art and colour to the street and encouraging community collaboration. However, consideration must be given to the impact on pedestrians with visual impairments and other disabilities who may be affected. Representative groups should be consulted before implementation.

Figure 5-13: Artwork applied to existing pedestrian crossing outside school (Credit - Create Streets)

5.13. *Road markings*

- In general, road markings create unnecessary visual clutter on the road and are intrusive, particularly in rural settings. Where possible, designers should instead use different materials or horizontal elements to demarcate speed changes, parking zones and other streetscape elements. Markings also imply vehicle priority and must be omitted where streets and junctions seek to create pedestrian priority.
- Centre line markings should be omitted from carriageways of 6.5m wide or less, or where the design speed is 30mph or under. On rural roads, up to the national speed limit, the centre line should be removed in conjunction with the use of edge of carriageway markings. This helps to create a rural feel, a less vehicle dominated environment, and perceived reduction in road width and thus vehicle speeds.

5.14. *Accessibility considerations*

Street design must comply with the Equality of Opportunity duty under the Equality Act 2010. Consideration must be given to those with mobility and sensory disabilities and those with differing life stage issues, as well as those with conditions such as dementia. This includes the use of accessibility elements such as dropped kerbs and level access at crossing points, etc. When choosing some street design features that seek to reduce the motor vehicle dominance, such as raised table junctions, consideration must be given to creating a fully inclusive environment. Engagement and co-design with stakeholder groups will be essential to ensuring an inclusive approach.

Reference should also be made to the DfT best practice guide *Inclusive Mobility*.[18]

[18] DfT (2022) *Inclusive Mobility A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*

5.15. *Safety considerations for streets with high vehicle volumes and / or speeds*

Busy roads can lead to traffic incidents when the street design does not adequately consider the safety of pedestrians, cyclists and even other motorists. Designers must comply with the following:

- *Pavements should have a minimum of 2m*, or higher on busier roads in accordance with street typology. Pavements should be wider at key locations subject to pedestrian footfall and comfort levels to prevent crowding and overspill onto the carriageway.
- *Buffers such as trees* and planting between the pavement and carriageway should be provided.
- *Pedestrian crossings* should be safe and convenient with traffic measures calming are essential. These should be located on pedestrian desire lines to maximise their use and benefits.
- *Cycle provision* must be segregated on roads with high speeds and/or volumes, with a suitable buffer between the carriageway and the cycle lane.
- *One-way streets should be avoided* where possible.

Chapter 6: Pedestrian and pavement design

6.1. Pedestrian vision and strategy

Pedestrians are at the top of the hierarchy of movement, and therefore the design of pavements, pedestrian paths and spaces for people take precedence over other street design elements. Pedestrian paths must be well connected to homes, local services and other uses. They must be and feel safe and easy to navigate. The following design principles should be adhered to:

- *Widths.* Pavements must be a minimum width of 2m (3m on primary roads) to allow for movement, with wider pavements in places where there is significant pedestrian footfall, such as town centres and outside of schools, and where there is additional street furniture. This can be reduced for short sections to 1.5m. On retrofit schemes you should seek to achieve a minimum of 1.5m pavement width. There is no maximum pavement width.
- *Materials.* Strong, durable, attractive, high-quality materials should be used where possible, including natural stone setts and flags, block paving and clay pavers. Asphalt should be avoided. Permeable paving can be used unless underground services are running beneath the pavement.

6.2. Continuous level surface streets

Level surface streets have no, or only a slight, kerb upstand, removing vehicle priority. Two types of level surface street should be used:

- *Pedestrian priority streets* These have no defined carriageway and pedestrian priority. These should be used on narrow and low trafficked streets. In residential areas this street type should only be used for mews style, or very low trafficked, streets and should use a different surface treatment to primary roads.
- *Delineated level surface streets.* A defined carriageway and pavement but with low or flush kerbs delineating an advisory pavement space. Asphalt should not be used for the carriageway, and road markings are not required, as the design of the carriageway should not imply that it is a space for vehicles only.

Chapter 7: Street trees

7.1. Why trees are important

Surrey County Council declared a 'Climate Emergency' in July 2019 and committed to plant a tree for every Surrey resident as part of a new tree strategy: *"By 2030, Surrey will benefit from 1.2 million new trees, with the right trees planted in the right place, including both urban and rural locations, and supported to grow to maturity."*

- Street trees are an invaluable means of achieving this aim, helping to create safer, healthier and more resilient streets. New developments are an excellent opportunity for creating new tree-lined avenues. Retrofit schemes allow us to regreen existing urban street. This is in line with the recommendations of the *England Tree Action Plan (DEFRA)*, the NPPF, the *Building Better Building Beautiful Commission (BBBBC)* and the new NMDC.

Street greening can:

- Improve air quality, absorb pollution and create a physical barrier from road pollution;
- Shade streets, help regulate temperature and reduce the urban heat island effect;
- Enhance biodiversity and ecological connectivity, creating habitat for wildlife;
- Intercept rainfall and increase infiltration, reducing pressure on drainage systems and recharging aquifers;
- Assist with traffic calming and speed control;
- Encourage physical activity, walking and cycling;
- Improve mental wellbeing and cognitive development;
- Enhance the appearance of streets, setting of buildings and help define public realm; and
- Increase property values.

7.2. *Adoption and planting*

All planting schemes within adoptable highways should be prepared with designers who have a deep understanding of planting in hard landscapes. Planting should follow the guidance in this chapter and the *Surrey New Tree Strategy*. The package should include a viable maintenance management plan which is subject to approval by the Highway Authority.

7.3. *Selection of street tree species*

The type of street trees selected should be native or appropriate to the area and should contain positive properties such as pollution absorption and shading. Selection should also factor in Surrey's future weather conditions of wetter winters and drier summers. *Surrey County Council's Tree Strategy* provides further guidance on suitable tree types for different contexts.

Small height (5-12m). Requires 10m³ to grow		
Latin name	***Common name***	***Description***
Prunus Royal Burgundy	Royal Burgundy	Purple leaves
Acer campestre var Elegant	Field Maple	Autumn colour
Liqustrum lucidum variegata	Chinese Privet	Evergreen
Corylus Colurna	Turkish Hazel	Large green leaves or red leaves
Medium height (12-17m). Requires 20m³ and a minimum width of 2m to grow		
Latin name	***Common name***	***Description***
Gleditsa tricanthos *Variance: Subnurst; Ruby Lace*	Honey locus	Yellow leaves
Koelreuteria paniculara	Pride of India	Flowers
Pyrus calleryanachanticleer	Ornamental pear	Autumn colour

Large height (17m+), Requires 30m³ and minimum width of 3m to grow		
Latin name	***Common name***	***Description***
Fagus sylvatica	Beech	Foliage native
Acer psedoplantanus varieties	Sycamore	Drought tolerant
Ginko biloba	Ginko	Pollution tolerant

Table 7.1 – Permissible tree species

7.4. Tree planting considerations

- The selection of appropriate species and ensuring planting occurs in appropriate locations will reduce the need for maintenance and ensure the long-term survival of street trees. Through careful design trees can be planted on almost all streets.
- Street trees should normally be planted 8m – 16m apart. The actual dimension will depend on factors such as the width of plot frontage, the length of parking spaces, location of overhead utilities and, critically, the proximity to streetlights.
- A coordinated approach should be taken when determining the layout of new trees and streetlights, however the former must not be dictated by the latter. Reference should be made to the guidance in *BS 5489 Code of practice for lighting of roads and public amenity* on the subject of integrating lighting and landscaping.
- Planting should reflect the surrounding or desired built form and character. Trees planted at even intervals on both sides of the street, with one species[19] to give a unified character may be appropriate on an avenue while a street with an informal layout may require irregularly spaced trees of mixed species.
- It is essential that adequate space is provided for the tree to grow and accommodate their typical canopy size. Advice should be sought from an early stage of design on height, crown spread and stem diameter to ensure these requirements of trees are fully factored into design.

[19] It is recognised that a mix of species should normally be provided for resilience and biodiversity (see the 10-20-30 rule), this should be weighed up against the importance of creating characterful streets, and diversity across a whole development should be considered. As a compromise, a mix of species of the same genus could be used.

7.5. *Appropriate tree planting locations*

Trees should be planted in, but are not limited to, the following locations. These are listed in order of preference:

Location	Notes
1. Within the carriageway, in build outs or at grade.	This will keep footways clear and continuous, providing traffic calming and visually break long rows of parked vehicles. On low traffic streets, such as mews, tree pits can be constructed at the same level of the carriageway.
2. Grass verges and 'leftover' green spaces adjacent carriageway.	On busier roads, a tree lined verge offers an effective way of separating the people and traffic and provides space for roots growth. A minimum 1 m verge is required.
3. Edge of footways	Where other options are not feasible, trees should be planted on the edge of the footway. A minimum clear width of 2m should be provided to allow space for wheelchairs and buggies, this can be reduced to a minimum of 1.5m adjacent to the tree. Tree pits, with a minimum dimension of 1m², must be provided. These must incorporate root barriers and deflectors to protect adjacent utilities and foundations.
4. Grass verges behind footway	Trees could be planted in verges, or hard spaces, to the rear of the footway where space exists and no other options are suitable. Where this land sits outside of the highway boundary, consideration should be given to the long-term maintenance strategy and the impact on the adjacent highway.

7.6. *Tree pits and root volumes*

- Tree roots need adequate volumes of soil in which to grow, along with access to nutrients, water and oxygen. Tree roots can also impact adjacent utilities and foundations of buildings. It is important to get the below ground design and specification right alongside choosing the right tree in the right place.
- Tree pits in hard surfaces should have a surface opening that is as large as the space allows but must be a minimum of 1m square. The pit should be left open and incorporate layers of ground cover planting. It should not be surfaced with paving materials. Initially the tree pit should be

filled with organic mulch to a depth of 50mm to 75mm, which will help the tree establish itself by regulating temperature, moisture and providing nutrients.

- Permanent ground cover planting should be added to the pit once the tree is established, species dependent. Dense, native planting, including shrubs, should be used on busy streets that will prevent litter accumulating and deter parking on the verge. Highly maintained, formal planting should be avoided in most situations to reduce the maintenance burden. Local residents could be encouraged to take an active role in planting and maintenance.
- Tree grilles should be avoided as these can accumulate rubbish. Where hard surfacing is required, permeable resin bound gravel, self-binding gravel or rubber crumb should be used.

Figure 7-1: Ground cover planting to street trees providing biodiversity and beauty (Credit - Create Streets)

Below ground, adequate space should be given for root growth. The volume of soil required depends on the tree size and species, so the available space below ground may dictate the tree selection. For example, a medium sized tree will typically require 12m³ of soil to establish fully, which may be difficult to achieve in many locations. In paved areas, it may be necessary to create more room for tree roots using structural soils and other load bearing systems. While these will help create excellent growing conditions, they are not always required so independent advice should be sought on the appropriate solution. The cost of these systems must not become a barrier to planting street trees. Such systems include:

- Structural soil systems. Structural growing mediums such as Amsterdam tree sand;
- Stockholm tree system. Structural soil using large stone aggregate;
- Crate and root cell systems. Proprietary systems, either plastic or concrete, that provide a structure to support pavements above; and
- Raft systems. Proprietary systems that provide a structural base that floats above the tree roots.

Further guidance on these systems can be found in the publication *Trees in Hard Landscapes*.[20] Reference should also be made to the *Surrey County Council tree strategy* and SuDS guidance.

- Trees, pits and verges could be linked together in a tree trench to maximise the available root volume. If combined with a structural solution, these trenches could be extended under paved areas, for example linking tree pits between parking spaces.
- Tree roots also need to be contained and deflected away from buildings and utilities through the use of suitable root barriers. Root deflectors should be used to guide roots down a minimum of 300mm to avoid damage to paving layers.

7.7. Protection and establishment of trees

Trees should have an appropriate level of protection for their environment. Bark protection is essential a tree's survival, especially for younger trees with thinner bark. Trees in publicly accessible areas must therefore have temporary light protection at their base. This includes hessian wrapping, bamboo wrapping or light duty mesh cages. In the permanent case, the primary method of protection should be through planting in appropriate locations and using an appropriate size of tree. The use of larger tree pits with low level planting offers an effective method of protection while bringing additional biodiversity benefits. In busier areas street furniture such as seating or raised planters should be used to provide a space efficient method

[20] TDAG (2014) *Trees in Hard Landscapes*

of protecting trees. Where no other methods of protection are feasible, and the tree is at risk from vehicle strikes, metal tree guards could be used. Consideration should be given in the budget to the maintenance and eventual removal of these, as the guard must be removed as the tree grows.

Figure 7-2: Trees and greening can soften streets and parking courts. L: Watercolour, Redhill, Surrey. R: Upland Road, Guildford, Surrey (Credit - Create Streets)

Street trees must be supported by stakes in the first few years of growth while root systems establish to protect them from strong winds and accidentally damage. The stakes must be embedded at least 60cm into the ground and secured to the tree. Plastic or rubber ties must be avoided as they need to be removed manually and can throttle the tree if left in place. Biodegradable ties, such as jute, should instead be used. The stakes and ties must be removed after 18 to 24 months. Root anchor systems could be used as an alternative to staking. These permanent support without the visual impact of stakes and do not need to be removed. However, they must be specified and installed by a specialist and can only be used on larger root balls.

Consideration should be given to irrigation of the trees. Irrigation rings, root drenchers or other suitable systems should be installed on trees in hard landscapes. These will allow effective irrigation of the root ball which is essential in the first few years after planting. Notices should be affixed to new street trees encouraging residents to water new trees with clear guidance on how to do so.

Fig 7-3: Street trees, Poundbury, Dorset (Credit - Create Streets)

Street trees are at particular risk of damage from continued use of salt as a de-icing agent which can damage soil quality and can cause management problems by encouraging the establishment of salt tolerant weeds. To reduce this risk, the following mitigations are recommended:

- Salt bins and salt dumps should be placed away from trees and shrub beds.

- The amount of de-icing salt used by maintenance teams should be kept to a minimum. Salt tolerant species can be selected if this cannot be avoided. Evergreen species and in particular conifers are especially susceptible to salt damage and grasses can be affected in the same way.
- Provide information to other parties who are likely to use salt (shop owners, local residents) and use of alternative materials such as calcium magnesium acetate (CMA), urea, and salt/grit mixes in pedestrian areas.
- There should be provision of slush disposal zones adjacent to planted areas with efficient drainage to remove salt laden water.
- Ensure soil cover in planting areas is of good quality and free draining to avoid water logging. This is particularly important where the planter is receiving surface run off as part of a SuDS scheme. If the tree pit is receiving runoff from the highway, this could be diluted with other runoff to provide dilution and reduce salt concentrations.

