

Highways Design Guide for New Developments

Revision 14 – February 2024

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Version control

Revision	Date	Page	Amendment
1	November 2015	36	Drainage Design details updated
2	July 2016	37 59	Soakaway drawing removed. Pipes for Drainage - diameter increased (item 5.1.1)
3	April 2017	43	Streetlighting information added
4	October 2017	46	Paint specification updated (item iii)
5	June 2019	46	Luminaires/Lanterns updated (item v)
6	February 2020	46	Luminaires/Lanterns updated (item v)
7	June 2020	146	Addition of appendices 3C, 3D, and 3E
8	August 2020	72	Manhole Covers and Frames Requirements updated (item 5.6.1)
9	October 2020	145 151	Fee structure added
10	April 2021	43	Contractor updated
11	April 2021	46	Streetlighting information updated Document cleaned up, errors corrected, reformatted into new template
12	July 2021	Several pages	Cycling guidance updated throughout. Minor corrections throughout.
13	October 2023	37-41	Street Lighting Guide updated
14	February 2024	16	Major Access Roads

Introduction

In recent years, the approach to the design of the space between buildings has evolved away from the traditional dominance of the engineered carriageway. There is now a recognition that the public realm has many wider functions than just the movement of vehicles. This has been recognised in the national launch of the planning policy and guidance, PPS3, and its companion guide 'Better places to live by design and Manual for Streets 1 and 2 by the Department for Transport and the Department for Communities and Local Government. The manual can be found on the Department for Transport website.

Torbay Council has produced this Design Guide to aid Developers, Designers, and other professionals, and to consider how their proposals will affect the highways and transportation infrastructure. It explains the Design Philosophies, Criteria, and Council Policies, and sets out the procedures for application and processes to be followed for adoption of the infrastructure. It also sets out the Council's requirements for compliance with Legislation, Health and Safety, Environmental and Public Protection.

To include:

- Road and personal safety: To achieve developments that: are safe for all users; promote road safety; and reduce personal safety risks (whether real or imagined).
- Accessibility: To achieve developments accessible to all road users (vehicles, cyclists, pedestrians, including those with sensory and mobility impairments. providing socially necessary local bus services, publishing bus and bus information strategies and promoting high-quality rural and urban services that encourage greater use of public transport
- Sustainability: To promote sustainable, high-quality alternatives to the private car, it introduces the key issues of sustainable travel (public transport, cycling and walking), and to encourage using sustainable materials wherever possible.
- The impact on highways and transportation infrastructure: To ensure the highways and transportation infrastructure is not adversely affected by developments, including safety and congestion, and impact on people and the environment is minimised.
- Design quality and future maintenance: To achieve highway and transportation infrastructure that: contributes to high-quality developments that can be properly and efficiently maintained, and encourages development layouts to be adopted, wherever possible, to safeguard homeowner's interest.
- Developments with more individuality and less of a 'one size fits all' approach.
- Developments that better reflect and respect local character, for example in terms of layout and architecture.
- Developments that better provide for local needs, for example in terms of the shopping or play facilities that they provide.
- Higher-quality developments that enhance their surroundings and provide a safe, accessible, and attractive environment in which to live, work and play.

Design Criteria

The guidance contained in this part is intended to help you design development layouts that provide for the safe and free movement of all road users, including, cars, lorries, pedestrians, cyclists, and public transport. You should select and assemble appropriate design elements to:

- provide road layouts which meet the needs of all users and restrain vehicle dominance.
- create an environment that is safe for all road users and in which people are encouraged to walk, cycle, and use public transport and feel safe doing so; and help create quality developments in which to live, work and play.

We believe that such an approach, coupled with the flexibility that our guidance allows, already reflects many key themes of the Manual for Streets, MfS2. Also, we have revised certain aspects of Torbay's design guide to reflect specific MfS2 guidance, particularly with regard to visibility splays descriptions and guidance. To seeking residential development layouts that recognise that roads have a wider role to play in creating a sense of place and community as opposed to simply having a functional transport role.

Where this cannot be achieved by development layouts that are explicitly covered by this guidance, we are prepared to be flexible. Where development proposals do not align with either the principles or guidance set out in this document it is likely that we will seek to resist those proposals in the interest of the users of the highway network and its primary role in providing safe and effective transport for all. However, if the proposals are significantly out of line with the principles and guidance the Council may recommend a refusal.

New Development Highway Types

Design criteria for the following categories of new roads are specifically dealt with in this section of the guide. The following hierarchy applies.

