Chapter 4:
Access, Layout and Connectivity

Streetscape Design Guide 2025

worcestershire
county council

Chapter 4: Access, Layout and Connectivity

1. Attributes of Street Types

For the highway network in Worcestershire, the following street types are classified and defined as follows:

1. Single Private Access
2. Private Shared Drive, Mews and Courtyard Parking Area (unadopted)
3. Local Residential Street
4. Secondary Street
5. Primary Street
6. Distributor Road
7. Industrial Access Roads
8. Active Travel (walking cycling, and wheeling) route

Table 1 provides an overview of the different attributes for the various classifications of street types.

Table 1: Street Attributes

Street Type	Indicative number of dwellings	Suitable for adoption	Design Speed	Minimum Carriageway Width	Cycleway, Footway and Service Margin	Minimum Centre line Radii	Minimum Junction Radii	Direct Frontage Access Allowed
Single Private Access	1	No	N/A	3.2 metres	N/A	N/A	N/A	N/A
Shared Private Drive, Mews and Courtyards	2 - 6	No	10mph	4.5 metres for at least for the first 15 metres	N/A	N/A	N/A	N/A
Local Residential Street	7- 50	Yes	15mph	4.5 metres to 5.5 metres	Footways and Service Margin	15 metres	6 metres	Yes
Secondary Street	51 - 100	Yes	20mph	5.5 metres	Footways	20 metres	6 metres	Yes
Primary Street	101-500	Yes	20mph	5.5 metres to 6.2 metres (Bus Route dependent)	Segregated Cycle Track and Footway	25 metres	Scheme Specific	Yes
Distributor Road	500+	Yes	30mph	6.7 metres to 7.3 metres	Segregated Cycle Track and Footway	40 metres	Scheme Specific	No, but considered where traffic volumes do not exceed 10,000 AADT
Industrial Access Road	N/A	Case-by-case basis	30mph	7.3 metres	Segregated Cycle Track	40 metres	10 metres	Yes

					and Footway			
Active Travel Route (Walking, cycling, and wheeling)	N/A	Yes	15mph	3 metres to 5 metres Active Travel Route off carriageway	N/A	15 metres	N/A	No

The design of new streets should consider the intended link and place functions, as well as the type, density and character of the development.

A streetscape environment should be accessible, comfortable and safe for both pedestrians, cyclists, wheelers, and other highway users. Furthermore, integration of the surrounding landscape and ecological context of the site must be integral to any design development.

1.1 Single Private Access

A single private access, serving only one dwelling, will not be adopted as a public highway. However, it will still need to be designed with the following considerations:

1. The driveway to include a minimum width of 3.2 metres.
2. Access from the existing highway will be via vehicular footway crossing (vehicle cross over), positioned at 90 degrees to the kerb line, where possible. Junction radii are not required.
3. The driveway to be surfaced with bound materials for first 5 metres from edge of highway/back of footway (loose material will not be supported).
4. If gates are sought, these must be set back at a minimum of 5 metres (subject to what the access serves) from the edge of highway and open inwards. This allows a vehicle to fully exit the highway before the gates are opened.
5. Accesses that exit onto A and B classified roads, including distributor roads and primary streets, must include the ability for vehicles to turn within the site, allowing access and egress in a forward-facing gear.
6. Surface water run-off from the driveway must not be allowed to discharge onto the highway.
7. Longitudinal fall – maximum gradient 1:12 towards carriageway (relaxed to 1:8 in exceptional circumstances), maximum gradient 1:15 away from carriageway.

1.2 Private shared driveways, mews and courtyards

A shared surface driveway, courtyard or mews can serve two or more dwellings, but not more than six dwellings, after which traffic volumes are unsuitable for this carriageway form. They are areas suitable for high levels of pedestrian and cyclist activity, particularly small children. Vehicle speeds must be very low and be self-enforcing through good design and appearance. Such driveways, mews and courtyards will not be adopted by the Local Highway Authority.

A private shared driveway, parking courtyard or mews can typically form an extension of a Local Residential Street.

If a shared surface street is designed, it must be:

- Visually and functionally distinct from other streets. This can be achieved by featuring gateways, changes in highway widths, changes in direction, suitable surfacing materials and landscape features. A change in surface materials or colour is encouraged, although these must not include vertical alignment i.e. raised tables and so forth.
- A combination of shared streets, with separate vehicle access points, but which are connected by a pedestrian or cycle route could be used to form a mews-style street.
- The Local Highway Authority will not adopt shared streets.

A private shared driveway, parking courtyard or mews area should be designed with the following considerations:

1. Carriageway width of 4.5 metres for the first 15 metres of the drive, measured from the edge of highway, allowing for two vehicles to enter and leave simultaneously. A minimum carriageway width of 4.1 metres could be accepted in certain circumstances, subject to agreement from the Local Highway Authority.
2. A separate footway is not required, as this becomes a shared surface with the driveway.
3. Design speed of 10 mph.
4. Access from the existing highway will be via vehicular footway crossing (vehicle cross over), positioned at 90 degrees to the kerb line. Junction radii are not required.
5. A turning facility is to be provided for cars where cul-de-sacs extend beyond 25 metres.
6. Consideration must be given to refuse collection if required. Layouts should not require a refuse vehicle to reverse more than 12 metres. The design must allow refuse vehicles to be able to get to within 25 metres of a refuse storage point. Residents must not be required to carry waste more than 30 metres to a refuse collection point or storage point.
7. Longitudinal fall – maximum gradient 1:12 towards carriageway (relaxed to 1:8 in exceptional circumstances), maximum gradient 1:15 away from carriageway.
8. If there are two points of access, full manoeuvring / turning within the site should be possible, with visibility requirements achieved at both access points.
9. It will not be adopted as public highway.

1.3 Local Residential Street

Roads suitable for serving up to approximately 50 dwellings.

Local Residential Streets provide a balance in use between vehicles and pedestrians and cyclists. They can provide direct access to residential properties, as they are not designed to cope with large traffic volumes. Their geometry and design should reflect low vehicle speeds to prioritise active travel[1].

Street Dimensions and Character:

1. Serving up to 50 dwellings, not suitable for bus service access.
2. Minimum carriageway width of 4.5 metres and a maximum of 5.5 metres.
3. Minimum 6 metre radii at junctions or sufficient to accommodate the largest vehicle expected i.e. a refuse collection vehicle without oversailing footway or verge. This ensures that these vehicles can manoeuvre comfortably without obstruction.
4. Design speed of 15 mph. Achieved through measures such as surface changes, visual narrowing, central reservations, sensitive parking provision and green infrastructure. Vertical alignment speed measures must not be included.
5. A minimum centreline carriageway radius of 15 metres. Forward visibility must remain within the public highway land area and be free from obstruction.
6. No unbroken straight section of carriageway greater than 100 metres.
7. A minimum 2 metre footway is required on both sides of the carriageway. Where no frontage development is provided, a 1 metre service margin will be accepted.
8. Direct vehicle access is permitted, subject to suitable vehicle and pedestrian visibility being demonstrated for safety.
9. Local Residential Streets can be put forward for adoption, should they meet the Streetscape Design Guide requirements and be acceptable to the Local Highway Authority.

Additional design considerations:

10. Maximum gradient of 1:20 (5%) desirable, but consideration given to gradients of 1:12 (8.3%) for lengths of 10 metres or less. Minimum gradient of 1:80 (1.25%).
11. Footways shall have a crossfall of 1:40 (2.5%) towards the kerb and a maximum longitudinal gradient of 1:12 (8.3%).
12. Turning head to be provided as per minimum dimensions for a suitable vehicle to turn.
13. Low rise kerbs should be provided, either as kerb sets or concrete edge strips, to indicate the boundary between adopted highway and private property.
14. Green infrastructure should be used extensively to soften highway infrastructure and add to the visual appeal of the street. The landscaping should consider a green infrastructure strategy for the character area of the site. Existing trees should be accommodated within the design and removal of them should be a last resort. Green infrastructure should be

[1] Active travel refers to making journeys using physically active modes of transportation, primarily walking, wheeling (using wheelchairs or mobility aids), and cycling. It encompasses journeys undertaken for various purposes, such as commuting to work or school, running errands, or leisure activities, as long as they involve personal physical effort).

incorporated as part of the service margin using an appropriate design solution. A commuted sum may be charged for future maintenance.

15. Street trees based on the priniciple of 'right tree, right place,' will be considered within the highway boundary irrespective of carriageway type.
16. Applicants are required to consult with the relevant stakeholders including the emergency services during the design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development.

1.4 Secondary Street

Roads suitable for serving up to approximately 100 dwellings.

A Secondary Street carries local traffic and provides access into a neighbourhood. They are often the location of schools and community facilities and may also be residential streets in themselves.