7.8. Existing trees and hedgerows

Existing healthy and well-formed trees and hedgerows should be retained or moved if compromising an urban layout as specified in this guide. As well as protecting existing biodiversity and assisting with biodiversity net gain (BNG) targets, established trees provide beautiful natural features that will enhance new developments.

Through good design practices trees and hedgerows can be integrated into, and enhance, the development. To achieve this, designers should follow the guidance in *British Standard 5837 – 2012* and the following additional requirements: [21]

- When pavements are proposed within tree root protection zones, a non-dig, permeable paving solution will likely be required to avoid loads being transferred to the soil and roots and prevent over compaction of soils. This may result in roads and pavements being raised over existing roots.
- Excavations under tree canopies, if needed, must be done by hand. No root over 25mm in diameter should be severed. Tree removal and replacement planting may be required if substantial root loss occurs.
- Existing trees within proposed visibility splays must be retained. Where there is a conflict the location and design of junctions should instead be revised. Considering the location of trees early in the design process will mean that such conflicts are avoided.

[21] BSI (2012) *BS 5837 – 2012 Trees in relation to design, demolition and construction*

Trees adopted by Surrey County Council Highways have been assigned a financial value using the *Capital Asset Value for Amenity Trees* (CAVAT) methodology.[22] The council will seek full compensation as per the CAVAT assessment for any removal of, or damage to existing highway trees. It should be noted that costs can be significant. An average mature oak can be valued at approximately £100,000 when using this method, and even a small ornamental tree would be valued at £3,000.[23.]

7.9. Safety implications for trees and planting

Poor siting of trees and poor species selection could have safely implications and lead to damage of property. However, safety implications should not be used as an excuse to not incorporate trees and greenery and there will always be a suitable method of introducing greenery to streets. The following requirements should be noted:

- Most planting, including trees, is permissible within visibility splays, but it should not obstruct visibility within a zone between 0.6m to 2.1m above ground level. This means ground cover planting and low-level shrubs can be used, and trees must have a clear stem height (the distance between the lowest branch and the ground) of 2.1m.
- Trees should not have branches or foliage below a height of 2.3m on a pavement / cycleway or 5.1m on the carriageway and areas of parking.
- Poor species selection can cause various long term safety issues. For example, species with invasive surface rooting and / or suckering can cause damage to private as well as highway structures and should not be used. The approved species listed in this guide must not be deviated from unless a rigorous assessment is undertaken by a qualified landscape architect or arborist. In all cases, the species selection must be undertaken by a qualified professional.

[22] London Tree Officers Association (LTOA): https://www.ltoa.org.uk/resources/cavat

[23] Surrey County Council (2016) *Highways and Transport Asset Management Strategy Section 8.11 – Arboriculture*

7.10. *Utilities and trees*

Conflict between tree roots and underground utilities is a common issue but can be easily mitigated through good design and construction practices. Best practice is set out in the latest *National Joint Utility Group (NJUG) guidance*[24], and the TDAG publication *Trees in Hard Landscapes.*[25] The following requirements must also be followed:

- Co-ordination of services with tree planting proposals must be undertaken at an early stage. Consideration should be given to the layout of services near trees, shrubs and pinch points within the carriageway.
- Excavation for the maintenance of services can disturb trees. It is recommended that common utility corridors are provided and that services are laid in ducts to reduce the need for excavation later.
- Where there is a risk of tree and vegetation related subsidence, flexible construction of pipes should be used to accommodate any ground movement.
- Where existing trees are present, services should not be laid within root systems. Where this is unavoidable, they must be laid in ducts beneath the root system to avoid future excavation and subsequent damage to trees.

7.11. *Tree maintenance and adoption*

All planting schemes within adoptable highways ensure that the proposal conforms with the context of the guidance in this chapter and Surrey County Council's Tree Strategy[26]. The package should include a detailed and viable maintenance management plan which is subject to approval by the Highway Authority.

The tree strategy documents provides detailed information about the Authority's approach to tree maintenance and additional information on best practice for new tree maintenance can be found at the Woodland Trust[27] and the publication Trees in Hard Landscapes.[28]

[24] NJUG (2007) Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees
[25] TDAG (2014) Trees in Hard Landscapes
[26] SCC (2020) Surrey's New Tree Strategy
[27] https://www.woodlandtrust.org.uk/plant-trees/advice/care/
[28] TDAG (2014) Trees in Hard Landscapes

Provision must be made for five years of comprehensive aftercare for the establishment of trees which must include replacement for any dead trees and weed control. This is to be followed by a management plan for new planting and commuted sums put in place for a further 20 years.

The local community should be encouraged to take some ownership of new trees and participate in maintenance, especially watering trees while they establish. This will reduce the long-term maintenance cost and reduce the risk of vandalism of new trees.

7.12. Planters

These are useful in places where it is difficult to plant a tree, particularly in dense built-up areas with little green space. They should be made out of good quality material that reflects the local character – wood is particularly encouraged – and should be large enough to allow for the growth of the tree or shrub. Planters can also be used as an attractive way to close off a street to traffic, in place of bollards. Planters must be placed to leave a clear pavement width of 2m. This can be reduced to 1.5m over short distances.

Planters also require frequent maintenance and irrigation, and so should only be used where there are no other feasible options, such as above a basement or podium slab, or where there is a very high concentration of below ground utilities, or if a temporary solution is required. It must always be a priority to plant into the ground. The highways team could work with residents, businesses, schools, and other organisations to assist in the watering and maintenance of any planters, especially while the planting is becoming established. This will require early community engagement and relationship building but can reduce ongoing costs.

7.13. Grass verges, shrubs and ground cover planting

Planting within roadside verges and pavements is an important means of maximising the benefits of greenery and making the best use of available land. The conventional, neatly mown, ornamental grass verge must not be a feature of new developments. Instead, opportunities should be taken on all green spaces, however small, to maximise biodiversity and introduce a wide mix of species, including flowering plants. Opportunities should also be taken to rehabilitate existing verges, ditches, and green spaces to maximise biodiversity and introduce a wide mix of species, including flowering plants.

Guidance on planting these areas is set out below:

- For new verges, a species rich or wildflower mix, appropriate to the local soil and environmental conditions should be used to establish ground cover. Over time, a suitable native plant mix will become established, providing that good management practices, such as limited mowing, are followed. Further guidance can be found in *The Good Verge Guide.*[29]
- Perennial species should be used to ensure longevity and reduce ongoing maintenance. Annual species must not be used unless as part of an agreed and funding maintenance plan.
- Grass should not be used where pedestrian use is likely to be high, hard surfacing or robust shrubs will be more appropriate in these locations. Reinforced grass can be used to strengthen grass verges in these situations.
- Amenity grass should only be used in accessible recreational areas, such as parks or parklets, or areas for sitting and gathering. It should not be used for verges or purely ornamental reasons.
- Grass requires good quality topsoil usually to a depth of 100-150mm. Wildflowers usually require 25-50mm of topsoil to successfully grow.
- Maintenance or construction work taking place on grassed areas should be in line with the DfT reinstatement guidance and must ensure replacement of the existing turf or re-seeding with the same, or more appropriate species mix.[30] Protective measures will be required to reduce impact and damaged areas must be returned to their previous condition.

Provision must be made for five years of comprehensive aftercare for the establishment of trees which must include replacement for any dead trees and weed control. This should be followed by a management plan for new planting and commuted sums put in place for a further 20 years.

The local community should be encouraged to take some ownership of new trees and participate in maintenance, especially watering trees while they establish. This will reduce the long-term maintenance cost and reduce the risk of vandalism of new trees.

[29] Plantlife (2016) *The good verge guide*
[30] Department for Transport (2019) *Specification for the Reinstatement of Openings in Highways (Fourth edition)* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/782183/reinstating-road-after-street-works-statutory-code.pdf

Narrow verges that are a result of 'space left over from planning' (SLOAP) must be avoided. They are difficult to maintain and often become neglected. Verges that demarcate pavements from carriageways should be a minimum of 1m and very short lengths should be avoided. Smaller areas can function effectively as small SuDS features, such as rain gardens. Surrey County Council supports the Blue Campaign which encourages residents identify local grass verges that are suitable for rewilding by the Council. Further details of the scheme can be found on the Council's website.[31]

Figure 7-4: L: Roadside planting in Ripley, Surrey (Credit – Create Streets), R: Wildflower Verges, Easton Road, Bristol (Credit - Sam Saunders CC BY-SA 2.0)

[31] https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/trees-grass-and-hedges/grass/the-blue-campaign-increasing-biodiversity-in-grass-verges

Chapter 8: Sustainable drainage systems (SuDS)

8.1. Introduction

SuDS are designed to mimic natural drainage systems and are more resilient and cost effective than conventional drainage methods. Surrey, like the south-east of England more generally, is at increasing risk of water stress, rising temperatures and flooding. Sustainable water management plays an essential role in alleviating these risks as well as helping meet wider climate resilience aims. SuDS also help placemaking strategies and deliver wider benefits. They must be considered from the earliest stages of the design process. Well-designed SuDS can:

- Significantly reduce surface water runoff, reducing the pressure on sewage and drainage infrastructure thereby reducing sewages spills into watercourses;
- Reduce the risk of flooding and provide resilience to future climate change;
- Improve water quality through filtration and natural breakdown of pollutants;
- Assist with groundwater recharge;
- Help create greener, calmer, more beautiful streets;
- Bring redundant areas of hard surfacing or highways land into productive use;
- Be more cost effective than traditional hard engineered drainage solutions; and
- Enhance biodiversity and provide urban greening.

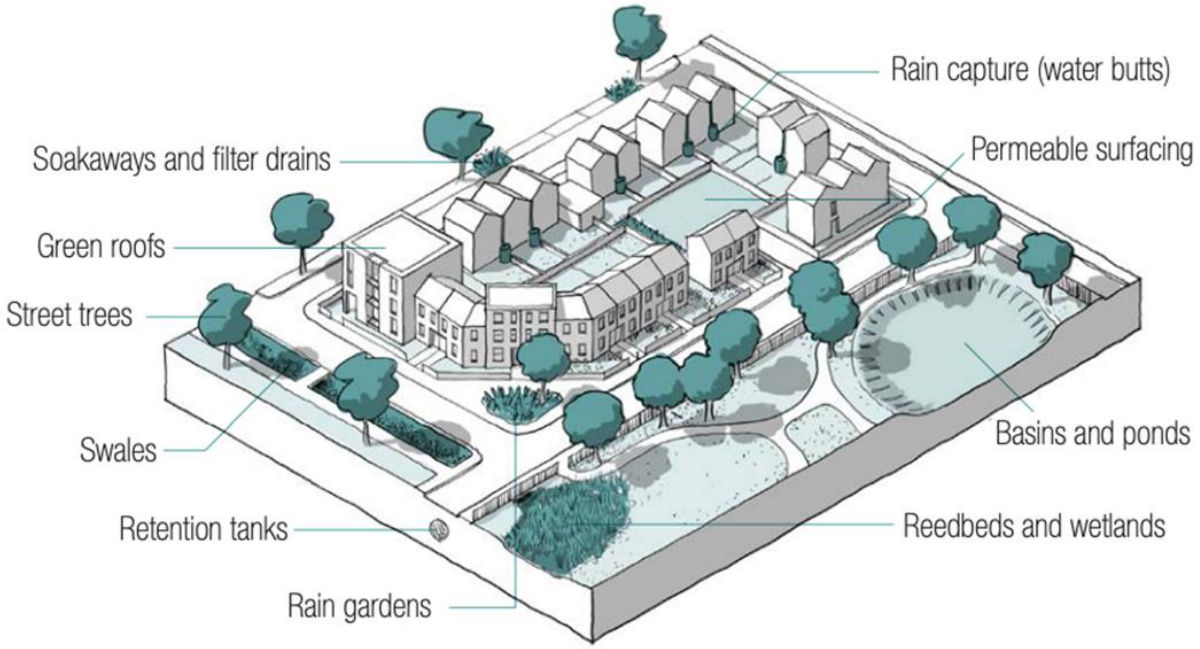


Figure 8-1: Some of the variety of forms and features of SuDS (Credit - NMDC)

8.2. Design principles for SuDS in Surrey

Specific designs will differ by location and will reflect the local context, site layout, local topography and geology. Detailed design guidance is available on the Surrey County Council *SuDS Design Guidance* website. However, all planning and design of SuDS must:

- Be designed to accord with EA long term flood risk EA long term flood risk assessment, CIRIA guidance, Defra non-statutory technical standards and the appropriate District or Borough Local Plan;
- Manage surface run-off as close to the source as possible;
- Follow Surrey County Council's sustainability hierarchy (see figure 8-2); and

- Consider the effects of climate change, such as increased rainfall intensity, in line with current Environment Agency and SCC guidance.

Sustainability Level	SuDS Technique	Flood Reduction	Pollution Reduction	Wildlife & Landscape Benefit
MOST SUSTAINABLE (PREFERRED)	**Green/Living Roofs & Walls**	✓	✓	✓
	Infiltration: Infiltration trenches & basins Soakaways: (standard or crate system)	✓	✓	✓
	Filter strips and Swales	✓	✓	✓
	Basins and ponds: Wetlands Balancing Ponds Detention Basins Retention Basins Conveyance swales	✓	✓	✓
	Permeable Surfaces & filter drains: Gravelled areas Porous paving	✓	✓	
LEAST SUSTAINABLE	**Tanks & Piped Systems:** Crated Attenuation Tanks Oversize pipes	✓		

Figure 8-2: Sustainability Hierarchy for SuDS selection (Credit - SCC)

SuDS must be designed with multifunctionality in mind from the start. They must follow the four SuDS objectives to enhance:

- *Water quantity:* to control the rate and volume of runoff, preserve the water cycle and reduce flood risk.
- *Amenity:* create and sustain better places for people, through the introduction of greenery and water features.
- *Water quality:* manage the quality of runoff and prevent pollution of watercourses.
- *Biodiversity:* to create and sustain better places for nature by including planting and habitat niches that respond to surrounding ecological conditions.