- Footways (adoptable)
- Cycle Tracks (adoptable)
- Single Private Drives (not adoptable)
- Shared Private Drives (not adoptable), where less than 5 properties served
- Shared Surfaces (adoptable)
- Home Zones (adoptable)
- Minor Access Roads (adoptable)
- Major Access Roads (adoptable)
- Local Distributor Roads (adoptable)
- Industrial and Commercial Access Roads (may be considered for adoption)

Footways

The layout and design of footways should aim to provide safe, reasonably direct, secure, and visually attractive routes for pedestrians. The provision of convenient and easy to use car parking facilities will be a significant factor in discouraging indiscriminate parking on pedestrian routes.

Whenever footways interconnect with carriageways at pedestrian crossing points, dropped crossing kerbs should be installed to assist wheelchair users and those with prams or pushchairs. The gradient should be no more than 1:12 and the kerb should be flush with the carriageway (refer to Specification for allowable tolerances). Tactile paving should be provided at dropped kerbs to assist blind and partially sighted people, unless instructed otherwise by highway officers.

Footways should be designed to take account of:

- The type and function of adjacent carriageways
- The location of apparatus for statutory and other services
- The types of pedestrian movement
- The number of pedestrian movements including
- In the vicinity of schools, play areas, shops, or other community buildings, there may be a need for variations in design compared to those adjacent to dwellings
- Requirements of pedestrians where the nature of the development includes a high proportion of the very young or people with disabilities
- The space occupied by street furniture such as street lighting columns, traffic signs, etc.
- The provision of access to dwellings for the emergency services; appropriate car parking can help save such access without obstructing footways
- Methods for reducing the damage to footways resulting from over running or parking of vehicles, particularly at junctions

Footways should always be provided where the use of shared surfaces would not be appropriate. Footway widths should normally be 2m, shared footway/cycleway surfaces should be 3.5 m plus. LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

Linking footways between cul-de-sacs will need to be carefully designed so that the security of the users and adjacent dwellings is not adversely affected. The designer will also need to include design features that may reduce nuisance to the adjoining householders from inconsiderate users of this type of footway.

Cycle Tracks

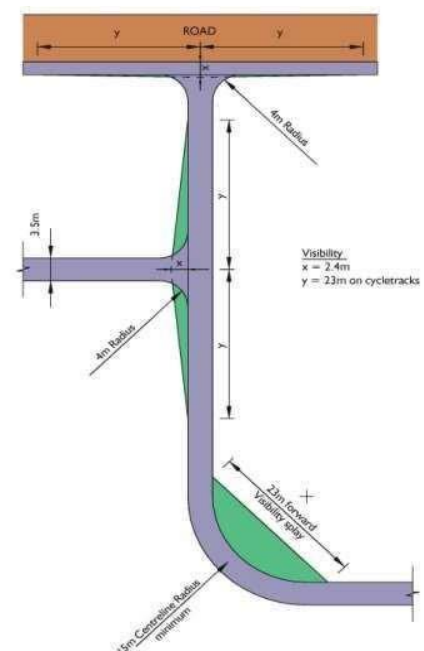
- Design speed - 15mph
- 3.0m minimum width for shared facility with pedestrians
- 2.5m wide for segregated facility with additional 1.5m for pedestrians
- Visibility at junctions with roads
- Signs and lines to be provided in accordance with Traffic Signs Manual
- Residential roads may form part of local cycle advisory routes and networks

Local Transport Note 1/20 provides guidance and good practice for the design of cycle infrastructure in support of the Cycling and Walking Investment Strategy.

The scope of this document is limited to design matters. Further reading on related matters, helpful tools and advice on procedural issues is included in the Appendices.