Street Dimensions and Character:

1. Serving up to 100 dwellings, not suitable for bus service access.
2. Minimum carriageway width of 5.5 metres. Lane widening may be required on bends.
3. Minimum 6 metre radii at junctions or sufficient to accommodate the largest vehicle expected i.e. a refuse collection vehicle without oversailing the footway or verge.
4. Design speed of 20 mph. Achieved through measures such as surface changes, visual narrowing, central reservations, sensitive parking provision and green infrastructure. Vertical alignment speed measures must not be included.
5. A minimum centreline carriageway radius of 20 metres. Forward visibility must remain within public highway land and free from obstruction.
6. No unbroken straight section of carriageway greater than 100 metres.
7. Minimum 2 metres footway on both sides of the carriageway.
8. Direct vehicle access is permitted, subject to suitable vehicle and pedestrian visibility being demonstrated for safety.
9. Secondary Residential Streets can be put forward for adoption, should they meet the Streetscape Design Guide requirements and be acceptable to the Local Highway Authority.

Additional design considerations:

10. Maximum gradient of 1:20 (5%) desirable, but consideration given to gradients of 1:12 (8.3%) for lengths of 10m or less. Minimum gradient of 1:100 (1%).
11. Footways shall have a crossfall of 1:40 (2.5%) towards the kerb and a maximum longitudinal gradient of 1:12 (8.3%).
12. Turning head to be provided as per minimum dimensions for a suitable vehicle to turn.
13. Green infrastructure should be used extensively to soften highway infrastructure and add to the visual appeal of the street. The landscaping should consider a green infrastructure strategy for the character area of the site. Existing trees should be accommodated within the design and removal of them should be a last resort. Green infrastructure should be

incorporated as part of the service margin using an appropriate design solution. See Chapter 3. A commuted sum may be charged for future maintenance.

14. Street trees based on the principle 'right tree, right place,' will be considered within the highway boundary irrespective of carriageway type. See Appendix F.
15. Applicants are required to consult with the relevant stakeholders including the emergency services during the design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development.

1.5 Primary Street

Roads suitable for serving up to approximately 500 dwellings.

Primary streets function as a connection for Local Residential and Secondary Streets to higher order roads. A primary street acts as a thoroughfare that connects areas, carries higher traffic volumes and can accommodate bus routes through a development.

Street Dimensions and Character:

1. Serving up to 500 dwellings, not designed as a cul-de-sac.
2. Carriageway width of 5.5 metres to 6.2 metres. The latter width required to accommodate bus service provision. Lane widening may be required on bends.
3. Junction radii sufficient to accommodate the largest vehicle expected i.e. a refuse collection vehicle without oversailing the footway or verge or cycle track or encroaching into opposing traffic lanes. Typically, the radius is in the range of 6-10 metres, but subject to appropriate vehicle tracking.
4. Design speed of 20 mph.
5. Minimum centreline radii of 25 metres. Forward visibility must remain within public highway land and free from obstruction.
6. No unbroken straight section of carriageway greater than 100 metres.
7. Minimum 2 metres footways on both sides of the carriageway. Widened footways to facilitate higher pedestrian demand and movement, where necessary.
8. Direct vehicle access will be considered, subject to network layout, and suitable vehicle and pedestrian visibility being demonstrated to ensure safety.
9. Segregated cycle facilities that form part of an existing or proposed cycle network will be required where possible. One-way cycle tracks should provide a minimum 2 metres width + 0.5 metre buffer on both sides of the carriageway. Two-way cycle tracks will only be required on one side of the carriageway, with a minimum 3 metres width + 0.5 metre buffer with appropriate crossing facilities.

Additional design considerations:

10. Maximum gradient of 1:20 (5%) is desirable but consideration given to gradients of 1:12 (8.3%) for lengths of 10 metres or less. Minimum gradient of 1:100 (1%).
11. At junctions, the gradient of the side road should not exceed 1 in 20 (5%) for the first 10 metres from the channel of the major road.

12. Footways shall have a crossfall of 1:40 (2.5%) towards the kerb and a maximum longitudinal gradient of 1:12 (8.3%).
13. Cycle tracks will need priority over other vehicles when crossing side roads. LTN 1/20 Chapter 10 includes several suggested junction layouts for priority junctions with cycle track priority crossing.
14. Worcestershire County Council would not normally support the use of raised tables as it does not support vertical traffic calming techniques at this type of location. However, the use of raised tables (vertical deflection) may be possible if the highway is going to be lit.
15. On-street visitor parking will be permitted within the highway extent. Where we adopt additional areas to accommodate on-street parking, Worcestershire County Council may seek a commuted sum to cover future maintenance. Applicants may also be required to provide measures to prevent parking in unsuitable areas. In certain circumstances, Traffic Regulation Orders (TROs) may be needed to control on-street parking, including waiting or loading restrictions either within the development or on the surrounding highway network. Where this is so, you will normally be required to pay costs associated with making the orders.
16. Where the route is identified as a bus route, on-street unallocated parallel or perpendicular parking bays will need to ensure bus journey time reliability and punctuality is not compromised. Parallel bays should be 2 metres by 6 metres with a 1 metre 'pull out' strip. A maximum of 3 contiguous bays will be permitted. Parallel parking spaces which are constrained along one edge by, for example, a fence or wall will need to be wider. Perpendicular spaces shall be at least 5 metres long and 2.5 metres wide if next to another parking space or open space. If constrained along one edge, then the width should increase to 2.7 metres. If constrained on both sides, the width needs to be increased to 2.9 metres. Where it appears that on-street parking could cause problems, we may ask developers for swept path tracking assessments of appropriate vehicle paths (these are likely to include larger vehicles such as refuse collection vehicles, emergency vehicles and buses if the development is to be served by public transport).
17. Turning head to be provided as per minimum dimensions for a suitable vehicle to turn
18. Street trees based on the principle 'right tree, right place,' will be considered within the highway boundary irrespective of carriageway type.
19. Applicants are required to consult with the relevant stakeholders including the emergency services during the design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development.

1.6 Distributor Road

Roads suitable for serving more than 500 dwellings.

A distributor road is a road within a larger development that carries higher traffic flows than local streets. They are designed to facilitate efficient movement of traffic, particularly for vehicles, while still considering pedestrian and cycle safety.

Dimensions and Character:

1. Serving 500 plus dwellings, linking principal routes. They are not to be designed as a cul-de-sac.
2. Carriageway width of 6.7 metres to 7.3 metres depending on traffic volumes, bus use and proportion of Heavy Goods Vehicles (HGVs). Lane widening may be required on bends.
3. Junction radii should include a minimum of 10 metres or determined by tracking sufficient to accommodate the largest vehicle expected i.e. a refuse collection vehicle without oversailing the footway and cycle track or encroaching into opposing traffic lanes.
4. Design speed of 30mph.
5. Minimum 2 metres footways on both sides of the carriageway. Consideration may be given to widening footways to facilitate pedestrian movement where necessary.
6. Minimum centreline radii of 40 metres. Forward visibility must remain within public highway land and free from obstruction.
7. Segregated cycle facilities that form part of an existing or proposed cycle network will be required where possible. One-way cycle tracks should provide a minimum 2 metres width + 0.5 metre buffer on both sides of the carriageway. Two-way cycle tracks will only be required on one side of the carriageway, with a minimum 3 metres width + 0.5 metre buffer with appropriate crossing facilities to enable cyclists to reach the cycle track.
8. Cycle tracks will need priority over other vehicles when crossing side roads . LTN 1/20 Chapter 10 includes several suggested junction layouts for priority junctions with cycle track priority crossing.
9. Worcestershire County Council would not support the use of raised tables as it does not support vertical traffic calming techniques at this type of location.

Additional design considerations:

10. Maximum gradient of 1:20 (5%) is desirable but consideration given to gradients of 1:12 (8.3%) for lengths of 10 metres or less. Minimum gradient of 1:100 (1%).
11. At junctions, the gradient of the side road should not exceed 1 in 20 (5%) for the first 10 metres from the channel of the major road.
12. 2-metre-wide verges on both sides of the carriageway.
13. Footways shall have a crossfall of 1:40 (2.5%) towards the kerb and a maximum longitudinal gradient of 1:12 (8.3%).
14. Street trees based on the principle ‘right tree, right place,’ will be considered within the highway boundary irrespective of carriageway type.
15. No direct frontage access, unless otherwise agreed with the Local Highway Authority.
16. For potential congestion and safety concerns, there is no on-street parking provision within the highway boundary. This also excludes parallel or perpendicular parking spaces.
17. In streets where on-street parking is discouraged, developers are typically responsible for the costs of implementing any necessary traffic regulation orders, such as waiting or loading

restrictions. These restrictions might include double yellow lines, single yellow lines, or clearways to manage traffic flow and prevent obstruction.

18. Applicants are required to consult with the relevant stakeholders including the emergency services during the design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development.

1.7 Industrial Access Roads

These road types, by their very nature are more focused towards vehicular traffic. It is, however, still an important requirement to consider the interaction of Heavy Goods Vehicle's (HGVs) with other non-motorised and public transport users.