8.3. SuDS management train

At the heart of the SuDS philosophy is the 'management train' approach. A sustainable drainage system should be thought of as a series of sequential components, rather than a single standalone solution. Different components will have different, although sometimes overlapping, functions that together deliver the required performance in terms of water quantity and quality, as well as the amenity and biodiversity benefits.

Component choice will be determined by a site's characteristics and layout. The use of multiple components will maximise the potential to intercept and treat runoff as well as opportunities for good design. This contrasts with a conventional drainage system that would rely on single 'end of pipe' solutions such as large tanks or even ponds to provide storage and pollution control. The principles of the management train are set out below:

- *Prevention:* Designing to reduce the impermeable area that needs positive drainage, and good management to ensure that pollutants don't enter the drainage system in the first place.
- *Source control:* The first, and most important, components in the SuDS management train. These should be located at the source of the runoff and be designed to provide initial rainfall interception and pollution control as well as storage. Examples include rain gardens, green roofs, harvesting, permeable paving and filter strips. Providing runoff control and storage at this stage will reduce the scale and cost of downstream components. In some schemes, such as SuDS retrofit, it may only be feasible to provide source control measures.
- *Conveyance:* Components that convey flows downstream to storage systems. This includes swales, channels and rills. Conventional piped systems should be avoided if feasible and should be kept short and direct if required. In contrast to conventional drainage, SuDS conveyance components are design to be slow and leaky. This helps intercept rainfall, through infiltration or uptake by plants, and remove pollutants. Conveyance features can also provide volume control, for example using check dams in swales.

- *Site Control:* Components that provide the remaining storage volume, and infiltration capacity, for a site. Such components include balancing ponds, storage tanks, detention basins, infiltration features, etc. These components would then discharge water to a watercourse, sewer or groundwater.
- *Regional Control:* Some storage volume may need to be provided in larger scale regional systems that serve multiple sites. However, where such systems are feasible, the focus should remain on controlling as much runoff at source as possible.

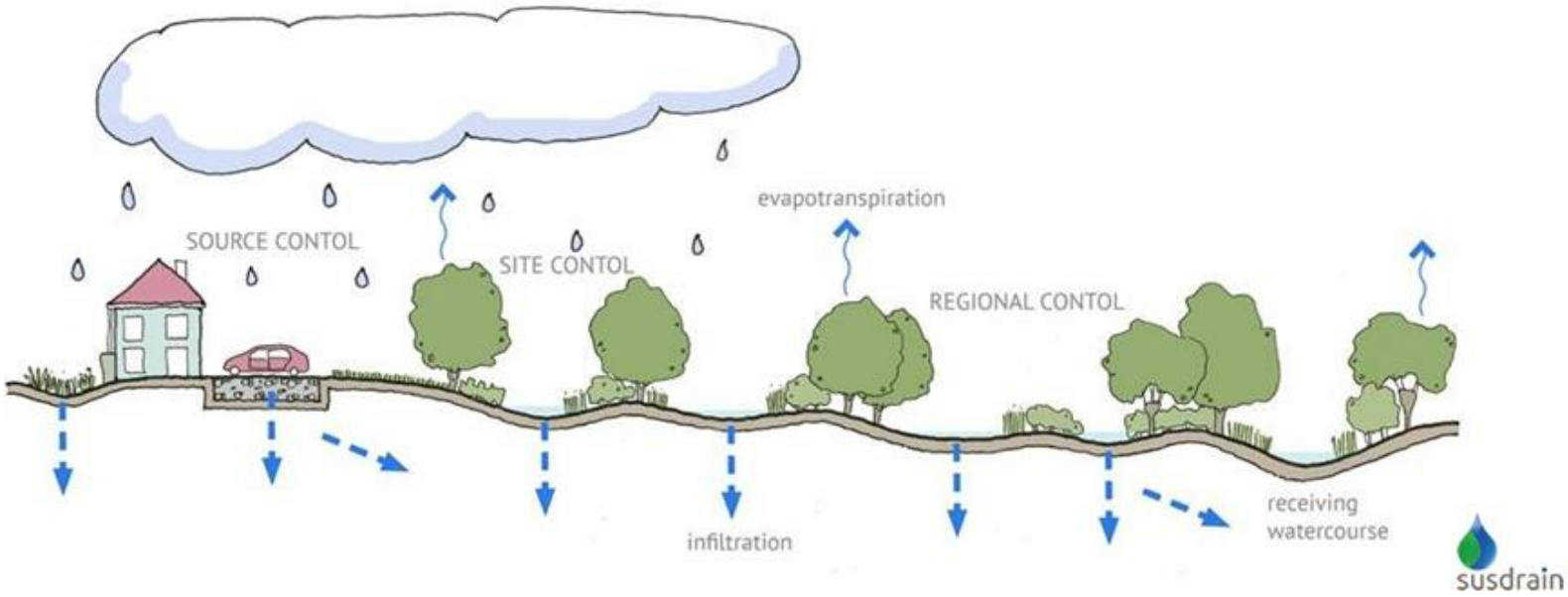


Figure 8-3: SuDS Management Train (Credit - Susdrain)

8.4. *Location of SuDS features*

SuDS should be integrated organically and attractively, such as in the form of public spaces, verges or linear parks. SuDS should be integral parts of the streetscape, not hidden away on the edges of developments.

It is essential to consider the layout of the SuDS system from the outset as part of the site planning process, taking account of site levels and existing flow paths, rather than later in the design process when the site layout is mostly fixed. Following existing levels and flow paths will lead to more efficient drainage systems, reduce the need for deep excavations for below ground infrastructure, avoid the need for pumping, and reduce flood risk.

8.5. Exceedance and flood risk

The layout should also consider flood flow paths in the event of a failure of any part of the system. While systems will be designed to a high level of performance, typically 1 in 100 years plus a climate a climate change allowance, there is still a risk that capacity will be exceeded or that there will be a failure such as a blockage. SuDS systems and site layouts should be designed to be resilient against flooding by ensuring that flood flow paths are directed away from buildings and vulnerable infrastructure.

Designers should refer to the Environment Agency's Risk of Flooding from Surface Water mapping, and Surrey County Council flood maps, to establish the existing flood paths and areas of surface water flood risk.[32] The Environment Agency's Digital Terrain Model (DTM), based on LiDAR surveys, is also a useful tool in establishing existing flow paths and minor watercourses.[33]

8.6. Choice of SuDS for streets

The choice of SuDS features will be influenced by the site location and must also factor in SCC's sustainability hierarchy (see above) which sets out a preference of methods based on sustainability. The types of SuDS features that should be considered as part of street design in both retrofit and new schemes listed below:

[32] https://www.gov.uk/check-long-term-flood-risk

[33] https://data.gov.uk/dataset/fodb0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme

SuDS Feature	Description	Specific Design Considerations
Green Roofs	Lightweight green roofs can be installed on structures, such as bus stops, bin and bike stores, etc. These incorporate a thin layer of soil and vegetation which helps to intercept rainfall, as well as enhancing biodiversity.	• Roofs should be designed to be low or zero maintenance. • Planting should be locally appropriate with a variety of flowering species. Sedum roofs should not be used. • An adequate soil depth and a reservoir board layer must be included to maintain moisture.
Permeable Surfaces	The use of permeable surfaces throughout a development can be space efficient, avoiding the need for overly engineered drainage solutions and increasing land for housing or open space. Permeable surfacing can be used in most contexts, depending on the surfacing system used.	• Must be designed in accordance with materials guidance in this document (o). • Must not be laid over any existing or proposed services wherever possible. • Materials should compliment the palette of neighbouring non-permeable materials to create a coherent streetscape. • Must be designed in accordance with the local ground conditions. • The porous sub base should be fully lined and include a connection to the drainage system. Unlined systems, those that allow infiltration into the sub-grade below, should be avoided unless no other solution is feasible. In all cases a geotechnical expert must be consulted.
Rain Gardens	These are landscaped areas that intercept rainfall and allow it to soak into the ground	• Must be relatively shallow with gentle slope.

	below or be slowly released into the drainage system. They are an ideal feature to use on new and existing streets, particularly in verges and any left-over spaces.	• Must provide above ground storage and be set at least 200mm below the adjacent paving level. • Must be protected from vehicles through use of kerbs of other methods. • Planting should be locally appropriate with a variety of flowering species.
Swales and Ditches	Swales are shallow, vegetation lined channels that collect and convey runoff, typically running alongside streets. They slow the flow of water, cleaning it in the process. Swales and ditches can be dry or contain a permanent water level. They are typically grassed but can contain larger planting where appropriate.	• Must be accessible for maintenance, such as mowing. • Should ensure a gentle slope profile, typically not steeper than 1 : 3. • Planting should be locally appropriate with a variety of species. • Should be protected from vehicle overrun.
Filter Strips and Verges	Filter strips and verges are gently sloped areas that can slow surface run-off are very effective at filtering pollutants. Runoff from the filter strip will be normally collected by a French drain, swale, or other linear feature.	• Must be accessible for maintenance, such as mowing. • Should be protected from vehicle overrun. • Must be at least than 1m wide, ideally more than 2.5m. However, special requirements must not impact on urban design and layout considerations.
Channels and rills	Channels, often constructed from cobbles or setts and running down the middle of a street, are an effective method of conveying surface water on narrow urban streets.	• Should be constructed from durable, attractive high quality materials such as natural stone. • Rills should be planted to enhance visual amenity and improve water quality, using locally appropriate species.

	Rills are deeper channels, typically with a permanent water level and planting, also effective for streets where space is constrained.	
Tree Pits	Tree pits can be designed to receive additional runoff from adjacent paved areas, reducing runoff and removing pollutants.	• Must be designed in accordance with the requirements of Chapter 6. • Must not be allowed to become waterlogged. The infiltration capacity of the soil must be assessed, and positive drainage provided if possible.
Attenuation Ponds and Basins	Ponds and basins are a very effective way of providing attenuation volume and removing pollutants as well as amenity and biodiversity. Multiple ponds can be linked together to spread the benefits around a site. Smaller ponds can be integrated into streets and squares, such as by creating a 'village pond', and they can be soft or hard landscaped. Large, single features should be avoided. Basins are normally dry and only flood in extreme rainfall events, and can be used for other functions, such as play. Where ground conditions permit, basins can drain via infiltration into the soils below.	• Must be downstream of other SuDS features, as part of the management train, and not used as an 'end of pipe' feature. • Should not be allowed to conflict with good density and layout principles. Through careful design it should be feasible to accommodate ponds in denser developments. • Should be multifunctional and provide additional amenity benefit and be integrated into the landscape. • Have due regard to safety and be protected from vehicle overrun.

Soakaways	Soakaways allow infiltration into the ground, they are constructed as either gravel filled pits or trenches, concrete rings surrounded by gravels, deep boreholes or by using proprietary crate systems.	• Must be downstream of other SuDS features to provide pollution control, as part of the management train. • Must situated 5m from any building foundation, increasing to 15m in chalk areas. Specialist advice must be sought where soakaways are required in chalk. • Must be designed in accordance with CIRIA[34] or BRE[35] guidance as well as SCC guidance.
Rainwater Planters	These are a low cost and low maintenance form of SuDS which can be used to collect roof drainage from new or existing buildings, providing a dual function of greenery and interception of rainfall. They are particularly appropriate on constrained sites and high streets.	• Planting should be locally appropriate with a variety of flowering species. • Must connect into existing or new downpipes. • Must incorporate a flow control device and overflow • Must use quality, durable materials.

Table 8.1 – Types of SuDS for streets

[34] CIRA (1996) R156 - *Infiltration drainage - manual of good practice*
[35] BRE (2016) DG 365 Soakaway Design

Figure 8-4: An example of SuDS retrofit which incorporate on-street parking, Grangetown, Cardiff and Mile End, London (Credit - Create Streets)

Fig 8-5: Left over areas grass can be re-purposed into rain gardens with wildflowers, Blackdown Close, Woking, Surrey (Credit - SCC)

Figure 8-6: Landscaped, Watercolour, Surrey (Credit - Create Streets)

Figure 8-7: Rill in Riverside Court, Stamford (Credit - Susdrain)

Figure 8-8: Cobble channel in narrow street, Lewes, Sussex. Note the lateral channels directing flows from RWPs. (Credit - Create Streets)

Figure 8-9: Attenuation pond acting as a focal point for adjacent homes, Alconbury Weald (Credit - Create Streets)

8.7. SuDS maintenance

As SuDS should be integrated into the landscape and streetscape, their maintenance can often be managed through landscaping plans. This could include grass cutting, inspections of inlets and outlets, silt control and erosion repairs. The long-term maintenance of a structure must be determined at the earliest stages of the design process and should be discussed with SCC SuDS team at the pre-app stage. The typical maintenance requirements of SuDS features are provided in the CIRIA *SuDS Manual*[36].

SuDS should be designed to be shallow as this will allow simple inspection and maintenance without the need for specialist equipment and training. Complicated, proprietary, or bespoke systems should be avoided.

[36]

The selection of an appropriate and varied mix of species for planting is also an important consideration for future maintenance and effectiveness of SuDS features. The selection will depend on the specific characteristics of the SuDS feature and the local conditions, such as soil types, but planting:

- Must be able to tolerate fluctuation in soil moisture due to periods of drought and sudden inundation
- Should include ever green species that reduce leaf debris
- Must be semi-mature (where possible) with fibrous root systems to increase soil stability and assist with silt trapping.
- Must be pollinator friendly to support wildlife.

8.8. Adoption considerations

SuDS features can remain in private ownership, serving individual or multiple properties, be adopted by the water company. In the latter case, the SuDS feature must meet the definitions set out in the *Sewerage Sector Guidance documentation*[37]; it must be constructed for the drainage of buildings associated hard landscaping and convey water to a discharge point such as a sewer, watercourse or the ground. The drainage of some highway areas to such features can be permitted, but this cannot be the main function of the SuDS feature and early discussion with the water company is required. Reference should be made to the *Sewerage Sector Guidance and the UK Water SuDS brochure*[38]. Where the below ground surface water drainage system services private properties and highway drainage, the drains will be defined as sewers and will be adopted by the water company. SCC highways will only adopt the gullies, drainage channels, catchpits, etc. and the lateral connections to the main sewer.

SCC highways will only adopt SuDS features that exclusively drain highway land. The only exception to this those that accept a small amount of surface run off from the front elevations of private homes on dense urban sites where there is no other appropriate drainage solution. Otherwise, private surface water drainage must not connect to the highway drainage system.