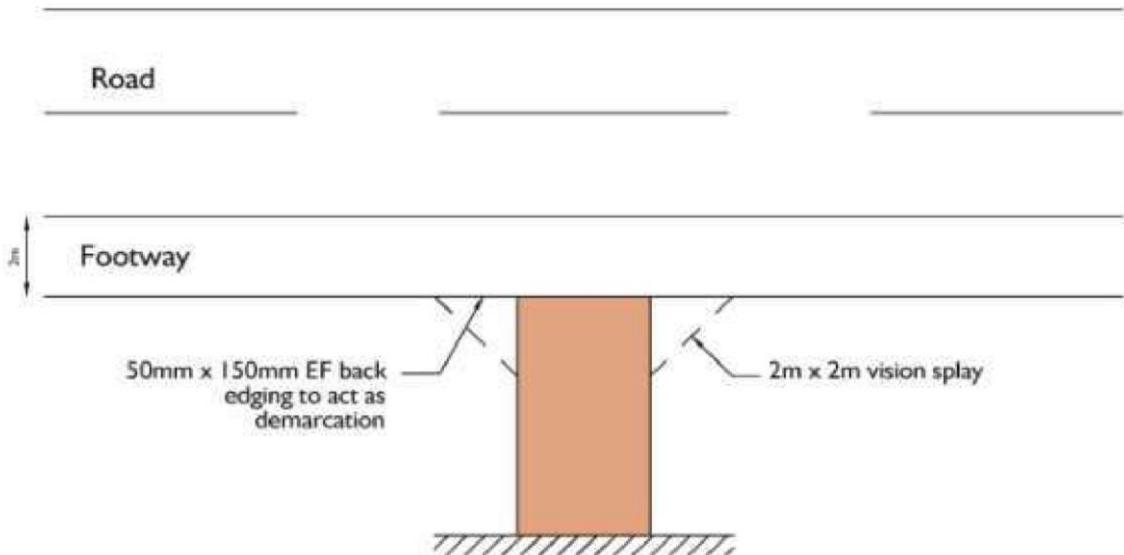
LTN 1/20 replaces previous guidance on cycle infrastructure design provided by LTN 2/08, and accordingly, LTN 2/08 is withdrawn.

LTN 1/20 also replaces LTN 1/12: Shared Use Routes for Pedestrians and Cyclists, and accordingly, LTN 1/12 is now withdrawn.



Single Private Drives

- Will not be adopted as public highway
- Water from driveways must not be allowed to discharge onto the highway
- Driveway to be surfaced with self-draining bound materials (loose material not allowed)
- The connection to the priority road shall be laid out as a dropped crossing to be set out at 90 degrees to the road, where possible
- Installed gates must be set back 6 metres from the highway boundary and open inwards
- Turning area to be provided where deemed necessary by the highway authority
- Visibility splay in accordance with Manual for streets and Design Manual for roads and bridges



Driveway width 3.2m min

Driveway Length 6.0m min

Longitudinal fall to driveway max 1:12 towards the carriageway, max 1:15 away from the carriageway