Access roads serving industrial, commercial and office developments should connect directly to a distributor road and must not be served through residential estates.

The Local Highway Authority normally considers industrial access roads to be of an insufficient public utility to warrant adoption. Where industrial access roads link with the public highway network, industrial access roads must be designed to accommodate HGV movements on a regular basis with the following considerations:

1. Carriageway widths may need to be increased to accommodate all types of vehicles expected to access these sites.
2. Design speed of 30 mph.
3. Carriageway width of minimum 6.7 metres and maximum 7.3 metres. Lane widening on bends may be required to reduce the likelihood of movement conflicts and overriding of the footway or verge. For roads identified to experience significant HGV turning movements per day, further carriageway widening could be considered, to enable ghost islands and turning lane facilities to be provided.
4. A minimum of 2.0 metres width footways or wider shared footway/cycleways should be provided. A footway or cycleway can deviate away from the carriageway if required, in providing a direct access to development plots or if it follows a pedestrian and cycle desire line or path. These should be separated from the highway by a minimum 1 metre green infrastructure strip and minimum 2 metres footways on both sides of carriageway.
5. Segregated cycle facilities that form part of an existing or proposed cycle network will be required where possible.
6. One-way cycle tracks should provide a minimum of 2 metres width + 0.5 metre buffer on both sides of the carriageway.
7. Two-way cycle tracks will only be required on one side of the carriageway, with a minimum 3 metres width + 0.5 metre buffer with appropriate crossing facilities to enable cyclists to reach the cycle track.

8. Cycle tracks will need priority over other vehicles when crossing side roads. LTN 1/20 Chapter 10 includes several suggested junction layouts for priority junctions with cycle track priority crossing.
9. Unless the Local Highway Authority considers it to be necessary and unavoidable, Worcestershire County Council does not normally support the use of vertical traffic calming, raised tables, on roads to be offered for adoption.
10. Minimum centre line radii of 40 metres.
11. Maximum gradient of 1:20 (5%) desirable but consideration given to gradients of 1:12 (8.3%) for lengths of 10 metres or less. Minimum gradient of 1:100 (1%).
12. Pedestrian crossings will normally be required wherever footpaths intersect with roads and accesses.
13. On-street parking on the highway will not be permitted. This will necessitate the implementation of a Traffic Regulation Order if the road is to be adopted by the Local Highway Authority. In this instance, the developer will normally be required to pay all costs associated with making the orders.
14. Green and blue infrastructure has a significant role in mitigating the impacts of major industrial/employment uses on biodiversity. If this type of road is put forward for adoption, these should be accommodated outside the limits of the adopted highway.
15. Sustainable drainage systems (SuDS) can be incorporated into green infrastructure, for example, using swales and tree planting. The Local Highway Authority would normally only accept adoptable highway drainage that connects directly to systems that are maintained by a statutory body (e.g. Severn Trent Water Ltd.) Where a dedicated highway surface water system is proposed, SuDS may be considered based on the design proposals and geotechnical considerations**.**
16. Street trees based on the principle 'right tree, right place,' will be considered in the highway boundary, irrespective of carriageway type.
17. Suitable kerb types and avoidance wherever possible of tight kerb radii will assist in reducing damage caused by vehicle overrun at junctions and bends. Where there is an unavoidable risk of kerb mounting or a likelihood of abuse of the footways or verges by vehicles, then specialised barrier kerbs should be used. In exceptional cases, practical and suitably spaced bollards may be installed.
18. Applicants are required to consult with the relevant stakeholders including the emergency services during the design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development.

2. Active Travel (Walking, Wheeling and Cycling) Routes

Active travel routes in new developments should be designed to ensure they provide a more direct and convenient means of accessing services and facilities than by using the road network alone.

For safety reasons, Worcestershire County Council requires that active travel routes be clearly marked to provide adequate separation of pedestrians and wheelers from motorised vehicles and cyclists, recognising the accessibility and safety benefits of this approach. Active travel should be

designed to minimise the need for cyclists to stop and to maintain a speed of up to approximately 15 mph.

Referring to LTN1/20 guidance for cycle infrastructure design, active travel routes will need to be designed with the following considerations, not limited to:

1. Design speed typically allows for up to 15 mph for cyclists.
2. Route width. Separate facilities should provide a cycleway width of 3 metres, with a footpath width of 2 metres that can be used to accommodate street lighting if required and where appropriate.
3. Route width for shared pedestrian/cycle facilities should provide an overall width of 4.5 metres, increasing to 5 metres to accommodate street lighting where appropriate.
4. New junctions should be designed to provide good conditions for cycling in all permitted directions, regardless of whether they are on a designated route, unless there are clearly defined and suitable alternatives.
5. Preferably 4 metres minimum radii at junctions subject to anticipated vehicle movements.
6. Minimum centreline radii of 15 metres.
7. Maximum gradient of 1:20 (5%) desirable, but consideration given to gradients of 1:12 (8.3%) for lengths of 10m or less. Minimum gradient of 1:100 (1%). Further details on suitable gradients for cyclists can be found in Chapter 5 - LTN 1/20: Cycle Infrastructure Design.
8. Protection from vehicular use - bollards or other suitable control measures should be used to prevent the use of footways and cycleways being used by motor vehicles.
9. Guard railing for pedestrian use should not be used as a default choice and any unnecessary physical hazards should be avoided.

3. Footways

Footways usually run parallel and adjacent to the carriageway. Footways and footpaths should be safe, convenient and secure for all users. Routes must include a smooth and even surface, be well-maintained, free from hazards and accessible. In achieving these basic objectives, footways and footpaths should be designed to:

1. Allow users such as pedestrians, pushchairs, mobility scooters and wheelchair users, including those with mobility issues to pass each other freely and without hindrance. The design should accommodate predicted demand. In locations where these provide access to high usage, footways may need to be wider than standard widths.
2. Accommodate dropped crossings and/or tactiles where accesses cross the footway.
3. Accommodate street furniture and statutory undertakers' services.
5. Chapter 9 Streetlighting should be referenced for lighting requirements.
6. Be overlooked i.e. include active frontages over their entire length.

Segregated footways are pedestrian walkways that are physically separated from cycle tracks or other traffic lanes, often by a kerb or other barrier. If highway adoption is sought, this will only be considered if the route is provided to a suitable width conforming with national and local design standards.

4.Establishing Access (Junctions)

An applicant must demonstrate that the junction arrangement proposed, represents an appropriate design, ensuring function and the safety of all users and that minimises queues/delays to highway users. Schemes must refer to the Manual for Streets (MfS) or Design Manual for Roads and Bridges (DRMB), as appropriate.

For cycle provision, the standards set out in Department for Transport's 'Cycle Infrastructure Design,' Local Transport Note LTN 1/20 should be applied, where it is reasonably possible.

The identification of an appropriate design guide should be discussed and agreed with the Local Highway Authority. In some cases, it may be appropriate to deviate from these standards, but this approach should be agreed in writing with the Local Highway Authority.

Scheme promoters are strongly encouraged to apply for the Early Technical Assessment process in considering access / junction design. The principle of seeking any Departures from Standards should be identified and discussed at the planning stage, supported by a Road Safety Audit (RSA), for any proposed permanent change to the public highway. Please see Appendix J for RSA templates.

In considering junction forms, wider technical considerations to consider include:

1. The volume of traffic: anticipated to use it and turning movements.
2. The volume of pedestrian /cycle activity.

3. Traffic composition and highway activity.
4. Demarcation: the requirements for clear demarcation between carriageway and footways as appropriate.
5. Where a single point of access for vehicles is proposed, this should be supplemented by additional points of access (wherever possible) for active modes to ensure the site is well connected with its surroundings, supporting Building for Healthy Living principles.
6. Street lighting: for all section 278 and section 38 applications, a developer will need to assess whether streetlighting is considered necessary or not. In all cases, developers shall complete the street lighting feasibility assessment, except where specified by '*BS 5489 - Road lighting'* in line with WCC's Chapter 9 Street Lighting. Considerations will include the environment, sensitive ecology, maintenance requirements and energy costs. For street lighting requirements for traffic calming features see LTN 1/07 – Traffic Calming Guidance, chapter 2.
7. Design speed: measures to control vehicles' speed must work at all times of the day and regardless of traffic volumes. Worcestershire County Council does not normally support the use of vertical traffic calming on roads to be offered for adoption where there is no specific provision for cyclists.
8. Geometry of the street: Depending on the road type, it may be necessary to increase the carriageway widths of bends to accommodate swept paths of larger vehicles without encroaching into the opposing carriageway or oversailing footways or verges, limiting unbroken straight sections of carriageway and the use of minimum centreline radii.
9. Vehicle tracking: all vehicle tracking (modelled at 10 mph) should demonstrate at least a 0.5 metre clearance (wheel tracking swept path) from all physical features within the highway and from other vehicles travelling on the highway. This is to allow for a factor of safety within the vehicle tracking proposals, as these tracking plans are often over optimistic and do not reflect real life manoeuvres. For more information about service vehicles, please refer to the Health and Safety Executive (HSE) guidance for safe operation of refuse and recycling collection vehicles in a pedestrian environment.
10. Applicants should normally avoid priority-controlled ('Give way') crossroads. When a crossroad cannot be avoided, the developer should normally provide an appropriate form of control such as a roundabout. Whilst mini roundabouts will not normally be acceptable at a junction into a development, they will be considered for use within developments, where they form part of a more comprehensive traffic calming scheme.
11. Digital infrastructure and/or the use of technology should be considered and incorporated to help future-proof solutions and services, reduce future maintenance costs, assist asset management, reduce environmental impacts and improve physical connectivity through the ability to make decisions based on 'real time' information. Please see Appendix H for more information.
12. Street trees provide opportunities for counteracting the emissions from traffic and energy use, as well as the overall environment, composition, quality and scale of streets, providing edges and canopies. Street trees based on the principle of 'right tree, right place' will be considered within the highway boundary irrespective of carriageway type. See Appendix F.