The design of SuDS in a given area must comply with a drainage plan, which should be carried out early in the planning process. The adopting authority of a SuDS feature must also be established in the planning process or early in the detailed design stages agreeing any maintenance responsibilities and commuted sums.

[37] Water UK (2019) *Sewerage Sector Guidance Appendix C – Design and Construction Guidance*
[38] Water UK (2020) *Sewers for Adoption in England - A changed approach to surface water sewers*

8.9. *Drainage Materials*

All materials must be compliant with the Specification for Highways Works and be British Board of Agreement (BBA), Highways Authority Product Approval Scheme (HAPAS) marked. Plastic products must be avoided where possible. For example, products such as HydroRock can be used instead of plastic crates for attenuation storage.

Design drawings submitted as part of the technical approval process shall contain construction details for all infrastructure including:

- Layout drawings with manholes and pipe runs clearly referenced
- Longitudinal sections of all main runs
- Full pipe and manhole schedules, including diameters, material, depths, load class, etc.
- Details of gullies, channels, etc.
- Construction details, where standard details are not used.

8.10. *Ordinary watercourses*

Where drainage works involve any ordinary water course i.e. highway ditch, stream then the Developer must obtain Ordinary Water Course consent from Surrey County Council as the Lead Local Flood Authority (LLFA). Examples would be where a section of open ditch is to be piped as a culvert due to a new bell mouth crossing over the water course.

Chapter 9: Street furniture, lighting and signage

As few physical interventions in the street, known as street clutter, should be made as possible. Lighting, signage and EV charging should be fixed onto structures or combined onto one pole where possible.

9.1. *Streetlights*

Most streets with regular movement of people should have appropriate street lighting that is evenly distributed to ensure these are safe and attractive. Pedestrian and cycle only routes must be lit to encourage safe sustainable transport modes at all times of year and reduce crime and the fear of crime.

Lighting provision will differ between urban and suburban or rural context and there may be instances in rural conservation areas where no highway lighting is required although this is dependent on consultation with the local planning authority. Heritage style street lighting columns and luminaires can improve the appearance and character of a street and can be used subject to agreement with the SCC team.

Ecological considerations are required to ensure urban lighting has a reduced impacts on nature and wildlife. In ecologically sensitive locations (e.g. adjacent to hedgerows or woodland) an ecologist must be consulted to advise on site-specific mitigation strategy and dark corridors may be preferred.

9.2. *Location of streetlights*

Lighting should be located to provide maximum lighting where it is most needed. Typically, this includes junctions, roundabouts, speed controls and crossing points to ensure the safety of pedestrians.

Streetlights should be placed to leave a minimum of 2m of pavement clear, but this can be reduced to an absolute minimum of 1.5m if limited space is available. Streetlights can also be fixed onto buildings to prevent street clutter, this is particularly appropriate on high streets (Street Type 2) or tertiary streets such as alleys or mews (Street Type 5)

Lighting must not be placed where they may obstruct pedestrians or cyclists. When positioned adjacent to cycle paths there must be a minimum set back of 0.5m to avoid obstruction to handlebars as per ILP TR23 Lighting for Cycle Tracks.

Care must be taken to avoid annoyance being caused by stray light (see the *Institute of Lighting Professionals (ILP) Guidance Notes*).[39] Locating a column in line with a party boundary, combined with the use of modern optics, may reduce or prevent nuisance from stray light. In residential areas

[39] https://theilp.org.uk/resources/#guidance-notes

the positioning of lighting close to the gable centres of properties should reduce light interference, but all sites should be assessed on a case-by-case basis.

9.3. Technical specification for lighting

Street lighting must meet the requirements outlined in the *Surrey County Council Street Lighting Developer's Brief* and associated specification documents. Milestone (formerly Skanska) are responsible for the maintenance and installation of all adopted streetlights and as such must design or check street lighting for section 278 or 38 agreements. [40]

The following requirements should also be noted:

- No adoptable lighting can be installed onto buildings unless agreed with the Authority in writing prior to installation and shall only be adopted upon submission of relevant wayleaves allowing the Authority the right, in perpetuity, to provide power, across said private property if required, install, operate, maintain, remove, affix signs, displays and notices, and provide sub-feed to adjacent equipment, across said private property as and if required.
- Sustainability is an essential factor in lighting selection. Guidance outlined in the Carbon Reduction Commitment Energy Efficiency Scheme (CRCEE), Energy Using Products Directive (EuP), Climate Change Act (2008) and Energy Act (2008) should be consulted. All new lighting must be LED.
- Light spillage can be avoided by adjusting lantern tilt and limiting light angles to less than 70°. Higher mounting of lights can also be beneficial to avoiding light spillage.
- Lighting near to or above the horizonal should be avoided to reduce glare. In rural areas full horizontal cut off luminaires installed at 0° uplift will minimise intrusion on surrounding areas.
- The colour temperature for lighting should be 3000K or under for high traffic areas and between 2200K – 2700K for low traffic and pedestrian areas. Sudden changes in lighting are problematic for partially sighted people.

[40] Surrey County Council (2021) *Developer Street Lighting Notes and Specifications (https://www.surreycc.gov.uk/roads-and-transport/roadworks-and-maintenance/street-lights-traffic-signals-and-signs/street-lights/specification-and-adoption-details-for-street-lights-in-new-developments)*

9.4. *Street furniture and signage*

- As few physical interventions in the street, known as street clutter, should be made as possible. Opportunities should be taken to reduce and rationalise, for example by integrating furniture, such as post boxes, into buildings, and only using signs where strictly necessary.
- Where signs are required, they should be attached to buildings or other structures, such as lamp posts, or grouped to reduce the number of posts required.
- Signage must be of a scale and appearance that is appropriate and in keeping with the local character. Street nameplates must be provided, but should be positioned on all corners, ideally mounted on buildings.
- Street furniture should also be in keeping with its environment. It should not impede pedestrian movement in the street and should aim to improve the street visually. It must not obstruct the pavement or reduce width below 1.5m, and only for a distance of no more than 6m, and where possible items should be placed within a 'furniture zone' to provide a continuous full width pavement. This should factor in buffer space around an object to allow for the 'footprint in use' which results from intended or unintended use.
- In urban areas and town centre conservation areas street furniture should be painted black, while timber furniture may be more appropriate for rural context. Further guidance on the appropriate appearance of furniture and street signage in rural settings can be found within the Surrey Hills Environmental Design Guidance. [41]
- Street furniture must be placed where it will provide the must utility, for example when placing benches, consideration should be given to where people will find it most comfortable to sit. This is generally at the edges of public spaces, not backing on to busy roads, close to shops and amenities, or simply somewhere with a good view.
- Street furniture such as cycle racks, planters and bins can serve a useful dual purpose by preventing vehicles encroaching onto pavements in combination and providing narrowing of the carriageway. In these locations, the furniture may need protecting with bollards. Containment

[41] Surrey Hills AONB (2019) *Environmental Design Guidance*

kerbs, high edge kerbs (140mm or more) or boulders in rural settings can also be used. Pedestrian guardrails must not be used to separate the pavement and the carriageway, instead softer and more permeable solutions, such as trees and greenery, should be used.

Figure 9-1: Public benches along a waterway and street signage in Shere, Surrey (Credit - Create Streets)

9.5. *Technical design specification for signage*

The council has fully adopted the latest version of *Specification for Highway Works* and *BS 873* in its requirements for temporary and permanent signage. Further guidance on the size of traffic signage is available in the *Traffic Signs Manual* (TSM)[42] and the *Traffic Signs Regulations and General Directions* (TSRGD).[43] The following additional requirements should be noted:

- The use of yellow or grey backing boards behind signs should only be used when essential to road safety. Signs should only be illuminated if specifies in the TSRGD as a legal requirement. This type of signage is usually used as a last resort, and no new development should require it as it would only be used where conditions are dangerous.
- Where signs are fixed to structures or buildings there must be an absolute minimum clearance above pavement of 2.1m (2.4m for cycleways) and 0.45m clearance to kerb. In rural settings signs should be mounted below adjacent hedges or walls to reduce visual impact.

9.6. *Technical design specification for bollards*

- The selection of bollards must reflect their setting especially in heritage or rural contexts. Bell bollards are present in Surrey towns centres and could be appropriate in certain contexts. Bollards can be integrated with EV charging or street signs to reduce street clutter. With the exception of bell bollards, heights should be between 700 – 1000mm.
- They must not be joined with chain or ropes to avoid obstruction to pedestrians.

[42] DfT (2018) *Traffic Signs Manual*
[43] HMSO (2016) *The Traffic Signs Regulations and General Directions 2016*



Figure 9-2: L: In urban contexts black / cast iron bollards are preferred (Credit - Create Streets)
Centre: Bell Bollards can also be used. (Credit – Mike Kirby CC BY-SA 2.0)
R: Wooden posts are appropriate in rural and suburban contexts (Credit - Create Streets)

Bollard placement standards	
Minimum distance from kerb face	450mm
Recommended distance between bollards to prevent vehicle access	1,200mm
Recommended distance between bollards for stopping vehicles from mounting the footway.	3,000 mm centres across the width of footway

Table 9.1: Bollard placement standards (Credit - adapted from TFL Streetscape Guidance, 4th edition, 2019)

9.7. *Electric Vehicle (EV) charging*

EV charging is a rapidly developing technology, and all developments must be planned to accommodate EV charging. Surrey County Council will seek to ensure that connection points are installed in line with emerging technical requirements and open standards. This guidance acknowledge that technology will continue to develop. This guidance applies to all new build (residential and commercial) development, and it is acknowledged that the retrofitting of EV chargers could require a more site-specific approach to design. This should be discussed with SCC on a case-by-case basis but should make best use of this guidance.

The following provisions should be made for EV chargers in developments in Surrey:

- Charger provision should be in keeping with the requirements outlined in the SCC Parking Guidance[44] and the SCC Electric Vehicle Strategy[45]. For commercial developments 20% of unallocated parking bays should have an active charge point and an additional 20% of spaces should be provided with cabling and supply.
- For new housing developments with garages and off-street parking, each dwelling should have an on plot fast charge point, this should typically be wall mounted.
- Car club spaces should have one fast charging point per bay

[44] Surrey County Council (2021) *Vehicular, Cycle and Electric Vehicle Parking Guidance for New Development*
[45] Surrey County Council (2019) *Electric Vehicle Strategy*

9.8. EV charging equipment selection

There are three main categories of charging equipment currently available:

Type of charge point	*Typical power output*	*Typical charging time*	*Typical application*
Slow	3kW	6-10 hours	Residential and workplace locations
Fast	7-22kW	2-4 hours	Retail, leisure, public, car clubs
Rapid	>50kW	30-45 minutes	Public, fleet, car clubs, strategic highway network

Table 9-2: EV charging equipment categories

There are different types of charger available, the use of which will depend on the location and context:

- *Pillar points* (rapid / fast charging)
- *Lamp post charging point* (slow)
- *Bollard / post / tree (arbor) mounted* (slow)
- *Wall mounted* (slow)

Slow charging points are not generally recommended for use on adoptable streets by Surrey County Council as this generally only suitable for 'top up' charging unless the vehicle is parked for 6-10 hours.

EV infrastructure must not be to the detriment of pedestrian, wheelchair or cycling users. The matrix below shows the hierarchy of approaches for integrating EV charging points into the streetscape, depending on street type. It also includes an 'alternative approach' if the preferred isn't possible and a 'back-up' approach if neither of the previous options are feasible. Additional guidance on appropriate EV charger strategies is outlined in the street types overview table (table 4.3). Options should also be assessed on a site-by-site basis and factor in:

- The available power supply
- The width of pavement and carriageway
- Adjacent land uses
- Volume of footfall
- Volumes and type of traffic flow EV charger matrix

	Primary Streets, High Streets, Secondary streets, Local streets and Tertiary Streets	**Residential mews / back streets and parking courtyard**	**Public car parks**
Preferred approach	If lamp posts are on the edge of the carriageway, lamp post mounted charging points (slow) can be used.	Wall mounted chargers (slow) are most appropriate.	Pillar points (rapid) should be used.
Alternative approach	Pillar points (rapid or fast) within build outs.	Bollard, post and tree mounted charging points (slow) powered by lighting column.	Bollard, post and tree mounted charging points (slow) powered by lighting column
Back-up approach	Bollard / post / tree mounted charging points (slow) powered by lighting column.	N/A	Wall mounted chargers (slow) may also be appropriate.

Table 9.3: Selection of EV charger types

9.9. *Location of EV charger equipment*

For on plot charging, private cables and pavement covers are not permitted to cross public pavements. New residential schemes must ensure that EV chargers are accommodated within the private driveway, this should be through the use of wall mounted chargers or within appropriately located charging points in parking courtyards.

For on street EV chargers, the following should be considered:

- Charging points must be clearly demarcated for this use and positioned in line with on-street parking guidance.
- Charging points must be located to provide access to the maximum number of cars. A car within a parking space is generally seen as chargeable if it is within 5m of a charge point.
- Ideally, charging points should be incorporated within kerb buildouts as this approach does not reduce pavement width, can help slow traffic, and can be combined with street trees and greenery.
- EV charging must only be incorporated into lamps and bollards when they are placed on the edge of the pavement and carriageway to avoid trailing cables.
- Where EV chargers must be located on the pavement, they should be set back a minimum of 450mm from the kerb edge. The positioning of EV chargers must not reduce pavement width below 1.5m between the charging point and adjacent building boundary, ideally a 2m distance should be maintained. For busier streets, such as high streets (Street Type 2), or areas of high footfall such as outside schools, chargers should be placed in a furniture zone (9.4).
- EV chargers should have front or side facing charging cables to avoid obstruction of pavement during charging. The location of charging points must be compliant with parking bay guidance outlined below.
- On new build schemes EV below ground infrastructure should be consolidated into service ducts (with a minimum 2m service margin from private dwelling or curtilage) for ease of access and maintenance.
- The location of EV chargers in heritage areas will require consultation with heritage officers.