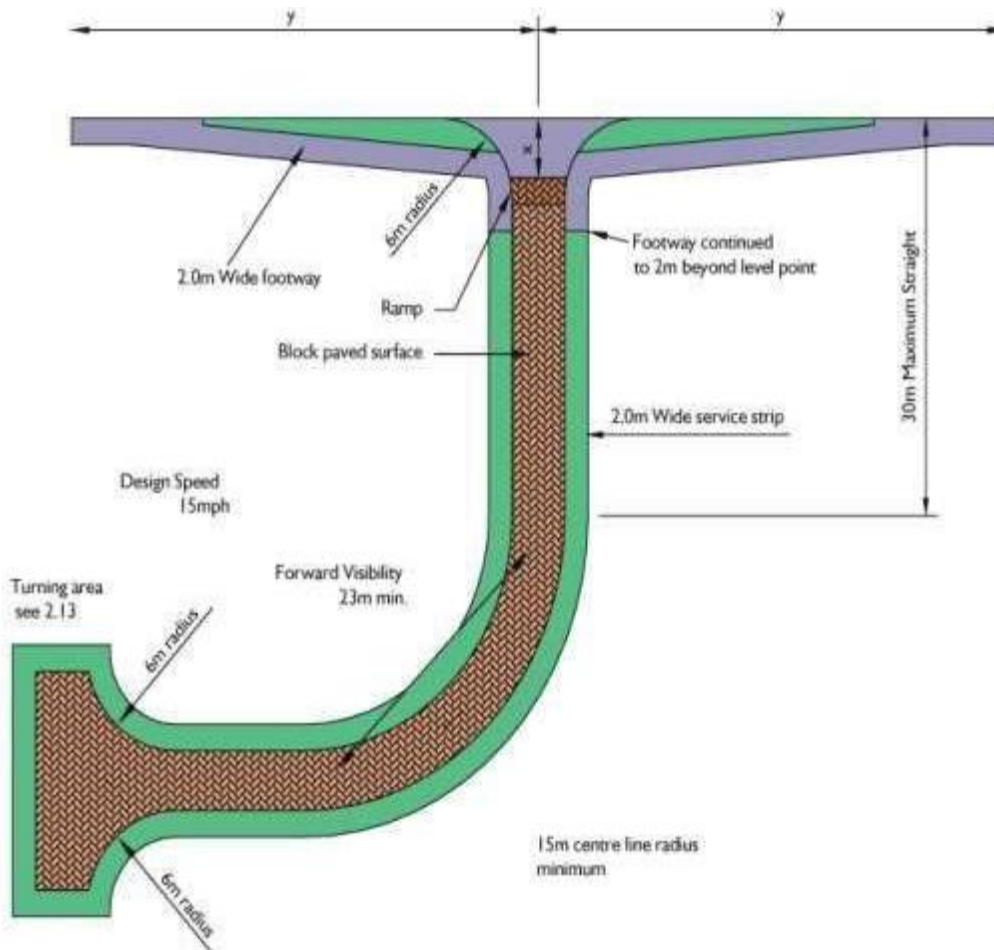
Shared Private Drives

- A shared surface which forms a cul-de-sac or courtyard serving a maximum of 5 houses
- Will not be adopted as public highway (unless over 5 properties served)
- Design speed 10mph
- Turning area to be provided for cars where length is less than 25m
- Where length exceeds 25m, a turning area for refuse vehicles and passing bays should be provided
- 2m x 2m vision splays to be provided at the rear of the footway minimum width of 3.5m
- Junction spacing to be 30m on the same side where shared drive is on a major access road
- To be set out at 90 degrees to the road where possible
- Visibility splay in accordance with Manual for streets and Design Manual for roads and bridges.
- Maximum gradient 1:8

Shared Surfaces

- Serving up to 25 dwellings (max 50 dwellings with two access points to higher category roads)
- Design speed 15mph
- Minimum carriageway width 4.8m

- Footways not required beyond entrance ramp
- Turning areas in accordance with Manual for streets
- Visibility splays in accordance with Manual for streets and Design Manual for roads and Bridges.
- A single hard surface for use by pedestrians and vehicles without segregation
- Service strip 2m wide, where provided
- Surface to be block paved or imprinted coloured Bituminous Material Design mix at the Engineers Specification
- Forward Visibility splay in accordance with Manual for streets.



Minor Access Roads

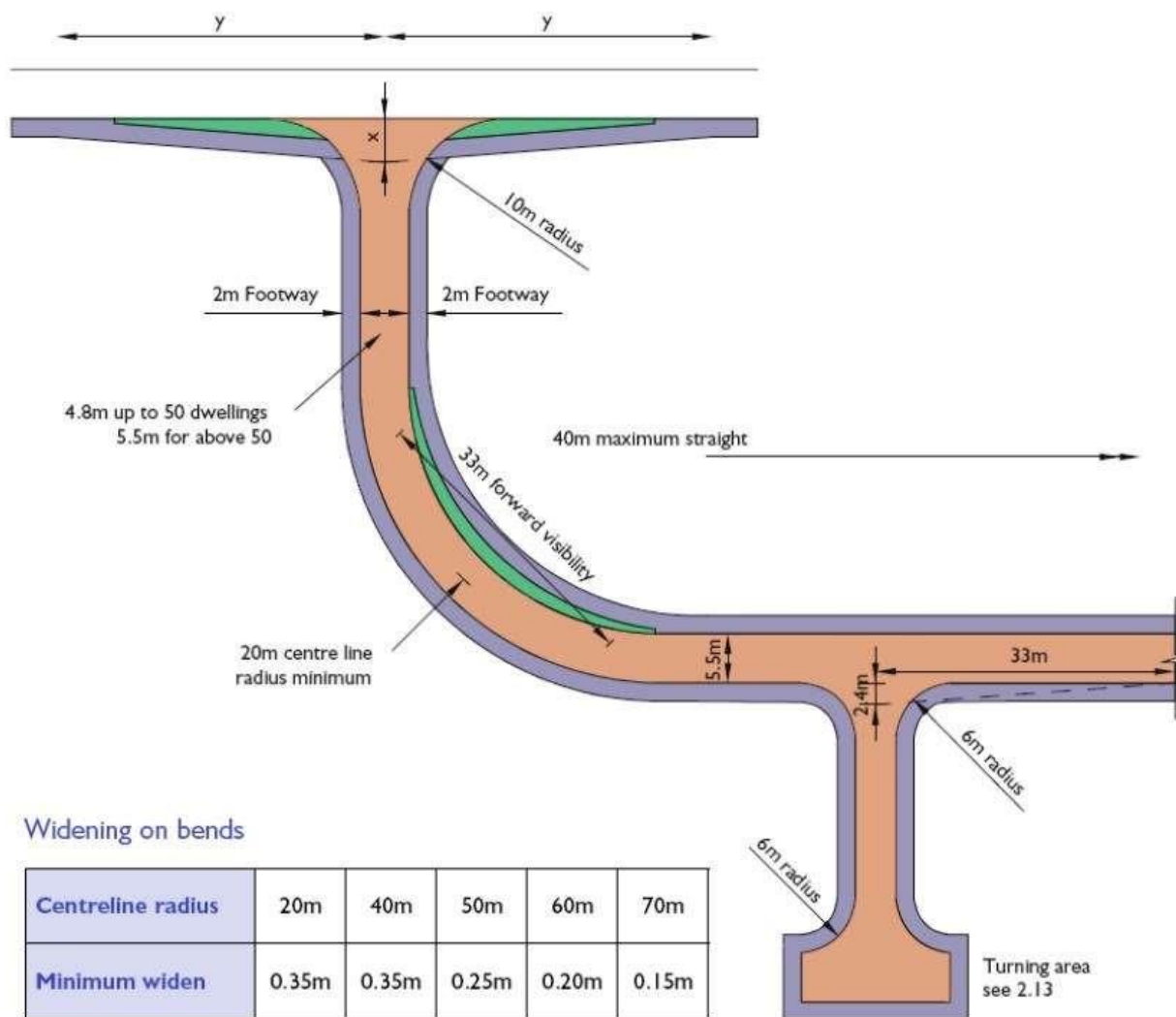
- Serving up to 100 dwellings
- Design speed 20mph
- Standard carriageway width 5.5m, may be reduced to 4.8m where less than 50 houses are served
- 2m wide footways to be provided on each side where dwellings have direct access
- Turning areas in accordance with diagram 2.13
- Visibility splays in accordance with Manual for streets, (Design Manual for roads and bridges to be used when joining strategic routes)
- Shared use may be considered providing designated parking provision is provided
- Consideration of connecting footways/cycle ways to adjacent access roads