13. Climate change and carbon emissions: Selecting the right elements that are appropriate for the site location by ensuring the elements are resilient to climate change, using sustainable materials that can withstand wear and tear and providing adequate drainage and irrigation.

The identification of an appropriate design standard, different to that referred to in this guide, should be discussed and agreed with the Highways Development Control Team at an early stage. In some cases, it may be appropriate to deviate from these standards, should the Highways Development Control Team approve this approach in writing to the applicant.

Applicants are strongly encouraged to agree the principle of any Departures from Standards at the planning stage and encouraged to enter the Early Technical Assessment process. Any Departures from Standards should follow the Local Highway Authority's standard procedure, including the one for highway structures; the Local Highway Authority will require a Road Safety Audit (RSA) in this circumstance. An RSA process in accordance with GG 119 should usually accompany any proposed permanent change or addition to the local public highway. Please see Appendix J for RSA templates.

4.1 Innovative Junction Design

Innovation in junction and street design is welcomed on a case-by-case basis, and it can be appropriate to extend these principles onto the existing highway network, either as part of an access scheme or as highway mitigation. Where innovative schemes are to be proposed, early discussions are essential with the Local Highway Authority and some specific issues will need to be explicitly considered. A non-exhaustive list includes:

- The design should reflect the needs of the surrounding environment.
- The needs of visually or physically impaired users should be considered and user groups involved from an early stage.
- Design speeds should be appropriate to the location and the junctions design.
- Proposed construction materials should be suitable and readily available; and
- Consideration must be given to junction efficiency, minimising delays to all highway users.

The developer will need to demonstrate that any highway design offered for adoption to the Local Highway Authority, enables Worcestershire County Council to discharge statutory responsibilities placed upon it by Section 149 of the Equalities Act 2010.

4.2 Junctions or Access Spacing

For non-DMRB design junctions and accesses, the minimum spacing requirements include:

1. 30 metres for opposing junctions and 60 metres for adjacent junctions.
2. No accesses or driveways are to be positioned within 20 metres of a junction bell mouth.

The Local Highway Authority adopts these standards in principle as a starting point. However, the Authority may consider alternative distances subject to the local context and supporting evidence. Any reductions on these values would require the provision of a Road Safety Audit to inform its consideration. These standards apply to both newly designed junctions or access points as part of a larger site and junctions or accesses incorporated into existing layouts.

Junction layout designs should be based on DRMB, will be spaced in accordance with visibility requirements and shall be suitable for higher speed roads. These will require a greater spacing distance to those distances specified above.

4.2.1 Stopping Sight Distances (SSDs) and Visibility Splays

An important contribution to road safety is the provision of adequate visibility, thereby enabling road users to see a potential hazard in time to slow down or stop comfortably before reaching it. In the context of stopping sight distance (SSD), link design refers to the geometric design of a road section (known as a "link") to ensure adequate visibility for drivers to stop safely at any point along that section. This involves coordinating horizontal and vertical curves to provide sufficient stopping sight distance, considering factors like design speed, road type, and terrain. For links, this will be provision of appropriate Stopping Sight Distances (SSDs) and, for junctions, provision of appropriate sightline visibility splays.

For all traffic locations, the following standards apply:

- For all traffic locations including traffic signals within the local road network in Worcestershire, DMRB visibility standards apply where the Design Speed / 85th percentile speed is above 64 kph (39.8 mph).
- MfS 1 visibility criteria shall apply where a Design Speed /85th percentile speed is 60 kph (37.3 mph) or below.
- Between 60 kph and 64 kph, and the characteristics of the road alignment with paragraph 1.3.6. of MfS2, the following may be used in the calculation to establish the SSD:

    - Reaction time of 2.0 seconds
    - Absolute Minimum deceleration rate of 0.375g

Table 2: Stopping Sight Distances and standards to be applied

Location	Design Speed	Standard
All traffic locations	>39.8 mph (64 kph)	DMRB Visibility standards
All traffic locations	<37.3 mph (60kph)	MfS 1 Visibility standards
All traffic locations	>37.3 and <39.8 mph (60 kph and 64 kph)	Use formula to calculate SSD as given in 10.1.5 MfS2, as described above.

For residential streets and commercial/industrial estates where the recorded 85th percentile speeds are 60 kph (37.3 mph) or less, MfS1 visibility splay requirements apply. Above this speed, a MfS2 visibility splay requirements may apply, particularly in residential areas or commercial/industrial areas, or where you would expect people to be walking, cycling, or wheeling. In other circumstances, and particularly for the Strategic Road Network, arterial routes (such as A classification roads), or higher speed roads, DMRB visibility requirements will apply, where there is little or no residential or commercial activity.

At junctions, visibility splays play a vital role to ensure drivers merging or crossing traffic have a clear view of oncoming vehicles, reducing the risk of collisions.

Where MfS1 focuses on lower volumes of traffic in residential streets, DMRB is more suited to roads outside of the residential street environment. Visibility requirements need to consider the relationship of the highway to its surroundings. The use of MfS2 helps fill the perceived gap between MfS1 and DMRB, assisting in identifying and applying an appropriate visibility splay for slightly faster routes, but still reflects a residential, employment environment or street function.

DMRB allows relaxation in certain circumstances. However, the SSD shall not be relaxed on the "*immediate approaches*" to junctions. Within road links, the forward visibility SSD can be relaxed based on the design speed, and in accordance with CD 109.

For Section 278 and Section 38 Design Audit Submissions, any relaxations included within the design shall be detailed and the mitigating circumstances explained. This shall also be provided to the Road Safety Audit team within the safety audit brief.

4.2.2 Speed Measurement

Speed measurements should be taken in accordance with DMRB's CA 185 that provides guidelines for spot speed measurements on roads. Spot speed is the instantaneous speed of a vehicle at a specific location and is used to understand how vehicles are moving at a particular point on the road. This data is crucial for road design and safety considerations.

For non-signalised junctions, the location at which the speed measurements are to be taken should be at the approximate 'Y' distance (see diagram 1) based on the posted speed limit of the major road permitted by legislation.

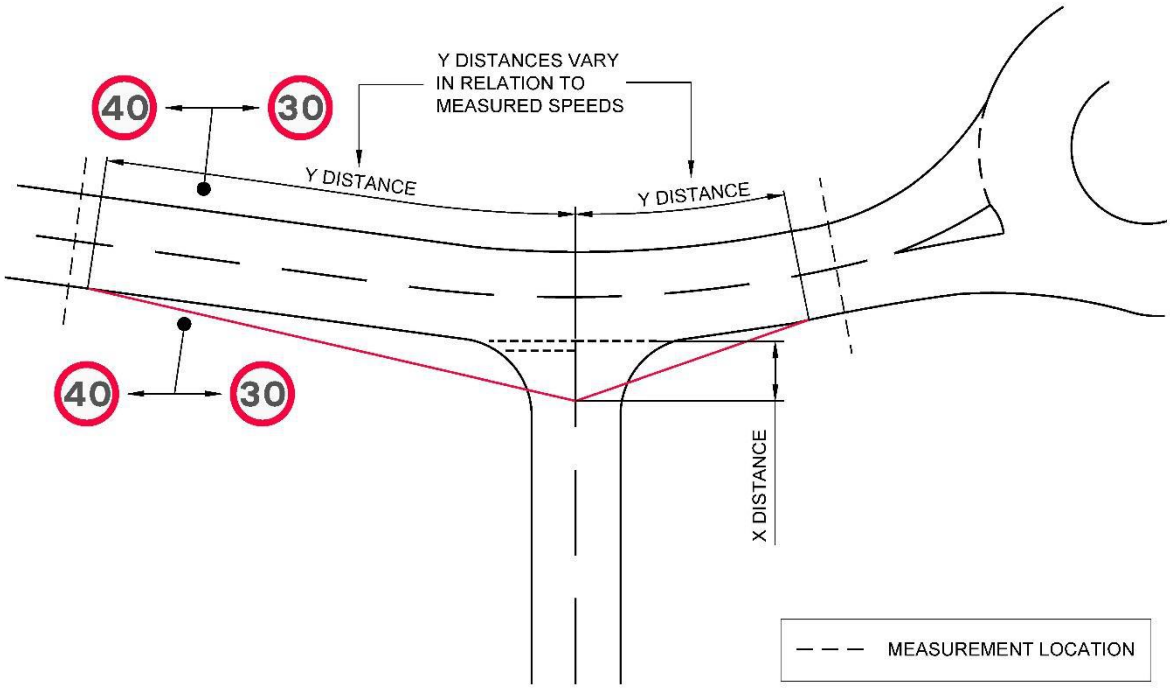
The method of measurement of the spot speeds (radar metre or pneumatic road tube example) shall be in accordance with CA 185 (DMRB). This includes free flow conditions, minimum number of vehicles measured or a minimum of three days of data, frequency of measurement and timing.