Fig 9-3: Pillar points (rapid / fast) must be without build outs, not on pavements. They are also appropriate for use in car parks. (Credit - SCC)

Fig 9-4: Wall mounted points (slow) are spatially efficient and should be used for driveway charging or car parks and parking mews streets (Credit - Create Streets)

Fig 9-5: Lamp post chargers (slow) must only be incorporated into lamps when they are placed on the edge of the pavement and carriageway to avoid trailing cables across the pavement (Credit - Create Streets)

Fig 9-6: Bollard / post / tree mounted charging points (slow) can help reduce street clutter and may be appropriate in constrained locations (Credit - Ubitricity)

Chapter 10: Vehicle parking

10.1. Parking Principles

- Developments must be designed around people not the car. Parking demands within Surrey are set by boroughs and districts but we would encourage developments seeking to be car lite and provide smaller numbers of parking spaces. To achieve people focussed streets the location and design of parking is key. It will remain a challenge to create beautiful and sustainable places with high amounts of parking.
- Surrey is adopting a split parking provision for when more than one parking space is provided. One space should be provided either on plot or close to the home on street, while a second or third space is accommodated in a separate parking area such as a peripheral parking court, parking shed/barn. This should be more convenient to use than existing on street parking in surrounding streets to avoid residents using that instead, and developers will be expected to demonstrate this.
- Parking provision should respond to the standards set out in the relevant District and Borough guidance. We encourage boroughs and districts to transition to parking maximums and allow developments to use fewer spaces than existing guidance when supported by the community, good public transport and cycling provision and car clubs.
- Opportunities should be explored to reduce or entirely remove parking provision on a site-by-site basis through discussions with SCC and local districts and boroughs at the earliest stage possible. Reducing levels of parking provision will have a significant impact on the character of a street and releases land for public spaces, tree planting or additional homes. The reduction of parking spaces must not solely be relied on to reduce car use, proposed travel plans must reflect and support the aims to reduce parking provision and promote the use of more sustainable travel options.
- Car clubs are supported by SCC as a means of promoting sustainable mobility, reducing vehicle emissions and dependency on the private car. Research shows that for every 1 car club space provided an average reduction of 18.5 private parking spaces can be achieved.[46] Club parking bays should be well defined and located throughout the development.

[46] Enterprise Holdings (2021) *Future Mobility and new developments*

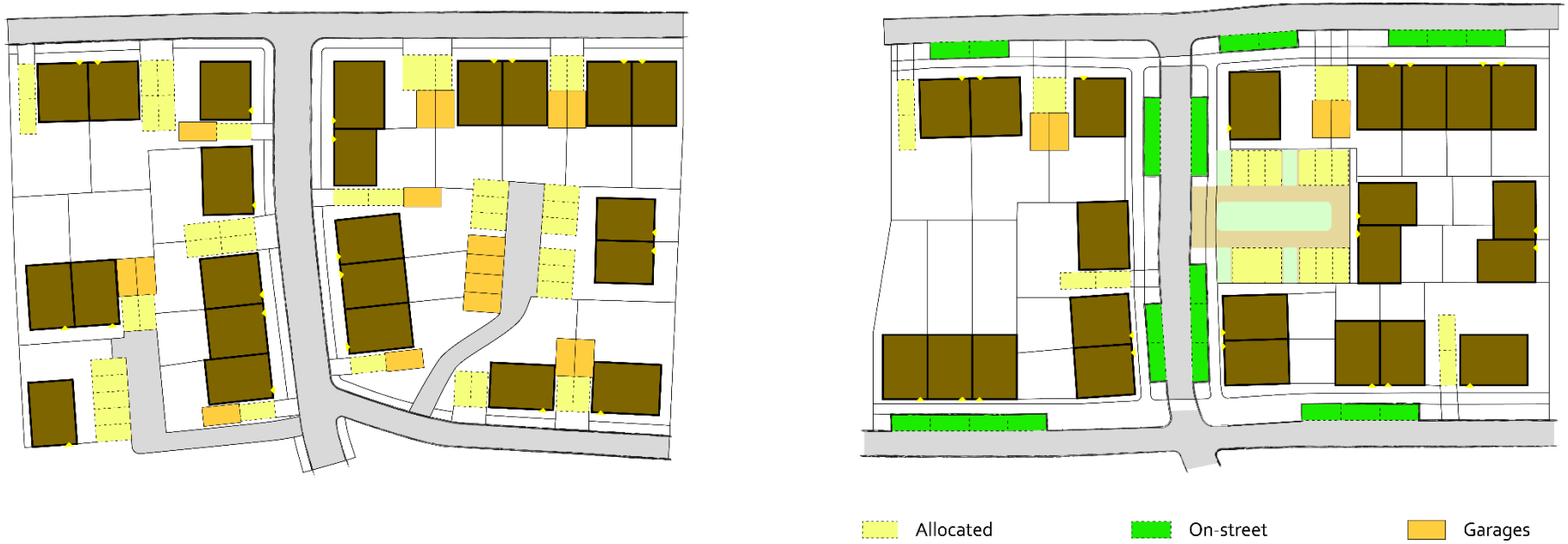


Figure 10-1 Parking strategies for new build development should prioritise on-street, unallocated parking over off-street provision and private garages (Credit - Create Streets)

10.2. On street and opportunity parking

On street parking is the most efficient way of delivering parking and integrating it into the layout of a development, and the street types in this guide all allow for on street parking provision. It will also help slow traffic by introducing edge friction, and provide additional separation between moving vehicles and pedestrians and cyclists. Appropriate on street parking typologies include:

- *On street parallel parking:* This is the preferred approach for the single close to home parking space. Parallel parking maintains tight street enclosure ratios and ensures streets are not excessively wide. This would be particularly appropriate for wide house types.
- *On street echelon (45-degree parking).* This should only be used when parallel parking cannot meet parking requirements.

- *Parking square / green.* Parallel parking around a central squares, green space or junctions. These must be designed as places, incorporating trees and greenery, street furniture and differentiated paving. Asphalt must not be used, and permeable materials are preferred. Parking should be fronted and overlooked by the built form, and a minimum 2m margin should be provided around all spaces.
- *Central reservation parking.* Parking integrated within landscapes strips, this may be particularly appropriate for high streets and avenues.

Fig 10-2: Examples of informal and formal parking squares (Credit – Create Streets)

The design of on street parking should consider the following:

- On street and opportunity parking must be unallocated, and where parallel parking is provided induvial bays should not be marked. This is a flexible and spatially efficient approach that reduces the overall need for spaces. A bay on the public highway cannot be allocated.
- Parking spaces should be clearly delineated through landscaping or material differentiation. On street parking provides a good opportunity for introducing permeable paving into the street.
- Additional spaces can be provided by using varying street widths and taking advantage of leftover space on masterplans.
- There must be no parking permitted on the pavement. Nuisance parking should be controlled through efficient street design, which leaves no left-over space, and the use of trees, greenery and street furniture. For example, using shrubs or low-level planting in verges to discourage parking.
- Spaces should be broken up into groups of no more than three spaces, ideally separated by kerb build-outs that can incorporate trees, greenery, SuDS, EV chargers and bike parking to minimize the visual dominance of the cars. Alternatively, tree pits can be constructed directly on the carriageway to break up parking. Care must be taken to ensure there are clear places for pedestrian crossings and access to pavements and cycleways is not blocked by parking spaces.
- On street parking can be within visibility splays where traffic speeds and volumes are low, which should be most new streets, but should generally be avoided through design..

Figure 10-3: Example of on-street parking. L: Goldsmith Street, Norwich. R: Finsbury Park, London (Credit - Create Streets)

10.3. Off-street parking (on and off plot)

On street parking should provide most of the parking required in a development. However, it may be necessary or desirable to introduce off street parking, either on or off plot, to provide additional spaces, and all off street parking, including garages, must contribute to parking figures. SCC or the local district or borough council will not adopt off street parking areas and a future maintenance strategy for these spaces must be provided by developers.

Appropriate typologies include:

- *Curtilage parking:* Vehicles must not obstruct the pavement. Curtilage parking must be accommodated to the side of the house (either in a garage, car port or on hardstanding, preferably permeable). This is suitable for detached, semi-detached and end of terraced homes. Front curtilage parking must be avoided. Where two spaces are required per home, these should be positioned end to end (see figure 10-4 below) to ensure a consistent building line.

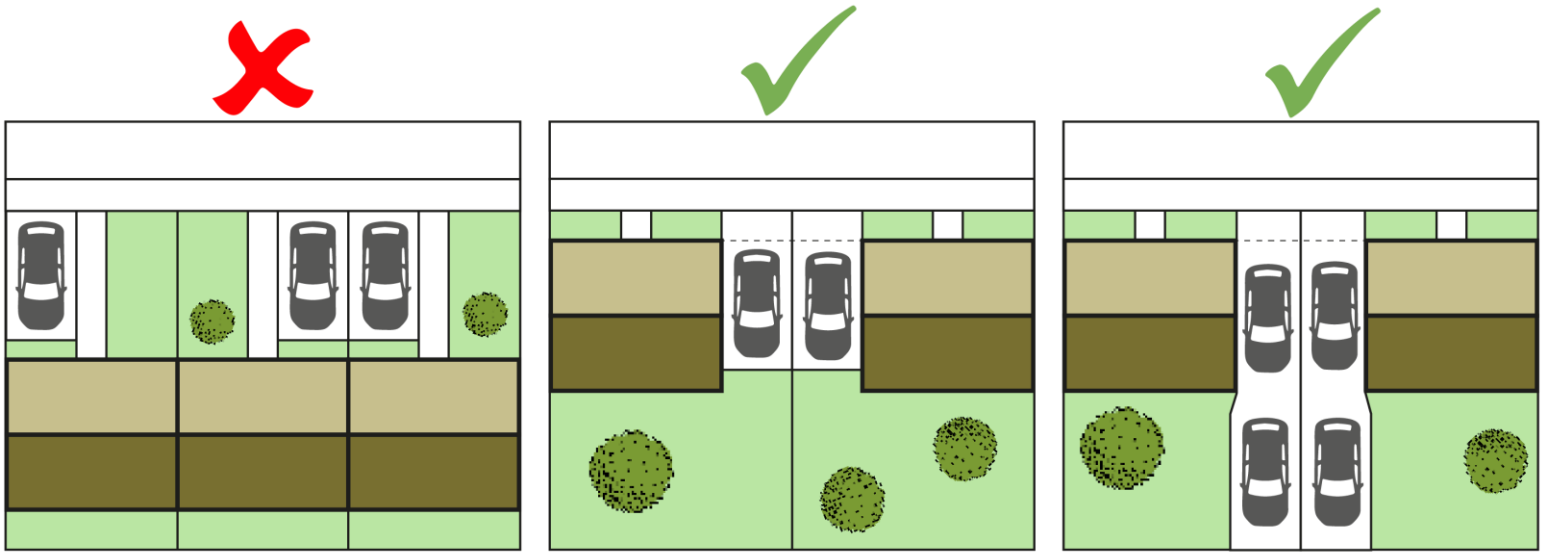


Figure 10-4: To avoid the creation of a car dominated streetscape curtilage parking should be positioned to the side of homes (in garages / hardstanding and car ports), not the front (Credit – Create Streets)

- *Peripheral parking (car barns and parking courts to the edge of developments).* Off-street communal parking located at the periphery of a development is appropriate for 2nd and 3rd parking spaces and apartment spaces and encourages people to use sustainable forms of transport first. This parking is a more efficient use of land, leads to lower car use and allows more walkable street patterns and widths to be used in a development. Parking courts should be well landscaped and use permeable surfaces. It is also a good place for car clubs and EV charging.

- *Courtyard cluster parking.* This could have a formal or informal character. Parallel, echelon and perpendicular spaces could all be used and must be integrated with landscaping and street trees. Courtyards should not exceed 12 spaces and must not be situated to the rear of homes. Surface treatment within courtyards should be permeable and asphalt should be avoided.

Figure 10-5: L: An example of well landscaped courtyard parking, Valençay, France (Credit – Create Streets)
R: Courtyard parking, Poundbury, Dorset (Credit - Andy Cameron)

- *Garages / car ports.* These must be well designed and be in line with or set back from the building line. Garages should be located to the side of homes and could be designed as integral or detached. Detached garages could occasionally be positioned to the rear of homes but must not be positioned to the front. Further guidance on garages is provided below.
- *Coach house.* These are homes or ancillary living / workshop spaces with parking spaces below. They could be terraced or detached and must only be used within mews streets to help create continuous frontages.
- *Under croft, multi-storey or underground parking.* Often appropriate in higher density development or constrained urban locations and brownfield in-fill sites. Multi-storey parking should be enclosed with built form to maintain active frontage on streets and entrances from the

street must not affect the pedestrian experience. These should be closed to the street. Open ground floor parking (with no gate) beneath buildings should be in well overlooked locations.

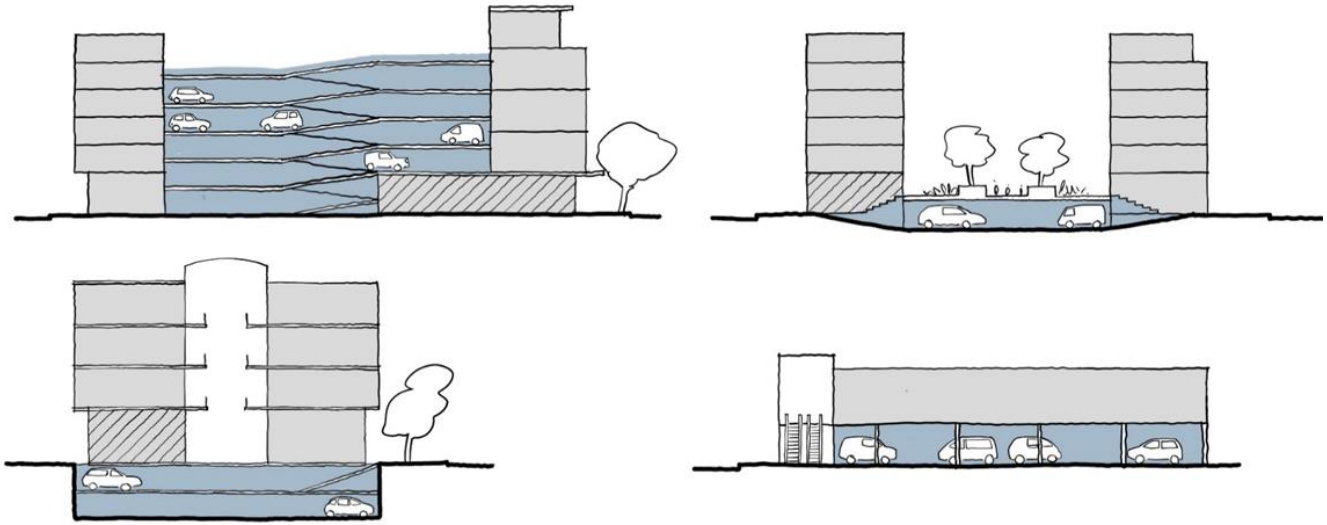


Figure 10-6: Podium, multi-storey or underground parking could be appropriate in urban sites or high-density areas. (Credit – NMDC)

- *Mews courts and streets:* These must be used in lieu of rear courtyard and rear curtilage parking. Mews parking should be used sparingly but may be appropriate on larger schemes in conjunction with terraced typologies. A mix of parallel, echelon and perpendicular spaces could all be incorporated into the design. Mews parking must be designed to function as a place not a left behind expanse of asphalt by ensuring that:
  - There are buildings fronting onto areas of parking
  - They can be landscaped with street trees and greenery to soften the streetscape
  - Visible rear boundaries are brick or stone to create a sense of enclosure, they should not be fenced.
  - Asphalt must not be used, and permeable surface materials are preferred

Figure 10-7: Mews court parking, Poundbury, Dorset. (Credit – Create Streets)

10.4. Parking space dimensions

Designs should adhere to the following standards:

- *On street parallel parking:* 2.0m x 6.0m, disabled parking space is a minimum of 2.7 m x 6.6m (preferably 3.6m x 6.6m). The end of a run of parallel bays must be squared off, not finished with a 45-degree cut.