Entry Radii

With major access road: 6m minimum
With higher category road: 10m minimum

Junction Spacing

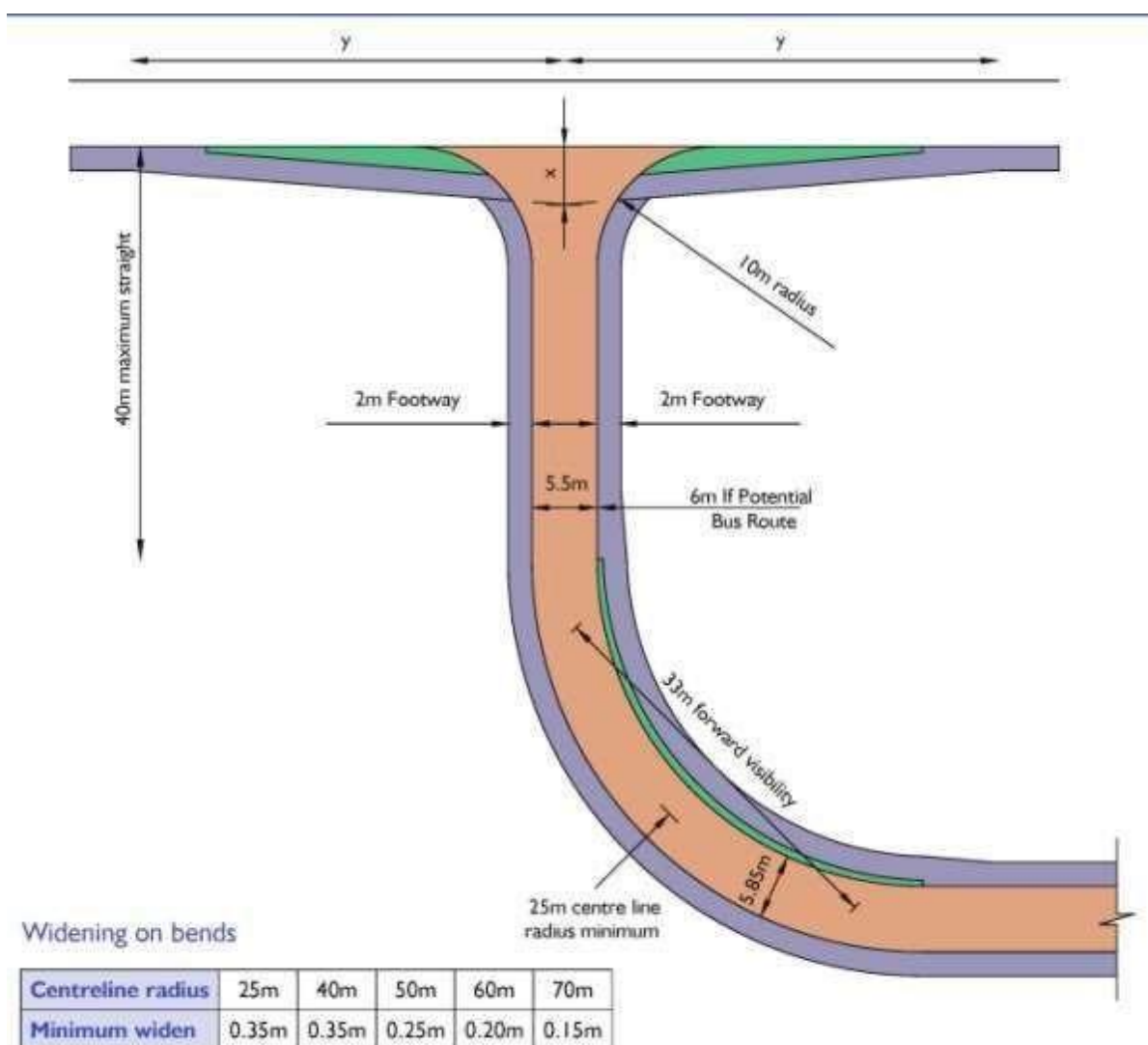
- Same side: not restricted
- Opposite side: not restricted