In the absence of confirmed dry weather and road conditions, 85th percentile speeds shall be increased by 8 kph for dual carriageways and 4 kph for single carriageways in accordance with CA 185.

Where there is a difference in speed depending on the direction of travel, different 'Y' distances may be used (rather than a single 'Y' distance based on the highest speed).

Early engagement with Worcestershire County Council is encouraged to resolve any queries.

Diagram 1: Indicative Measurement Locations
This is an illustrative example only.



4.2.3 Forward visibility sightline distance

Forward visibility, in the context of road design, refers to the minimum distance a driver needs to see ahead to safely stop and avoid an obstruction in the road. This distance is often determined by the vehicle's stopping sight distance (SSD), which is the distance required to stop safely, considering factors like speed, reaction time, and deceleration. Sightline distance, on the other hand, is the distance along which a driver needs to have an unobstructed view to perceive potential hazards in time to react and stop safely.

SSD shall be based on the design speed in accordance with Table 2.10 in CD 109 or Table 7.1 in MfS as appropriate. The minimum design speed for SSD shall be 20 mph. Where the design speed falls

between the tabulated values in CD 109 or MfS, the higher value shall be used. Alternatively, the SSD may be calculated from first principles.

When assessing forward visibility, the vertical visibility envelope shall be as stated in MfS and CD 109 respectively with an object height of between 0.6 metre and 1.05 metres (2.00 metres where the combined proportion of HGV and bus traffic is more than 5% of the traffic flow) where MfS 1 or 2 applies and between 0.26 metre and 2.00 metres where DMRB applies.

Where the forward visibility line passes over any soft landscaping areas (e.g., where the alignment is on a horizontal curve), a 6 metre vertical clearance shall be achieved above the soft landscaping/grass to allow for vegetation growth. Where a 6 metre clearance is not achievable, hard landscaping should be considered. Horizontally, visibility splays shall not be obstructed by vegetation. Proposed planting or trees shall be set back sufficiently so as not to impede the visibility splay once fully mature.

If there is any doubt that an adequate visibility splay is achievable vertically in any direction, it may be necessary to procure a topographical survey and to provide a long section with the carriageway level and the visibility splay plotted. This may require supporting by cross sections, where the visibility splay crosses land at the edge of the carriageway that is elevated or contains features that are above carriageway level such as a roadside embankment.

The driver's position in an agricultural vehicle is often much higher than in a car, van, or lorry, and the driver is often sat much further back from the front of the vehicle. The elevated position of the driver may allow a clear line of sight in the vertical plane over field boundaries. However, obstacles such as tree canopies, traffic signs, or bridges, may obstruct the driver's visibility from the elevated position. Where an agricultural access is proposed or it is likely that the use of an existing agricultural access will increase, it will be necessary to demonstrate that a clear line of vision would be available from the access at an 'X' distance of 4.5 metres, from a height of between 2.0 metres and 3.5 metres above carriageway level to a height of 2.0 metres over the stopping sight distance, as well as demonstrating that the general visibility splay requirements set out in this chapter are achievable.

4.2.4 'Y' distances for vehicles

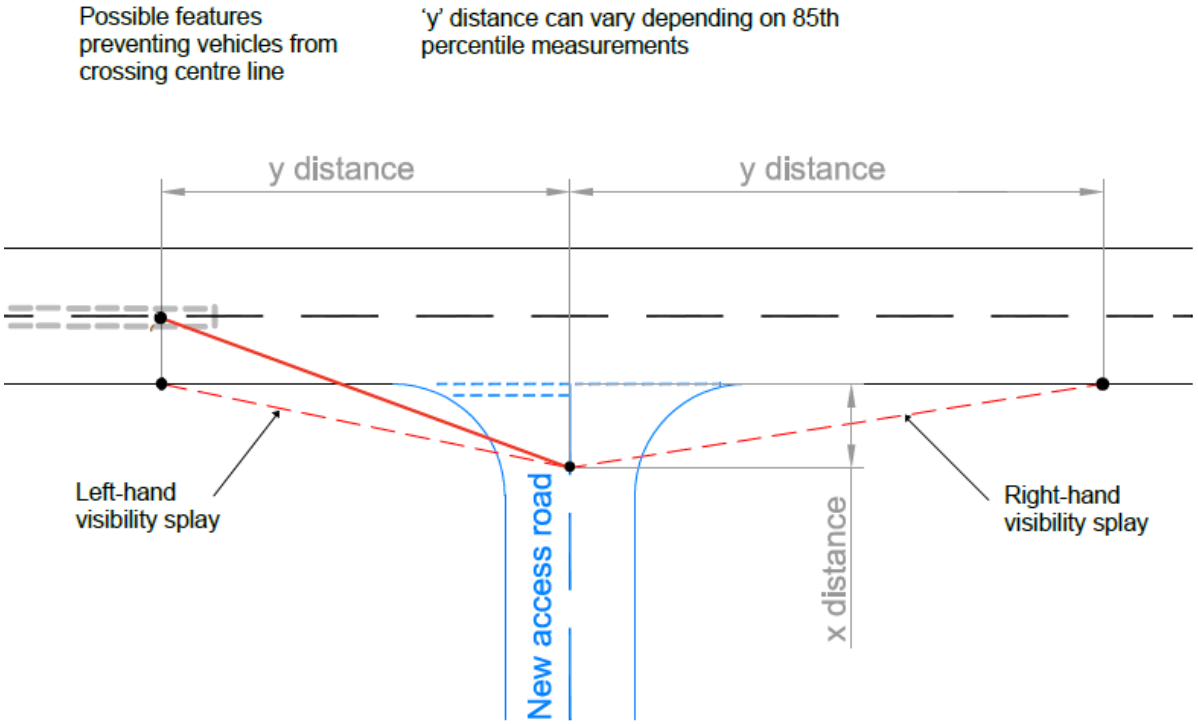
The 'Y' distance is the Stopping Sight Distance (SSD). Please refer to diagram 2.

The point to which the 'Y' distance to the left is measured may be relaxed in some circumstances as listed below:

- A refuge island is provided with high level 'keep left' signs within the 'Y' distance or,
- Where a physical feature is provided such as a central reserve or refuge preventing vehicles from crossing the roads centreline.
- Relaxations would require written approval from the Local Highway Authority.

Diagram 2: Measurement of 'Y' Distances

This is an illustrative example only. MfS1 Figure 7.18 Measurement of junction visibility splays on a straight road section (as below) and on the inside and outside of a bend.



The point to which the 'Y' distance is measured should be to the channel / kerb line as shown in Diagram 2.

When considering stopping sight distances, if the speed of a vehicle varies depending on the direction of travel (e.g., uphill vs. downhill), it is crucial to use different 'Y' distances for each direction rather than relying on a single 'Y' distance based on the highest speed. This ensures a more accurate and safer assessment of visibility requirements.

The visibility splay shall not enter an adjacent junction minor arm, such that a vehicle waiting to exit the adjacent junction, would then obscure the visibility splay. For example:

a) For a junction to the right, the visibility splay shall not cross the tangent point of the bell mouth with the mainline.
b) For a junction to the left the visibility splay shall not cross the centreline of the adjacent junction).
c) Where the adjacent junction to the right is a merge, the visibility splay shall not enter the merge taper.

The following principles apply:

- When designing a visibility splay at a road junction, it should not extend over any nearby crossovers that serve seven or more homes, commercial properties, or any side road. This ensures clear sightlines and prevents potential accidents.
- Road junctions on the same side of a road within a development scheme should be spaced so that a vehicle waiting to enter the main road, does not interfere with visibility for a vehicle waiting at another.
- A visibility splay should either be within existing public highway or across land controlled/owned by the developer and which can be adopted as public highway.
- The vertical visibility envelope when assessing visibility along the 'Y' distance shall have an object height of between 0.6 metres and 1.05 metres (2.0 metres) as described above if MfS applies (see section 4.2.3).
- Horizontally, visibility splays shall not be obstructed by vegetation or other objects. Proposed planting or trees shall be set back sufficiently so as not to impede the visibility splay once fully mature.