- *On street echelon parking:* 2.4 m x 5.5m, disabled parking space is 3.6 m x 4.2m. Consideration should be given to vehicle overhang, this could be addressed using a wider pavement or introducing furniture or greenery.
- *Perpendicular parking:* 2.4m x 4.8m, disabled parking space is 2.8 m x 4.8m (with an additional 1.2m space between two disabled bays)
- *Curtilage parking:* 2.6m x 4.8m or 3.6m x 4.8m for disabled space
- *Dedicated motorcycle spaces:* 2 m x 0.8m (though these are typically accommodated within car spaces)
- *Dedicated bike and e-mobility (scooter):* spaces should preferably be on carriageway and fit neatly into one vehicle parking space
- Smaller disabled spaces could be permitted when adjacent to a level area (e.g. a lowered pavement) at least 1.2m wide to allow people to get in and out of a vehicles. Designers should also refer to the Building Regulations[47] and the guidance in in Traffic Advice Leaflet 5/95 for further advice.[48]
- Where spaces are located next to a potential obstruction (wall, fence, hedge, street trees) an isle width of 0.5m should be added to the width of the space.
- There are no set manoeuvring space dimension requirements. The width should be determined based on the street type, parking type and confirmed using swept path analysis. It is not necessary to access a parking space in one movement, and dimensions should not be determined by the worst-case largest car. For perpendicular parking, a wider bay will result in a narrower aisle or street width, and this would be preferable to a wider aisle.

10.5. Garages and driveways

In order to count towards parking figures, garages should be designed in accordance with the following requirements:

- Garages must be a minimum of 3.3m x 6m (internal dimension).

[47] HMG (2016) *Building Regulations Approved Document M*
[48] DfT (1995) *Traffic Advice Leaflet 5/95 – Parking for Disabled People*

- Garage doors must not protrude onto the street. On tight sites, such as mews roller-shutter, sliding or inward-opening doors should be used.
- Through garages may be used to enable parking within rear curtilage of the property.
- Where curtilage parking is to be provided in front of the garage these must be set back a minimum of 5.5m from the pavement edge to avoid obstruction of pavement and to limit visual impact of parked cars.
- A change in surface materials should be used to delineate driveways from public realm.
- Driveways should be laid in a permeable material and should allow space for greenery. Drainage from the driveway must not enter the highway, either through use of permeable paving or a channel drain across the entrance.

10.6. On street delivery and loading bays

These may be necessary for commercial or industrial buildings and requirement / size of bays is to be determined on a case-by-case basis.

Loading bays can be provided within carriageway or where the existing pavement is sufficiently wide (over 3m), inset bays may be used. In the former case, bays should be clearly delineated using changes in material, not road markings. Inset bays should be at pavement level as the pavement and accessed via a splay kerb.

In either case, bays should be positioned to facilitate ease of loading / unloading without causing obstruction to pedestrians, cyclists or other road users.

10.7. School parking

Schools should place parking away from main entrances to discourage people from driving where they can. With the exception of staff and visitor parking, parking strategies for all new schools must look to disincentivise car use by not providing parent / student parking or drop off/pick up areas.

Parking and drop off provision for local buses and coaches must be convenient with an attractive walk to the building.

10.8. Parking management and control

Use / withholding of parking permits and 'residents only' parking areas could be used in combination with physical measures as part of a private management strategy. This should be discussed with the appropriate local district or borough. Traffic regulation orders should be used to reduce on street / problem parking close to schools.

Figure 10-8: On street loading bay at pavement level – Bond Street (Source: Andy Cameron)

Additional Resources:

- English Partnerships (2006) *Car Parking – What Works Where* (available via online version at: http://www.spacetopark.org/go/what-works-where)
- *Space To Park* - online resources (http://www.spacetopark.org/)

Chapter 11: Cycling

11.1. *Cycling Vision and Strategy*

Surrey is committed to a goal of achieving net zero carbon by 2050 with a target of cutting transport emissions, which make up 46% of the County's emissions, 60% by 2035. It is recognised that a step change in share of journeys made by walking and cycling ('active travel') will be essential in achieving these ambitious targets. The benefits would be much wider than achieving carbon reduction targets. An increase in active travel would help improve health and wellbeing, better air quality as well as bringing economic benefits to town centres and local business.

The latest Surrey *Local Transport Plan* (LTP4) aims to achieve this step change in part through the delivery of safe, attractive, accessible and connected network linking residential areas to key destinations such as high streets, employment centres, school, leisure, public transport and other amenities. This includes the provision of segregated or low speed, traffic calmed routes with separation between cyclists and pedestrians.

Key to achieving this is integrating good cycle design standards into new and refurbished streets, and the proposed Street Hierarchy in this document sets out the requirements for each street typology. All new streets and developments must prioritise active travel, with pedestrians and then cyclists placed at the top of the modal hierarchy, and create safe, useful cycle networks that are well connected to the local area. This guide sets out the high-level principles, and detailed design requirements, that will allow developments to achieve this. Much of this guidance is based on the latest DfT guidance: LTN 1 / 20 Cycle Infrastructure Design and should be read in conjunction with it.

11.2. *Principles of good cycling infrastructure*

The following principles should apply to all new cycle infrastructure

- *Coherent* – Routes should be continuous, legible, easy navigated and well-integrated into the street network. Any gaps in provision, such as where routes take users via a dangerous road or junction, will render the route unusable for many users. The focus must be on delivering networks, rather than token sections of infrastructure.
- Direct – Cycle routes should be as convenient as possible to encourage use, often following the logic of the street network. This means making main routes safe to cycle on. Where feasible, routes for cyclists should be more direct and convenient than those for cars.
- *Safe* – Cyclists should be protected from vehicles, either by creating streets with low traffic speed and volumes, and where that is not feasible, providing properly segregated routes with well-designed junctions. The perception of safety must also be improved to encourage more people to cycle.

- *Comfortable* – Well designed, well maintained, good quality routes that are separated from traffic will make cycling more comfortable and enjoyable. Particular focus should be given to the effort required in cycling, most of which is in accelerating or climbing gradients so routes should aim to maintain a steady speed, with few stops and starts, and avoid excessive changes in gradient.
- Attractive – Routes and infrastructure should help create places that are pleasant to cycle. An attractive route, through green space, alongside water, or through a beautiful street, will be a well-used cycle route.
- *Accessible to All* – Routes should be safe and comfortable enough to be used by cyclists of all ages, abilities, confidence and levels of fitness. Cycle lanes should be wide enough to accommodate a diverse range of users and bicycle types, including handcycles, wheelchair friendly bikes and bikes with trailers. Typical dimensions are provided in Figure 11-1 below.

11.3. Cycle infrastructure design considerations

Protecting cyclists from motor traffic is essential. Unsafe roads are one of the most significant barriers to the uptake of cycling in the UK and the provision of protected cycle space normally results in an increase in cycling. Safe routes can take cyclists on the carriageway, where traffic and speeds are suitably low, but on busier and faster roads some form of segregation is normally required. As a guide, designers should seek to create cycle routes that would be safe for children to use without supervision.

The following table from LTN 1/20 shows the appropriate level of protection required based on traffic volumes and speed limits. Designers are encouraged to exceed the minimum requirements, particular the level of traffic at which on street cycling becomes 'suitable for most people'. This is set at 5000 PCUs (passenger car equivalent units) per day for 20mph streets, but designers should aim for separation on all streets above 2000 PCU/day which is in line with international best practice.[49]

[49] Based on the Dutch *CROW Design Manual for Bicycle Traffic*, as referenced in: London Cycling Campaign (2019) *Infrastructure Handbook*

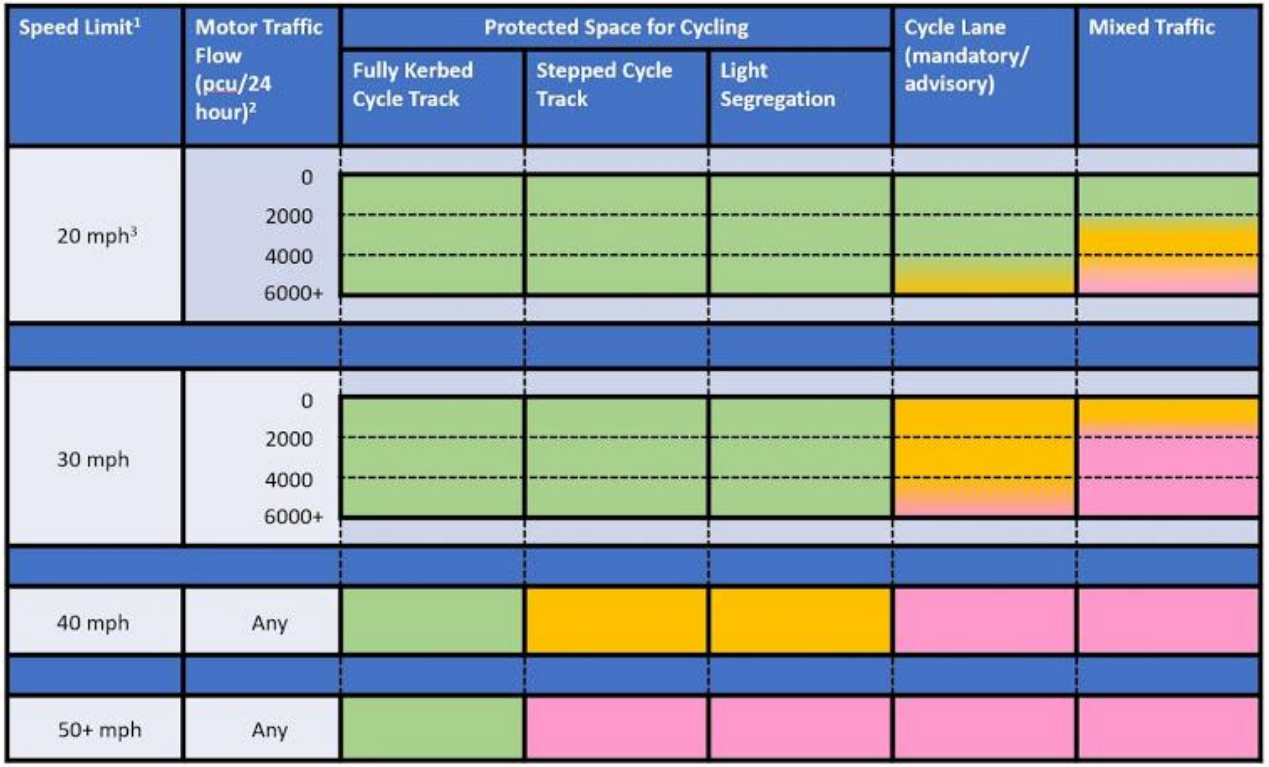


Figure 11-1: Appropriate cycle infrastructure by traffic speed and volume (Credit - LTN 1/20).

Appropriate protection can be provided by using the following cycle route typologies. In most cases, these will be integrated into the design of the street and as such detailed guidance is provided in the street typologies guidance in this document (**Error! Reference source not found.** and table 4-3).

- *Motor traffic free cycle path.* These include routes on disused railway lines, through parks and public open space, on canal and riverside towpaths, and public rights of way. These can form long distance, inter urban routes, or short routes within urban areas. Where cycle and/or pedestrian volumes are sufficiently high, separation may be required.
- *Segregated cycle track.* This refers routes that are within the highway but are separate from motor traffic. There are generally three levels of segregation:

  a) *Full height kerb* – Normally at carriageway level, with full height kerb separation on both sides, and some buffer space between the track and the carriageway. This should normally be avoided, and stepped cycle tracks are preferred.

  b) *Stepped cycle track -* Set between pavement level and carriageway level, separated by low kerbs. This is the preferred method of segregation for new streets in Surrey.

  c) *Pavement level cycle track* – Set at pavement level, separated by a raised strip to clearly mark the track, and constructed in a different surfacing material. Line markings are not appropriate as separation.

- *Cycle lanes* – Areas of the carriageway reserved for cyclists, as defined by Traffic Signs Regulations and General Directions (TSRGD). Either demarked by a solid white line (mandatory lane) or a dashed white line (advisory).
- *Cycle lanes with light segregation* - Describes the use of intermittent physical features placed along the inside edge of a mandatory cycle lane to provide additional protection from motor traffic. This can give a greater perception of safety, which is important in encouraging people to cycle, whilst allowing permeability.
- *On street* – Where traffic flows and speeds are low (<20mph), and streets and junctions are well designed, on street cycling can be safe and attractive. LTN 1 / 20 recommends that streets should be suitable for Bikeability Level 2 skills, meaning that they could be used independently by a 12-year-old child.
- *Continuous level surface streets* - Level surface streets have no, or only a slight, kerb upstand, removing vehicle priority. These typically have pedestrian priority, and very low traffic levels.

Figure 11-2: Streets must be designed so that they are safe for cyclists. L: Chapeltown, Aberdeenshire. R: Poundbury, Dorset. (Credit - Andy Cameron)

The following table sets out suggested segregation methods based on the street typologies in this guide. The cycle track widths are recommended minimums and wider tracks may be required where there are likely to be high flows of cycle traffic, typically over 200 per hour. Refer to LTN 1/20 for further guidance.