Major Access Roads

- Serving between 100 and 300 dwellings
- A development of more than 100 dwellings with a single vehicular access will also require an emergency access (minimum width 3.7m).
- Design speed 20mph
- 5.5m wide carriageway, 6m if possible, bus route
- 2m wide footways on both sides, 3m wide if shared pedestrian/cycleway
- Turning areas in accordance with Manual for streets
- Visibility splays in accordance with Manual for streets 1 and 2 (Design Manual for Roads and Bridges when joining strategic routes)

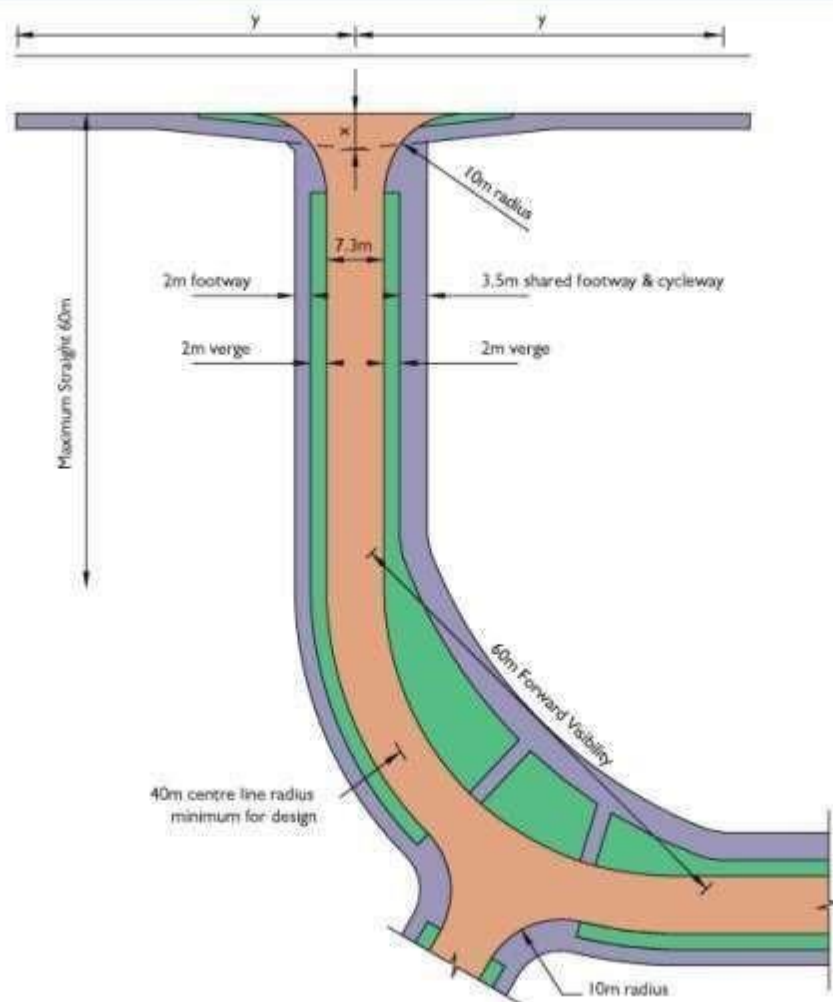
Entry radii	Junction spacing
With higher category road: 10m minimum	■ Same side: 30m
	■ Opposite side: 15m