4.2.5 'X' distances for vehicles at priority junctions

A priority junction is where one road has right-of-way over another, typically at T-junctions and crossroads. Vehicles on the major road have priority, and those on the minor road must give way, usually by using 'Give Way' or 'Stop' lines. At unmarked crossroads, drivers should proceed with caution, as no one has clear priority. A simple priority junction is a type of road intersection where traffic on the main road has right-of-way, and traffic on the minor road must yield. It is a common configuration for T-junctions and crossroads where no central treatment like a central reserve or ghost island exists and no merging or diverging tapers are present.

The 'X' distance for priority junctions shall, unless otherwise agreed with the Local Highway Authority, be as detailed in table 3.

Table 3: 'X' distances for priority junctions

Type of Priority Junction	'X' Distance
All priority junctions where the major road is less than 40mph	2.4 metres
Simple priority junctions (as defined by CD 123 DMRB) where the major road is 40mph or more	2.4 metres
All other priority junctions where the major road is 40mph or more (see below)	4.5 metres

A greater 'X' distance of 4.5 metres is a common visibility requirement for major junctions, busy access roads or where the side road has a speed greater than 40 mph. The greater distance would also likely apply to industrial roads. The requirement for this will be site specific and designers should seek advice from the Local Highway Authority.

4.3 Walking, Cycling and Horse-Riding Sightline Distance Requirements

Requirements for walking, cycling and horse riding shall be considered as appropriate, in accordance with the relevant national design standards including DMRB, MfS, Traffic Sign Manual, Local Transport Notes (e.g. LTN 1/20).

Each crossing location with a carriageway shall be assessed in terms of visibility splay and stopping sight distance in accordance with CD 143 and CD 195 (DMRB) and utilising MfS SSD's only where MfS applies.

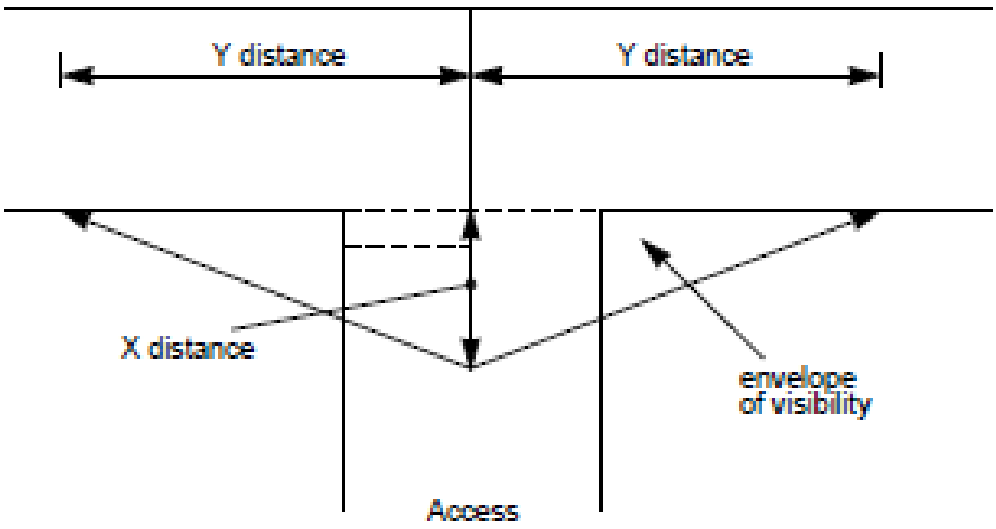
4.4 Visibility Requirements at Vehicle Crossovers

For vehicle crossovers (dropped kerb accesses, not full bellmouth construction), the 'X and Y' distance(s) can either be based on the design speed or 85th percentile speeds. Diagram 3 also shows an illustrative example**.**

MfS2 states that a minimum 'X' distance of 2 metres may be considered in some slow-speed situations when flows on the minor arm are low, but using this value will mean that the front of some vehicles will protrude slightly into the running carriageway of the major arm, and many drivers will tend to cautiously nose out into traffic. The ability of drivers and other road users such as cyclists to see this overhang from a reasonable distance, and to manoeuvre around it without undue difficulty, needs to must be considered. An 'X' distance of 2 metres will only be accepted in appropriate locations that are considered by the Local Highway Authority to be appropriate, i.e. for example a cul-de-sac, where the road design of the carriageway ensures slow speeds and the traffic volumes are low.

Diagram 3: Vehicle Crossover Visibility

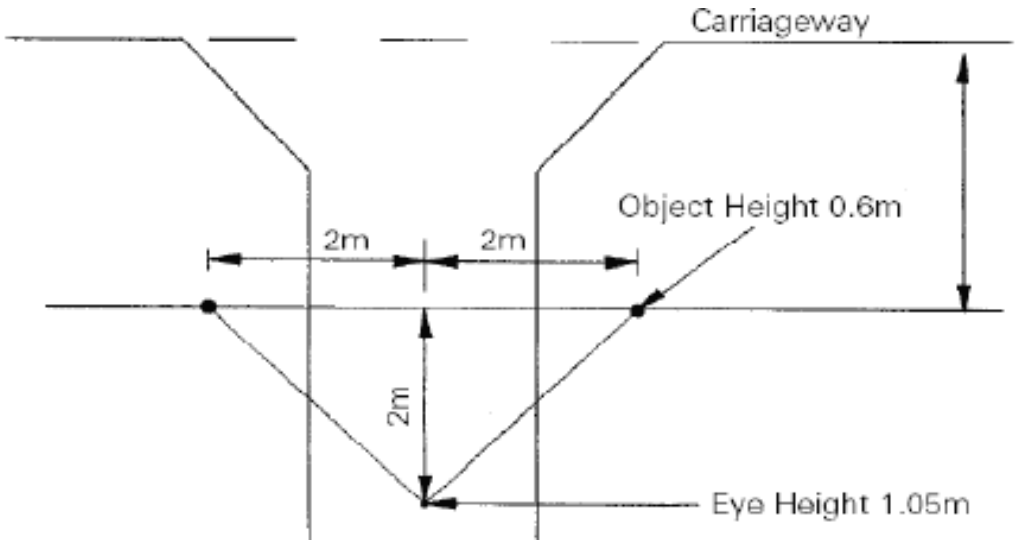
This is an illustrative example only.



Where the proposed access crosses a footway/cycleway, then inter-visibility from between the driver and any footway/cycleway users shall be provided. This shall be measured as 2 metres x 2 metres from the back of the footway/verge and be kept clear of any obstruction including trees or landscaping greater than 6 metres in height above the carriageway level, i.e. taken from driver's eye height. See Diagram 4.

Diagram 4: Pedestrian/Vehicle Intervisibility at Vehicle Crossovers

This is an illustrative example only.



The absence of wide visibility splays at single access driveways should encourage drivers to emerge more cautiously. Consideration should be given to whether this will be appropriate, considering the following:

- the frequency of vehicle movements,
- the amount of pedestrian activity, and
- the width of the footway.

4.5 Vertical Alignment

Steep gradients should be minimised where possible. Gradients should not exceed the guidance in the "Inclusive Mobility" government guidance document. Where the footway follows the longitudinal fall of the carriageway then consideration must be given to maximum gradients and lengths, to ensure that the footway remains accessible to people with disabilities. The desirable maximum longitudinal section gradient of adoptable or adopted footways or footpaths is 1 in 20 (5%). In some circumstances 1 in 10 may be permissible but, generally 1 in 12 should be the maximum footway longitudinal or crossfall gradient.

For new carriageways, the maximum and minimum gradients allowable are as follows shown in Table 5.

Table 5 – Maximum and Minimum gradients allowable

Category	Maximum Longitudinal Gradient	Minimum Longitudinal Gradient
All road categories	1:20 (5%) desirable but consideration may be given to gradients up a maximum to 1:12 (8%)	1:100 (1%)
Side roads approach to a junction	1:20 (5%) maximum for 10 metres from the give way line	1:100 (1%)
Cycle tracks and footways	1:20 (5%) over a distance of 10 metres	1:100 (1%)

It is important to note:

- Where a 1:12 gradient is proposed, no length shall exceed 10 metres. These standards apply to both private driveways and proposed streets.
- For cycle tracks and footways, refer to LTN 1/20 for maximum lengths of gradients flatter than 1:20.
- Transitions between sections of constant gradient shall be by means of vertical curves defined by the appropriate 'K' value. The minimum 'K' values are defined in table 6.