Street Type	Suitable Cycle Provision	Design Considerations
Type 1 (a): Primary – Bypass / Distributor	Motor traffic free cycle path	Alternative route recommended, avoiding junctions
	Segregated cycle track – full height kerb	At least 2m separation from carriageway 2.2m wide, full height (100 -125mm) kerbs

Type 1 (b): Avenue	Segregated cycle track - stepped	2m wide, stepped cycle track with 50 – 65mm shallow splayed kerb. To include 0.5m wide buffer strip alongside parking.
Type 2 (a): High Street – Arterial	Segregated cycle track - stepped	2m wide, stepped cycle track with 50 – 65mm shallow splayed kerb. To include 0.5m wide buffer strip alongside parking.
	Light segregation	Cycle lane at carriageway level. Use of trees, planters or bollards to provide segregation.
Type 2 (b): High Street – Low Traffic	On street	Speeds must be 20mph or lower.
	Light segregation	Cycle lane at carriageway level. Use of trees, planters or bollards to provide segregation.
Type 2 (c): High Street – Traffic Free	N/A	N/A
Type 3: Secondary streets	On street	Speeds must be 20mph or lower, and traffic flows should be low with no bus and limited HGV traffic. Otherwise use segregation as below.
	Segregated cycle track - stepped	2m wide, stepped cycle track with 50 – 65mm shallow splayed kerb. To include 0.5m wide buffer strip alongside parking.

	Light segregation	Cycle lane at carriageway level. Use of trees, planters or bollards to provide segregation.
Type 4: Local streets	On street	Speeds must be 20mph or lower. Model filtering encouraged
Type 5 (a): Shopping Avenues	N/A	N/A
Type 5 (b): Residential Mews	Level surface	Design speeds must be very low.
Type 5 (c): Rural lanes	Motor traffic free cycle path	Alternative routes recommended
	On street	If speeds are kept low and traffic volumes are low

Table 11-1: Appropriate Cycle Segregation by Street Type

11.4. Creating a Cycle Network

As standalone pieces of infrastructure, cycle paths and tracks will not encourage a modal shift to cycling. A network must be planned and developed, with the routes described above forming links between various nodes such as junctions, origin points and destinations. This needs to be based on an understanding of where people need and want travel, and what barriers might prevent them making these journeys by cycling. The simplest way of creating a network is to integrate cycle routes into the street network and follow the logic of street hierarchy.

Area wide cycle networks will be planned through the development of *Local Cycling Walking Infrastructure Plans* (LCWIPs). Surrey Country Council are working with District and Borough councils to roll out LCWIPs across the county. All new cycle infrastructure and networks should be developed in

line with these emerging plans, and developers should work with the District and Borough councils to maximise the opportunities for developing cycle networks.

A good cycle network will consist of the following elements:

- Safe and comfortable cycle routes, on or off street.
- Simple, safe junctions with dedicated space for cyclists.
- Safe crossings points with cycle and pedestrian priority.
- Secure and convenient cycle parking and storage at key destinations.

Proposed cycle schemes must achieve the minimum criteria set out in *Local Transport Note 1/20.* These are the thresholds for Department for Transport funding that must be met.

- A minimum score of 70% under the Cycling Level of Service (CLoS) assessment, and no critical fails.
- No 'red' scores under the *Junction Assessment Tool* (JAT).

On new developments, the network must not be confined to the red line boundary as trip demand will never be confined to the development. The key nodes outside the development should be identified, such as nearby train stations, local centres, local attractions, or links to other cycle routes. The network should provide direct and convenient connections to these destinations, in line with principles described above. The intention is to not only provide a viable alternative to private vehicles for these journeys, but to make cycling, and walking, the preferred mode of travel for these journeys. Establishing these wider networks will require improvements to infrastructure in the wider area, these can be delivered through Community Infrastructure Levy (CIL), Section 106 contributions and the Section 278 off site highway agreements.

On larger residential developments, such as garden villages, opportunities should be taken to introduce cycle hire schemes. These facilities could increase the appeal and affordability of cycling to a wider range of residents while also reducing the space required for private / allocated cycle parking spaces. Hire schemes can be a useful solution to the 'last mile' problem of public transport journeys and should be integrated into the public transport network. This can be achieved through the delivery of 'mobility hubs' at key transport nodes, and through the development of 'Mobility as a Service' (MaaS) technology to create seamless planning, booking and payment. Further information can be found in the latest SCC *Local Transport Plan* (LTP4).

11.5. Cycle lanes at bus stops

There are three main strategies for dealing with conflicts between cyclists and stops, depending on the level of cycle and pedestrian traffic. Most new streets with a bus route will be primary or high streets and should therefore have a segregated cycle lane. The preferred arrangements are as follows:

- *Bus Stop Bypass.* The cycle track is taken behind the bus stop, allowing enough space at the kerbside for a shelter and waiting area. A pedestrian priority crossing will provide access across the cycle track. If the cycle track is set lower than the pavement, the crossing should be at pavement level to encourage cyclists to slow down.
- *Bus Stop Island*. Similar to a bus stop bypass except that the shelter and waiting area is on the pavement side of the cycle track and a smaller island is provided for boarding only.
- *Bus Stop Boarders.* No island is provided and boarding and alighting is via the cycle track, with cyclists having to give way to buses. This can offer a simple, efficient solution where cycle traffic or passenger numbers are relatively low.

Most new street types with a bus route and a cycle lane in Surrey will incorporate parking or a verge between the lane and the carriageway, this should provide adequate space for an island or a bypass with minimal change to the street section.

11.6. *Cycle Crossings*

Where a street could create a significant barrier to cycling, either due to fast or high volumes of traffic, crossing facilities should be introduced to maintain a safe route. However, pedestrians should still have priority in line with the user hierarchy (2.1). Uncontrolled crossings are suitable for minor roads that are 30mph or under. For busier roads the following crossing types are recommended. Crossings will often be located on the arms of junctions, and consideration should be given to wider movements, in line with the junction guidance below. Further guidance can be found in *LTN 1/20, section 10.5*.

- *Cycle priority crossings.* These should be constructed as raised tables in line with the guidance in this document (5.3 and 5.11), with the appropriate markings to the *Traffic Signs Manual*. Where a segregated cycle track on a primary, high or secondary street crosses a side street a continuous crossing should be used (5.2). Where the major arm of the junction is particularly busy, and queuing needs to be avoided, a 'full setback' crossing could be introduced which offsets the cycle track to allow space for a vehicle to wait and give way.
- *Parallel crossing.* This is similar to a zebra crossing, with the addition of a parallel cycle lane. These should be constructed as raised tables with markings and beacons to the latest *Traffic Signs Regulations and General Directions* (TSRGD).

- *Signalised crossing.* These can be either shared 'toucan' crossings, or separate pedestrian and cycle crossings. Further advice or design and timings is provided in LTN 1/20, and the *Traffic Signs Manual*.

11.7. Cycling at Junctions

Junctions, by definition, are places of conflict and as such the most hazardous and intimidating parts of the street network for cyclists and pedestrians. Between 2015 and 2020, around 71% of cycle casualties occurred at or within 20m of a junction, with the highest proportion being at T, Y or staggered junctions.[50] An unsafe junction, either perceived or actual, will deter people from cycling and sever the wider network, regardless of the quality of the adjoining routes. Creating safe, user-friendly junctions, or convenient alternative routes, is essential to achieving a joined up, attractive cycle network that will lead to increased uptake in cycling as a mode of transport.

The design of safe junctions is a complex topic, and new arrangements, such as the CYCLOPS junction, have recently emerged.[51] This guide provides a high-level summary of potential options and design considerations. Further detailed design guidance can be found in LTN 1 / 20 and designers must make use of the Junction Assessment Tool.

Junctions can be designed to separate cycle and motor traffic, especially where the latter is high, or to reduce traffic speed and volume and make it safe for these different traffic streams to mix. Between these two strategies there is a spectrum of levels of separation or integration. Separation of the flows can be spatial, such as using bypasses, or temporal by using cycle only phases with signals.

[50] DfT (2020) *Reported road casualties in Great Britain: pedal cycle factsheet* https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-pedal-cyclist-factsheet-2020/reported-road-casualties-in-great-britain-pedal-cycle-factsheet-2020

[51] TfGM (2029) *CYCLOPS* – Creating Protected Junctions

The following table sets out different junction treatments, in approximate order from most to least segregated.

Separation Level	Type	Control	Comments	Suitable for all users?
Full separation 	Full bypass	Signalised	On both new and existing junctions, it may be better to divert cyclists around the junction and across the main streets outside the main junction area. A fine urban grain will allow routes that bypass the main junction but remain direct and convenient. This integrates the junction into the wider urban fabric, avoiding the need for a single, expansive junction.	Yes
	CYCLOPS or Circulating Stage Junction	Signalised	Using an orbital cycle track encircling the junction, cyclists only have to give way to the right to other cyclists. These are not space efficient and while simple to use, can lead to visual clutter and leftover spaces.	Yes
	Priority junction (with priority crossings on all arms)	Unsignalised	Where there are cycle tracks on the major arm of the junction, these should cross the minor arm (side road) as a full priority continuous crossing. For busier roads, such as primary streets, priority cycle crossings should then be introduced on the major arm to allow safe right turns. These should be located a safe distance from the minor arm to reduce conflict.	Yes
	Dedicated Cycle Phase	Signalised	A dedicated, all movements phase in lights for cyclists only. A simple, spatially efficient method of separation. Particularly useful where a junction allows some cycle only movements.	Yes, if adequate timings are provided.
	Cycle and pedestrian only phase	Signalised	As above, but mixed with pedestrian movements so only suitable where there are low pedestrians flows.	Yes, if adequate timings are provided.
	Priority junction (with priority crossings on	Unsignalised	Where there are cycle tracks on the major arm of the junction, these should cross the minor arm (side road) as a full priority continuous crossing. If the major arm is has relatively low traffic, such as a secondary street or smaller high street,	Yes

	minor arms only)		uncontrolled crossings can be used to allow right turns. These should be located a safe distance from the minor arm to reduce conflict.	
	Mini roundabout	Unsignalised	Suitable for low traffic streets. Double roundabouts should be avoided.	Yes
	Raised table junctions	Unsignalised	Informal, shared surface raised table junctions can be used on low traffic streets, mainly Local streets. On busier roads separation may be required.	Yes
Integration with traffic	Junctions on shared surfaces or quiet streets	Unsignalised	Lack of vehicle priority and very low speeds ensure street is safe for all users.	Yes

Table 11.2 – Cycle friendly junction treatments, by levels of segregation

Designers should not be timid in their ambitions for creating safe, attractive junctions through segregation or by significantly restricting traffic speed and volume. As demonstrated in the table above, partial measures will not make the junction feel safe enough for all users which will create a weak point in the network and reduce the number of trips that can be made my bike. On existing junctions, some compromise may be unavoidable. All junctions must be assessed using the *Junction Assessment Tool* (JAT) in LTN 1/20, no movements should be scored 'red' and those on key cycle routes must be scored 'green'.

In new developments, all junctions should be suitable for users of all abilities and confidence levels. Junction designs should be coherent, simple and legible across a network and so a mix of typologies should be avoided. In general, where there is segregated cycle provision on the street, a segregated junction should be provided. Elsewhere, traffic volumes and speeds should be low enough to allow integration with traffic.

11.8. *Cycle storage*

Cycling parking standards are outlined within the *Surrey County Council Parking Guidance* which should be read in conjunction with this guide.[52]

Parking must be provided in new developments. At least 1 space must be provided for 1 or 2 bedroom homes, and at least 2 spaces for larger homes. This can either be provided as:

- *At home cycle parking*. Individual parking provisions for homes either within inside storage or shared rooms or as a separate bike shelter. The shelter should be secure and protected from rain. The space should be suitable for general storage for those whom may not own any bikes.
- *Shared or communal cycle parking.* This type of parking is more efficient in terms of space use, and the number of facilities depends on the number of bikes anticipated in a given area. This type of storage must be secure, well-overlooked, secure and easily accessible and large enough to accommodate all cycle users. Appropriate types of shared cycle parking include:
  - Cycle racks
  - Cycle garages (often within a building)
  - Cycle stands

Visitor parking must also be provided at convenient locations, and non-residential facilities should also have parking for employees and visitors, in line with SCC parking guidance.

The following should be considered when designing shared or communal bike shelters.

- Made from attractive and robust materials
- Positioned to be consistent with the building line if street facing and should be placed in a 'furniture zone' to avoid obstructing pavements
- Situated in well overlooked locations, well lit, signed and close to the entrances of buildings (within 20m of the building they serve)

[52] Surrey County Council (2021) *Vehicular, Cycle and Electric Vehicle Parking Guidance for New Development*

- Undercover where possible
- Laid out in small clusters of within communal spaces. Consolidated parking facilities should be used for large public / community buildings, transport hubs and flats

Figure 11-3: Examples of cycle storage: L: Attractive, good quality undercover parking at Goldaming Station (Credit – Andy Cameron) R: Public cycle and scooter parking on the carriageway keeps pavements free for pedestrians. Richmond (Credit - Create Streets)

Resources:

- *Gear Change - A bold vision for Cycling and Walking* (DfT July 2020)
- *Cycle Infrastructure Design* (LTN 1/20) July 2020

Chapter 12: Integrating public transport

Integrating public transport into development and providing connections beyond the site must be one of the design process's key principles. However, recent studies into new developments suggest that effective public transport links are rarely put in place (*National Housing Audit* - Place Alliance 2020 and Transport for New Homes). It is vital that the new homes and communities we create can be served by *convenient, affordable, and reliable* public transport to enable us to move around sustainably, reduce car reliance, create beautiful streets, reduce congestion and improve air-quality. This follows national and local policy including Surrey County Council's *Green Futures Strategy*, *Draft Local Transport Plan* (LTP4), the *Travel Plans Good Practice Guide* (TPGPG) and the *Bus Back Better Strategy*.

Public transport is essential at all scales of developments. Ensuring convenient routes and efficient bus stop location is an important way to encouraging public transport use. Sustainable public transport services must be delivered early. To avoid creating car-dependent developments and to increase the appeal and uptake of public transport, services must begin as the first residents move in. This could be provided by extending existing routes, improving pedestrian and cycle connections to existing bus stops or providing temporary services to key destinations such as a demand-responsive minibus or a shuttle service to nearby train station. This can be upgraded as developments grow in size and more users are living nearby.

12.1. *Public transport principles*

The following principles should guide how to design streets successfully to accommodate public transport.