Local Distributor Roads

- Design speed 30mph
- Road width 7.3m
- Minimum centre line radius 40m
- Forward visibility 60m
- Individual private access only in exceptional circumstances
- Minimum of two access to existing highway network
- 3.5m shared pedestrian/cycleway
- Visibility in accordance with Manual for streets 1 and 2 (Design Manual for Roads and Bridges when joining a major access roads and strategic routes)

Entry Radii	Junction Spacing
With higher category road: designed in accordance with HA TD 42/95	Same side: 100m
	Opposite side: 50m



Home Zones

A Home Zone is essentially a shared surface road but laid out so that pedestrians and other users have equal priority with vehicle users. In essence, the Home Zone should make motorists feel they are guests in a pedestrian environment and should drive accordingly.

Although the introduction of a Home Zone can contribute to road safety, the main benefit to local people is a change in how the street can be used. Home zones may consist of shared surfaces, indirect traffic routes, areas of planting, and features to encourage the use of the street, such as seating. Gateways and signing will be needed to mark the limits of the zone.

The key benefit of a Home Zone is that it turns a residential street into valued public space and not just a place for movement.

- A speed retarder ramp and/or pinch point will be required to define the zone limits together with relevant signage and design features to create a sense of identity.
- Home Zones must be designed to meet the needs of all members of the community. Disabled people will have particular requirements, which must be taken into account. Shared surfaces cause problems for blind and partially sighted pedestrians and this is highlighted in Manual for Streets.
- Vehicle speeds shall be kept to substantially less than 10mph by means of design layout; specifically, substantial changes in direction of the traffic route.
- The minimum forward visibility splay shall be 12m.
- Swept path analysis will be required to demonstrate that highway design, and speed restricting alignments can adequately accommodate appropriate vehicles, including large refuse freighters and emergency services vehicles.
- Road Safety Audits and Risk Assessments will be required for Home Zones.

- Properties adjoining the highway must comply with CDM regulations to ensure that safe access for property maintenance is provided.
- Home zones will only be considered on roads which meet the criteria for shared surface roads in this guide.

Industrial and Commercial Access Roads

- Design speed 30mph
- Carriageway width 6.7m, increased to 7.3m if large no. of HGVs served
- 2m wide footways on both sides
- 3m wide shared pedestrian/cycleway
- Turning areas in accordance with diagram 2.13
- Visibility splays in accordance with Manual for streets (Design Manual for roads and bridges)

Entry Radii

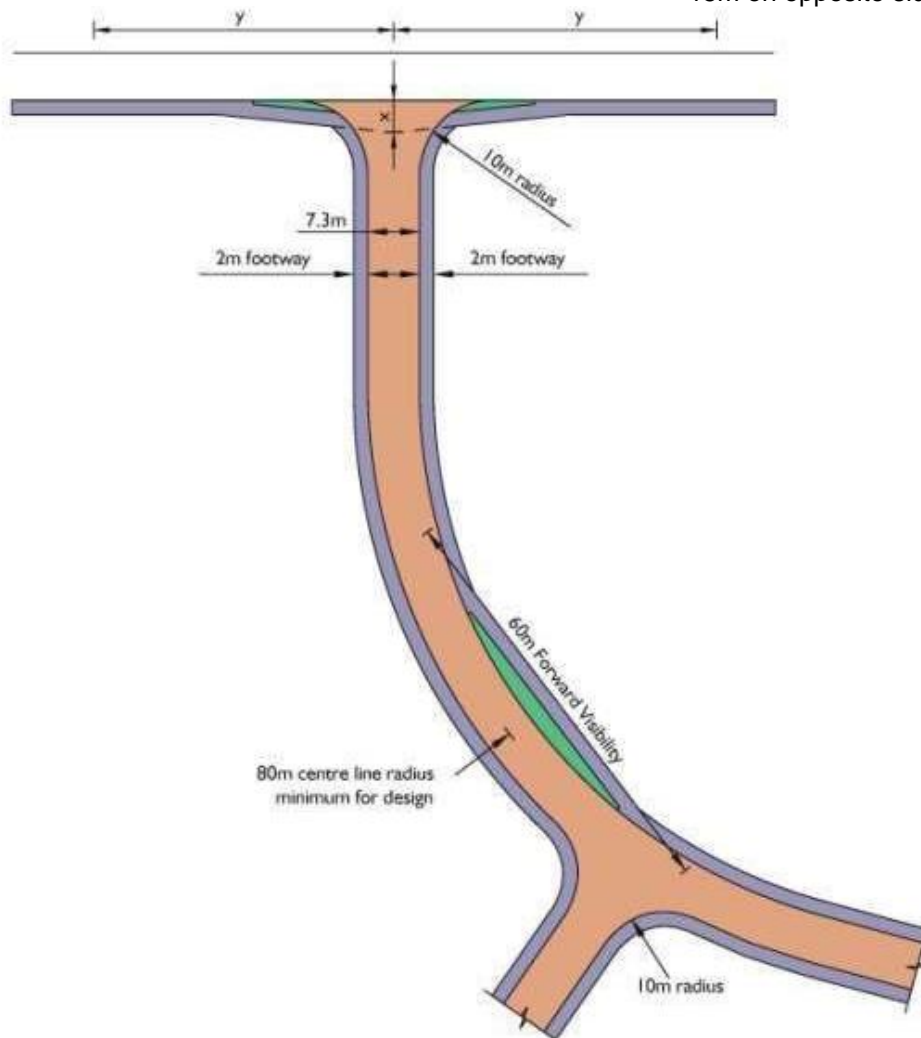
With higher category road: designed in accordance with HA TD 42/95