Table 6 – minimum 'K' values

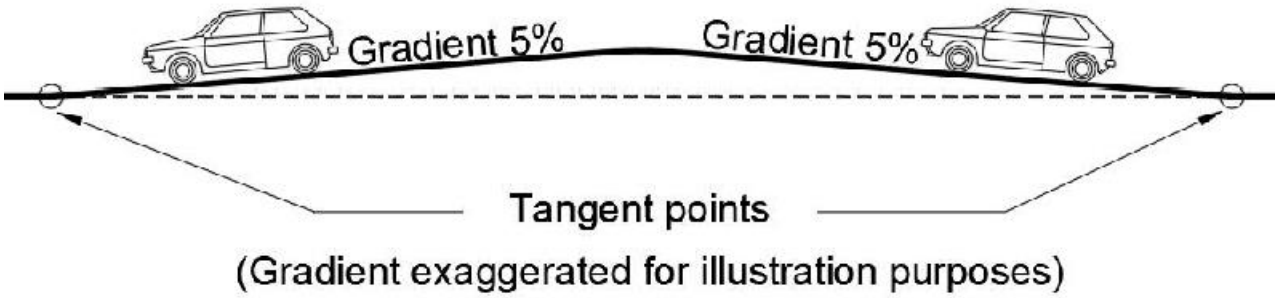
Category	Minimum 'K' value
Major access and above	6
Minor access and below	2
Cycle track	6

Additionally, the minimum curve length shall not be less than 20 metres. The following example has been included to assist developers in designing vertical curves.

Example Alignment:

The example shows a 20-metre curve length between sections of the alignment with gradients of +5% and -5%. See diagram 5 for an illustrative example.

Diagram 5: vertical curves



The 'K' value is given by Length of Curve / Change in Gradient
'K' = 20 / 10
'K' = 2

The calculated 'K' value is acceptable for a minor access road and falls within the design criteria and therefore, would be acceptable.

The developer should note that where gradients exceed 5%, there may be a requirement for a grit bin. In such instances the developer will need to ensure the design provides an adequate location for a suitable grit bin to be located and provided.

Carriageways should normally have standard camber or crossfall gradients. Consideration may need to be given to eliminate any adverse crossfall on tight radii in roads to allow vehicles to negotiate such bends safely. Superelevation of local distributor roads may need to be applied for certain centreline radii. Superelevation should not be introduced or adverse crossfalls eliminated so gradually as to create almost flat areas of carriageway or so sharply as to give the kerb line a kinked appearance.

4.6 Horizontal Alignment

4.6.1 Sharp Corners and Speed Control Bends (Highway Geometry)

Speed control bends, with a deflection of between 80 degrees and 100 degrees, are usually only suitable on non-primary streets within developments where speeds have already been reduced. They must be clearly visible as being different from a normal bend. The full forward visibility for the appropriate design speed should be provided.

Carriageway widths should be able to safely accommodate all vehicles that can be anticipated to use the road. On a swept path analysis, where a large vehicle is indicated as crossing the centre line of the carriageway to negotiate a bend or junction, traffic volumes must be minimal with associated speeds should be less than 10 mph for the crossing vehicle.

Within secondary or local residential streets, the vehicle swept path could use both sides of the carriageway to enable consideration to be given to tight junction radii to allow more direct and convenient pedestrian and cycle desire lines to be achieved. This approach will not necessarily apply at proposed junctions to the existing highway network. Whether a vehicle swept path can use the entire carriageway depends on a Road Safety Audit, the specific context, and written agreement from the Local Highway Authority. The Road Safety Audit assesses safety and feasibility, while the context, including vehicle type and road conditions, also plays a crucial role. Written agreement by the Local Highway Authority ensures clarity and responsibility for any necessary adjustments or restrictions, like strengthening footways or ensuring visibility.

Strengthened footways may be necessary where unavoidable vehicle overrun by heavy vehicles may be expected, e.g. bends where corner radius is less than 6 metres and could otherwise lead to early deterioration and result in more frequent maintenance.

4.6.2 Overrun Areas

Overrun areas should be avoided in residential streets. Where an overrun area is used adjacent to a pedestrian, wheeler, cycle or horse-rider crossing, the overrun area should not resemble a footway or refuge to discourage pedestrians or cyclists using it to cross the carriageway. In some instances, access to an overrun area by vulnerable road users should be prevented.

Where it is proven and accepted that an overrun area is unavoidable, the maximum dimensions for overrun areas need to be in accordance with Regulation 5 of Highways (Traffic Calming) Regulations 1999. The design of an overrun area should not prevent cyclists crossing it safely. The radius for the outer edge of an overrun area shall be formed from readily obtainable radius kerbs. Signing is not normally required, as they should normally be constructed in contrasting material or colour. Where appropriate, delineation from the normal running surface may be achieved using road markings to diagram 1012.1, Traffic Signs Regulations General Directions 2016 (as amended). It is not appropriate to use any type of hatched markings across overrun areas, as this may conceal them.

Overrun areas may be viewed by some as parking places as they are surface finished in a contrasting appearance to the regular blacktop treatment. To prevent this from occurring, it may be necessary to implement yellow line parking restrictions on the bends. In this instance, the developer will normally be required to pay all costs associated with making the Traffic Regulation Orders (TROs).

Worcestershire County Council requires development layouts and access routes to be assessed using appropriate design vehicles included in the AutoCAD (or equivalent) vehicle tracking software. Design vehicles should be representative of vehicle types likely to serve the development.

4.6.3 Swept Path Analysis

Good practice should be followed when undertaking swept path analysis, including the use of appropriate design speeds and other parameters appropriate to the context of the analysis.

All schemes must incorporate reasonable tolerances and safety margins. Vehicle tracking should demonstrate at least 0.5 metre clearance (wheel tracking swept path) to kerbing or vertical obstructions on each side of the swept path.

In areas of potential conflict between vehicles, the swept path analysis shall demonstrate that the minimum clearances required can be achieved between both moving and stationary traffic. The extent of stationary traffic queues for this assessment shall be the agreed peak flows from the traffic assessment for the junction.

Tracking assessments will be required to validate the functionality of turning areas and emergency routes. This will include a refuse vehicle and a fire tender, but vehicle and specific vehicle specifications should be agreed in advance with Worcestershire County Council.

When presenting drawings of vehicle tracking swept paths, the following criteria should be applied:

1. Vehicle tracking to be illustrated at an appropriate drawing scale with a north arrow and new or existing roads clearly identified.
2. Vehicle profile to be shown in a drawing frame.
3. Vehicle tracking speed to be shown in a drawing frame. Generally, 10 mph is acceptable, although lower speeds may be accepted for certain turning movements.
4. Vehicle tracking to show both the body of the vehicle and wheel tracks.
5. No hatching is to be shown within the vehicle envelope to ensure no features are obscured.
6. A minimum 0.5 metre offset to kerbs and features from the outside edge of vehicle body should be maintained.
7. Swept paths demonstrating that the vehicles which will use the street on a day-to-day basis can pass one another.
8. How on-street permissible parking will affect available carriageway width.
9. The route for larger vehicles such as service vehicles or buses should not require back-tracking.

5. Designing for Service Vehicles

Service vehicles are infrequent users of the road and their incorporation into the design should not dominate the overall design. The frequency with which they use each road should be considered and the road should be designed to match the requirement. Sites where a high number of HGVs or service vehicles are expected will require that the road width be suitable to accommodate these vehicles traveling in both directions and the width should ensure that they can pass each other safely and at the appropriate speed, including any widening on bends.

Where service vehicles are less frequent in residential areas and are unlikely to meet each other traveling in opposite directions, the road width can be reduced accordingly. In these circumstances HGVs can use all parts of the road and cross the centreline. However, road design in these situations

must incorporate a swept path analysis to ensure that all HGV service vehicles can travel along the road without complicated manoeuvres being required. Roads or private accesses shall be laid out so that, when accessing a collection/drop-off point or residential property, the maximum distance a pantechnicon, or other light goods vehicle (LGV) needs to reverse, should not exceed 20 metres.

Cul-de-sacs longer than 20 metres shall be provided with turning facilities. These shall be suitable for vehicles up to 3.5 tonne maximum gross weight plus other vehicles that will be expected to use them. The drivers of vehicles intending to enter a cul-de-sac should be able to see whether the turning facility is free of obstructions before undertaking the manoeuvre.

Turning heads and similar facilities should contain vehicular accesses at suitable locations to discourage obstructive parking. Where this would not be practicable, the turning facility shall still be useable with the expected parking.

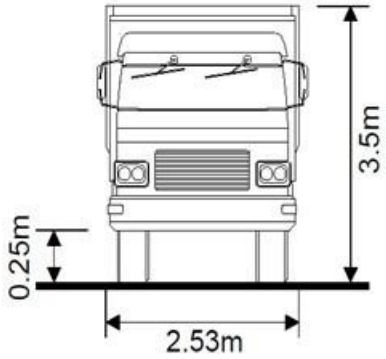
5.1 Refuse Collection Vehicles (RCVs)

A new or amended development site should be designed to accommodate refuse collection vehicles used locally for junction radii and vehicle turning.