- *Wider connections.* The development should connect into existing routes and enhance service provision for the wider neighbourhood. This could be achieved through route diversions, increasing frequency and hours of operation and providing a 7-day bus service along with ticketing or fare offers to increase bus use. Larger schemes could deliver an entirely new bus route or service. Where good existing public transport services are not present, they must be provided.

- *Permitting evolution.* Public transport is continually evolving and the provision of alternative and complementary modes of public transport should be considered such as hail and ride bus service, shuttle services between key destinations, bike hire schemes or responsive 'Mobility as a Service' (MaaS) travel apps. Shared mobility should be considered early in the design. These may be particularly appropriate in rural areas with low ridership where traditional bus services may not be practical.

- *Using the street hierarchy.* To ensure direct and efficient bus services, routes within new developments should follow the street hierarchy. They will normally run along primary streets, high street or secondary streets (4.14).

- *Bus routes.* Streets that will accommodate bus routes should be fairly direct without too many frequent turns. Parking control, bus stops' location and highway geometry are all key considerations. Bus priority could be facilitated through bus gates or priority signals at junctions. Speed management should be bus friendly and be designed in consultation with bus providers to ensure acceptance. In high streets or areas of high footfall it is fine to allow slower bus speeds where pedestrians will become the priority.

- *Larger schemes.* On larger schemes bus only corridors should be included to provide quick and direct access to key facilities. These should be combined with pedestrian and cycle routes.

- *Public transport integration.* Routes must be designed holistically and consider pedestrian and cycle access to and from bus stops to allow for seamless transitions with different modes of public and active travel. Sufficient safe cycle parking by bus stops and locating bus stops in development centres or next to schools is essential.

12.2. *Mobility hubs*

On larger schemes or where distances to local services may be prohibitive to pedestrian and cycle access, mobility hubs should be included. Such hubs could contain bus stops, car club provision, EV charging points, electric cycle or scooter hubs, secure bike storage and repair shops along with flexible demand-responsive shuttle buses to complement traditional services. Where provided, homes should be within a 10 minutes' walk (800m) of primary hubs or 5 minutes' walk (400m) from smaller hubs. Further guidance on mobility hubs is outlined in the SCC Draft *Local Transport Plan* (LTP4).

12.3. *Rail links*

Links to rail local rail stations are very important as they enable a high proportion of sustainable transport in a development. Where new stations are not appropriate developments must factor in access to nearby existing train stations and ensure access is adequately provided for through design of bus routes, safe walking and safe cycling routes. New rail stations could be provided on larger sites which might be adjacent to or span existing rail lines and these opportunities should be discussed with Surrey County Council, the rail authority and relevant service providers early in the design process.

12.4. *Bus stop location*

- Bus stops must be located on key desire lines and around areas of higher activity, services, community facilities, employment and residential density. Homes should be within 400m walk of a bus stop or transport hub, as most people are prepared to walk five minutes (400m) to a bus stop. There is flexibility in this standard as bus stop positioning must avoid overly circuitous routes and ensure a balance between ease of access while maintaining a convenient bus service (figure 12-1). Bus operators should be consulted for bus stop location.
- Pedestrian accessibility to bus stops must consider the quality of the local environment as well as distance. Bus stops and transport hubs must be connected to walking and cycling paths that are pleasant to use. Main bus stops should be well-lit.
- Bus stops should generally be spaced between 200-400m apart to ensure they are accessible to riders while also reducing journey times.
- Bus stops should not be positioned at the crest of a hill.
- Bus stops must be positioned in places of pedestrian activity, such as street corners or the entrance of community, employment and retail buildings.
- Bus stops' location must be agreed at outline application stage. However, sufficient flexibility for the location will be allowed at the discretion of the planning authority to avoid adverse impact on future land use as designs develop. This will ensure that the location of bus stops does not have any adverse impact on adjacent land uses.

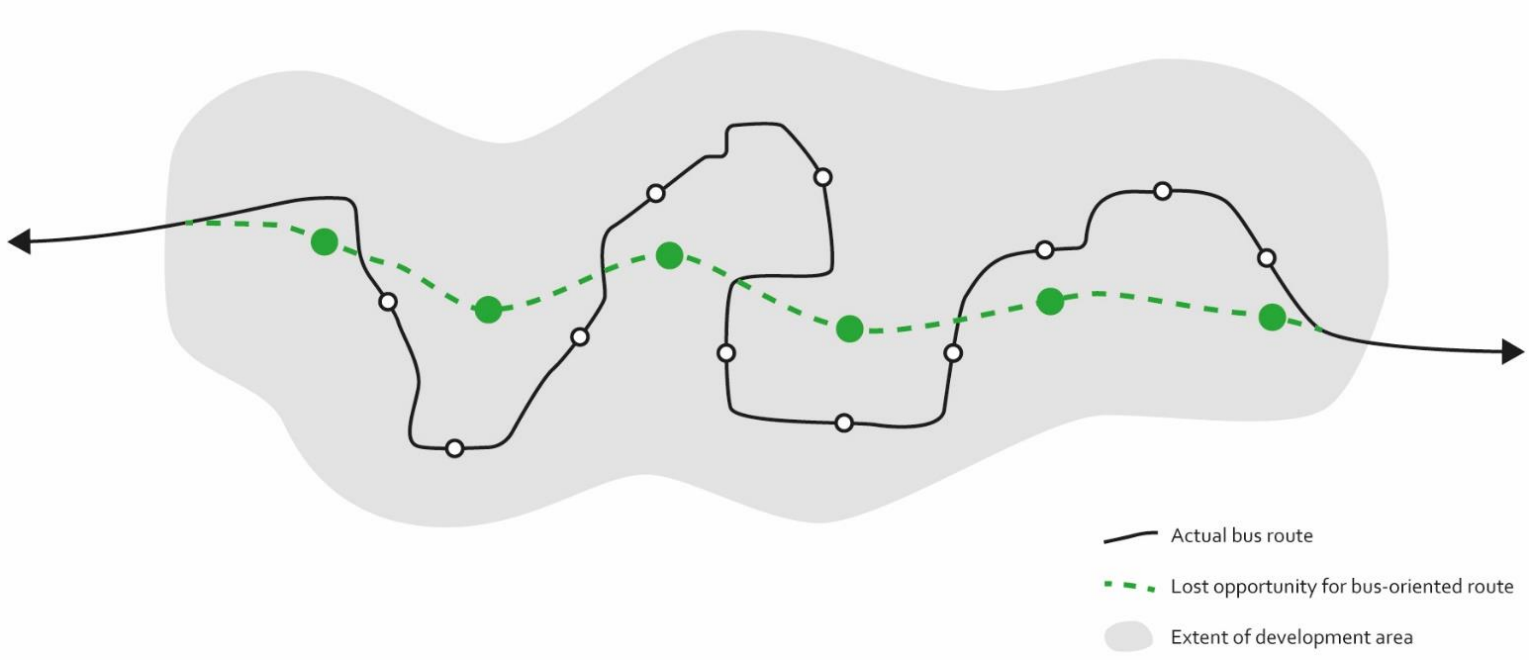


Figure 12-1: Bus orientated street layouts. The green dashed line is best practice. (Credit - Create Streets)

12.5. Bus route design

- Two-way streets on bus routes should have a minimum width of 6 m (3.0m per lane) where a 20mph speed is applied. The carriageway must be kept free of on-street parking and can be reduced even further for short sections through consultation with the council as on-street parking, traffic calming and opposing flow visibility may impact this.
- Carriageway widths on bus routes, where there is no separate cycle lane, should be wide enough for buses to pass cyclists safely.
- Where possible, buses should be given a dedicated lane and priority access. These must be a minimum width of 3m where a separate cycle lane is provided, or 4.5m where the lane is shared with cycles.

12.6. Bus stop design

- Places for waiting should be attractive and comfortable and lit. This should be achieved by appropriate seating, cover and lighting as well as by locating stops adjacent to areas of street planting, small parks or play areas.
- Bus stops must include a bus shelter. Flag only stops should only be permitted in constrained locations.
- Bus shelters could be designed with a green roof or solar panels (8.6)
- Must be designed sympathetically to their surroundings and should reflect the distinctive character of the local area.
- Additional street furniture should be kept to a minimum and only provided if absolutely necessary and not be positioned within 2m of boarding or alighting areas to enable bus ramps to be deployed without obstruction. For further guidance refer the street typologies guidance in this document (4.2 and table 4-3). Bins should be provided. Cycle parking should be provided at stops in key locations as this can enlarge the catchment area of a bus stop
- Bus stops adjacent to cycle paths and passes should be fully transparent to ensure good intervisibility.
- Pedestrian needs should be the priority where cycle paths run immediately adjacent to bus stops. Consideration should be given to the appropriate size of waiting area and how to provide safe access to bus stops for pedestrians. Please see Chapter 11 for further information on integrating bus stops with cycle infrastructure.
- Bus laybys should not be used. They are an inefficient use of space and may reduce the ease of buses re-joining the main carriageway. They should only be used where stationary buses would cause a significant safety problem, which does not include queuing traffic.
- Bus boarders are useful for incorporating cycle lanes, car parking or creating more space for waiting pedestrians to facilitate the easy pick up and drop off of passengers. These should generally be between 2-2.6 metres in width although boarders of 1- 1.3 metres could be used on constrained sites.
- Bus stops must be easily accessible to passengers. Pedestrian crossings should be provided close to bus stops and other public transport hubs. They should not be positioned within the bus gate. Please see paragraph 5.11 for further information on the design of pedestrian crossings.

12.7. *Bus stop technical specifications*

- Pavement width to the rear of the bus stop should be a minimum of 1.3m. In areas of high pedestrian footfall or close to the entrance of buildings this should be a minimum of 2m. Where the existing environment does not support this, additional space for buses must be provided through pavement widening / build outs.
- Should where possible be fitted with digital countdown displays that provide live information on bus times. They should also include legible maps of the other bus services, local facilities and pedestrian and cycle connections to aid passengers in their onward journey.
- A clear 2m x 2m area must be provided between the bus flag and shelter. This will allow sufficient space for wheelchair users to manoeuvre and access a bus without obstruction.
- A minimum kerb height of 125mm must be used at bus stops. This should be for a minimum distance of 6m to facilitate the easier access onto and off buses for all passengers. Kerbs should be located so as not to obstruct the swept path of a buses with lowered front steps.
- Buses must be able to stop and be no further than 50mm away when parallel with the pavement.
- Bus stops and flags should be positioned at least 0.5m from the edge of the kerb.

12.8. *Bus service provision, funding and maintenance*

- Under the *Transport Act 1985* Surrey's bus are provided on a deregulated basis. The County Council secures the provision of bus services through contracts with local operators and is best placed to advise on the appropriate level of service provision of new developments and must be consulted with as early as possible in the planning stages. Bus providers should also be involved in the design process through discussions facilitated by the County Council.
- The long-term support and maintenance of public transport services and infrastructure must be agreed before a development goes ahead. Innovative funding mechanisms that support the early delivery of public transport are already in place in Surrey and should be considered on other schemes through discussion with Surrey County Council.

12.9. *Additional public transport design resources*

- *Buses in Urban Developments, CIHT (2018)*
- *Transport for New Homes*
- *TfL Accessible Bus Stop Design Guidance (2017)*
- *DfT Inclusive Mobility*
- *The Traffic Signs Regulations and General Directions*
- *Better Planning, Better Transport, Better Places, CIHT (2019)*
- *Bus services and new residential development, Stagecoach (2017)*

Glossary

Active frontage: Ground floor uses that create interest and activity.

Active travel: Making journeys in a physically active way e.g. walking and cycling.

Adoption: The process by which land for open space, landscaping or highway use is transferred to a local authority to maintain.

Air quality: Term used to describe the levels of pollution in the air. Higher levels of pollution lead to lower air quality.

Best Practice: To pursue the best approach.

Biodiversity: Effectively it is synonymous with the term "variety of wildlife" where wildlife means all plants and animals.

Building line: The building line is created by the primary front face of buildings along a street and is a key element of design codes.

Built Form: This is the main issue that varies by area type including density, grain, building line and height.

Car Club: A pool of cars that people and businesses can pay to use on a per trip basis.

Connectivity: In relation to transport, this means the effectiveness of the transport network at getting people from one location to another

Density: How many homes there are in a given area. Often expressed as dwellings (homes) per hectare.

Design principle: One of the basic design ideas at the heart of an urban design framework, design guide, development brief or a development.

Desire Line: An imaginary line linking facilities or places that people would find it convenient to travel along

E-bike: A cycle with an electric battery to assist or replace pedalling.

Electric Vehicle (EV): EVs are vehicles that are either partially or fully powered on electric power.

Enclosure: The use of buildings, trees and hedges to create a sense of defined space.

E-scooters: A scooter with an electric battery that propels it forward.

Landmark buildings: A building or structure that stands out from its background by virtue of height, size or some other aspect of design.

Last Mile: The last leg of a journey, either for a person or goods being delivered.

Layout: The way buildings, routes and open spaces are placed in relation to each other.

Legibility: The degree to which a place can be easily understood and moved through.

Mixed-use: A mix of uses, usually complimentary, within a building, on a site or within a neighbourhood. 'Horizontal' mixed uses are side by side, usually in different buildings. 'Vertical' mixed uses are on different floors of the same building.

Mobility as a Service (MaaS): A system through which people can access information, plan and pay for their journeys in one simple place e.g. on a mobile app. This app can cover multiple different ways to travel e.g. bus, rail, cycling and car share.

Mobility Hub: A high quality, accessible space bringing together access to different modes of transport

Modal filter: A street which prevents some vehicles, often private cars, from driving through whilst allowing pedestrians, cycles and other users.

Mode Shift: A change in the way people travel for a specific journey. For example, from a car to a bus.

Neighbourhood: District of distinct character usually on a scale that makes internal movement easy for pedestrians.

Nodes: Points at which routes for public transport and other modes of movement intersect. Places where activity and routes are concentrated. Often used as a synonym for a junction.

On-curtilage parking: Parking within a building's site boundary, rather than on a public street or space.

Pavement: The section of the highway reserved for pedestrians only, also known as the footway

Permeability (streets): The degree to which an area has a variety of pleasant, convenient and safe routes through it.

Public Space: The character of each type of street will vary by area type.

Set-Back: The distance that buildings are set back from the edge of the highway (usually the back of pavement)

Sustainable Transport: Forms of transport that have a low impact on the environment