Refuse collection vehicles typically have a height of 3.5 metres, which rises to 5.1 metres with the tailgate raised and a width of 2.53 metres as per diagram 6.

Diagram 6: typical refuse collection vehicle specifications

This is an illustrative example only.



The length of a refuse collection vehicle differs throughout the county. For example, in Malvern Hills, a vehicle typically has a total length of 11.3 metres with the tailgate raised, whereas other Districts use a vehicle of 10.3 metres in length (assuming the tailgate is raised). Therefore, it is advisable to consult with the Design Codes for the relevant District Council to confirm the exact refuse collection vehicle specifications when providing a suitable design layout.

The design layout must demonstrate that the standard refuse vehicles can enter the site safely and efficiently, and manoeuvre around the site to collect from all the proposed presentation points.

Provision to turn the vehicle within the site must also be provided to allow safe exit in a forward gear where necessary. All bin presentation points are to be positioned to allow safe working of the refuse vehicle and operatives in respect of road junctions or not cause unnecessary obstruction to other road users.

All required swept path analysis should account for the likely locations of on-street parking, the passing of other vehicles and the need to ensure a 0.5 metre buffer between the vehicle wheels and the kerb edge.

Reversing and manoeuvring a refuse vehicle is one of the most hazardous tasks refuse drivers perform. The maximum distance a refuse collection vehicle needs to reverse should typically not exceed 12 metres and shall be no more than 20 metres. Longer distances can be considered, but any reversing routes should be straight and free from obstacles or visual obstructions, with the potential requirement of street lighting in some instances. Such situations should be discussed with the relevant Local Planning Authority.

Building regulations mandate that residents should not have to carry their wheelie bins more than 30 metres to their designated storage area, or from the storage area to the collection point. The waste containers should be within 25 metres of any waste collection point specified by the waste collection authority. The route between storage and refuse collection points should be solid, non-slip and as far as possible level. The route should not require bins to be moved up/down slopes of more than 1:12 or multiple steps.

For access purposes the minimum width of a private drive or unadopted road should be not less than 3.5 metres and the minimum height clearance should not be less than 4 metres across the whole width of the road and 1 metre either side. There must be no obstruction from overhanging branches, cables, etc. likely to cause damage to the vehicle. Any part of a building through which a refuse vehicle passes must have a minimum clear height of 4.5 metres, to allow for overhead fixtures and fittings.

5.2 Vehicle Turning Heads for RCVs

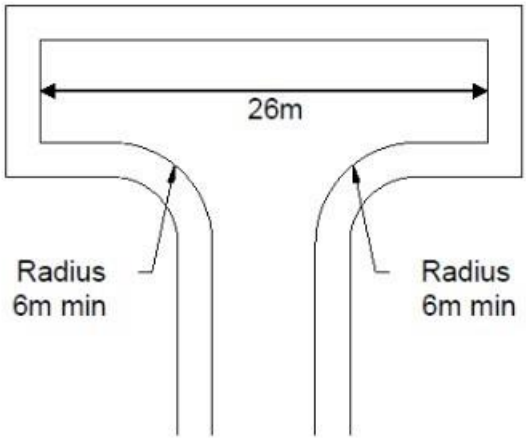
To accommodate refuse collection vehicles, residential cul-de-sacs typically require a turning area where its length is greater than 25 metres. To be effective and usable, the turning heads must be kept clear of parked vehicles on the street.

Turning areas in residential streets should be designed to allow turning for refuse collection vehicles, whereas in industrial and retail developments, turning areas should allow for articulated or pantechnicon vehicles to turn, subject to what is relevant to the proposals. Tracking of the relevant vehicle swept paths must be presented using CAD software.

'T-form' turning facilities should maintain a length of 26 metres across the 'T' to facilitate manoeuvres by pan Technicon (HGV) sized vehicles. The carriageway widths, radii and footway widths should comply with the design specification for the road which they serve. Please refer to diagrams 7 and 8 for specifications.

Diagram 7: 'T' form

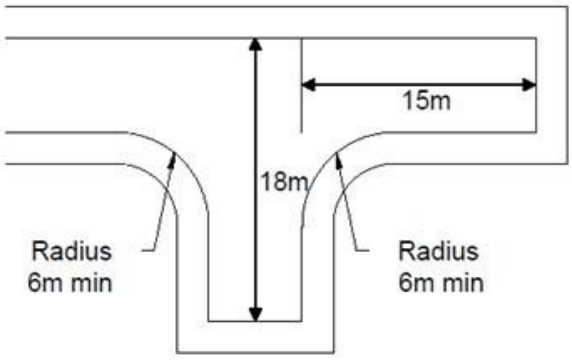
This is an illustrative example only.



'Side T-form' turning facilities as per below, should maintain a width of 18 metres and a length of 15 metres from the termination of the carriageway and the start of the spur. The carriageway widths, radii and footway widths should comply with the design specification for the road which they serve.

Diagram 8: 'T' turning

This is an illustrative example only.

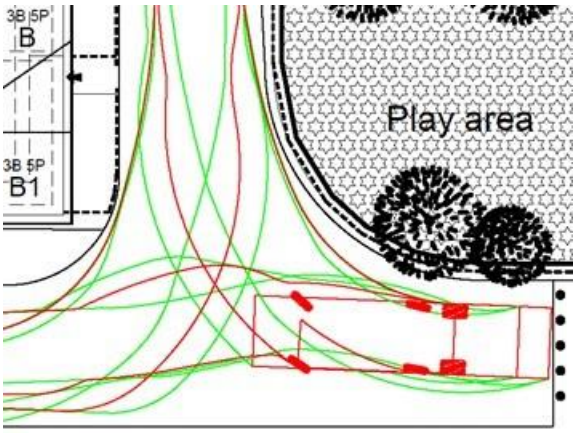


Variation from these dimensions is acceptable subject to successful tracking of the District Local Authority's refuse collection vehicle specifications.

The refuse collection vehicle should stay within the kerb lines, but the isolated vehicle (body) overhang of the footway may be accepted, if the streets on which they occur have low pedestrian volumes and the driver is given the required visibility to observe them. This is not a constraint where a verge is provided. Please see diagram 9 for refuse collection vehicle tracking.

Diagram 9: Tracking for Refuse Collection Vehicle

This is an illustrative example only.



5.3 Emergency Vehicle Access

Developments should be designed so that there is no requirement for an emergency vehicle only access link. These are difficult to enforce, and physical barriers can cause delays. The practical requirements for servicing by an emergency vehicle must be incorporated into the design of all developments whether they are proposed for adoption or not.

Developers should consult with the relevant emergency services during the early design and planning stages, particularly where there are designs which limit access for emergency vehicles to any part of the development. It is recommended for developers to have early engagement with Hereford and Worcester Fire and Rescue Service (HWFR) for further guidance about vehicle access.

Where emergency access is to be provided, the applicant shall provide scaled drawings of the access which includes vehicle tracking.

5.4 Traffic Mirrors

The placing of traffic mirrors on or around publicly maintained roads are not normally permitted. An exception may be made where the site has a poor personal injury road traffic accident record, and all other viable solutions have been explored. Worcestershire County Council, as the Local Highway Authority, has the responsibility for deciding whether a traffic mirror is needed to maintain highway safety. They are not provided for private roads.

A traffic mirror is legally defined as a traffic sign and can only be erected by Worcestershire County Council as the Local Highway Authority. It is governed by Legislation: The Traffic Signs Regulations and General Directions (TSRGD) 2016. The Local Highway Authority can place them without authorisation from the Department for Transport (DfT).

The placing of a traffic mirror can affect road safety due to the following issues:

1. Distortion of reflected image; glare from sunlight or headlamps affecting the driver's vision.
2. Visibility issues during bad or extreme weather such as rain, snow, fog and frost.
3. Difficulty judging the speed of an approaching vehicle from the mirror image.
4. Maintenance issues – mirrors could be prone to vandalism, maintenance of their alignment and cleanliness is critical.
5. Unreasonable dependence on the mirror's restricted image may compromise the safety of other road users, including pedestrians, wheelers and cyclists, who do not appear in the mirror.
6. Other solutions may be available instead, e.g. cutting back vegetation, moving or lowering boundary fences, walls, or other obstructions.

The Local Highway Authority will use its powers to remove any traffic mirror placed in private property that is found to adversely affect highway safety. A mirror placed on private land shall:

1. Be subject to any required planning permission.
2. Be erected outside the limits of the highway.
3. Cause no danger to any other road user either by glare from reflected sunlight, or headlights at night.
4. Not overhang the highway and obstruct vehicles, pedestrians, or equestrians.
5. Have permission of the landowner.
6. Be at no cost or liability being passed on to the Local Highway Authority.

Early engagement in the design process with Worcestershire County Council is encouraged to resolve any queries.