Junction Spacing

100m on same side

Within the industrial estate:

- 30m on same side
- 15m on opposite side



Vertical Alignment

The Developer must consider the following when designing vertical curves on new developments.

Generally, the maximum and minimum gradients allowable on new developments will be as detailed within the table below:

Category	Maximum gradient	Minimum gradient
All road categories	1:20 (5%) desirable, but consideration may be given to gradients up to 1:10 (10%)	1:150 (0.67%)
Cycle tracks and footways	1:150 (0.67%)	1:150 (0.67%)

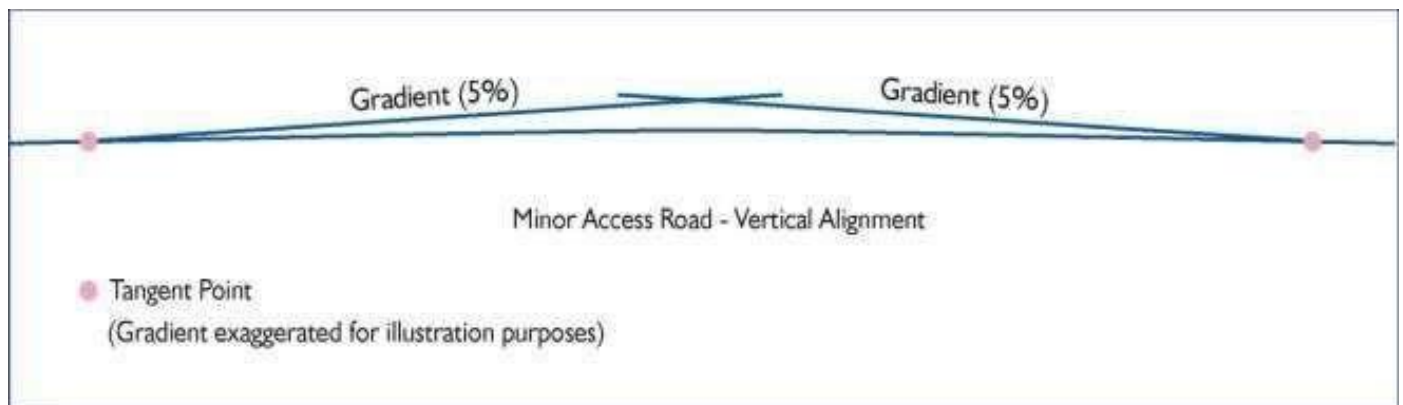
Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

Additionally, the Developer must consider the curvature of the new highway. The design curve length will be a function of the algebraic change of gradient, expressed as a percentage, multiplied by the 'K' value. 'K' values are provided in the table below:

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

Example: Minor Access Road - vertical alignment

The example below has been included to assist Developers in designing vertical curves.



The Developer should note that side road gradients into junctions should be set at a maximum of 1:20 (5%) for the first 10m. Additionally, the minimum vertical curve length of any section of road should be not less than 20m.

In the above example, assuming it is a Minor Access Road, and the curve length will be 20m

The „K“ Value is given by:

$$\text{Design curve length} / \text{Algebraic change of gradient} = 20\text{m} / 10 = 2$$

Therefore, the above example falls within the design criteria and would be acceptable.

Headroom

Additionally, the Developer must also consider in the design that the minimum allowable headroom for all new highways intended for adoption shall be as follows:

Category	Minimum Headroom
All roads	5.3m
Cycleway	2.7m
Footway	2.7m

Visibility

	Major road type															
	Strategic routes					Roads within residential estates										
Design speed (kph)	100	85	70	60	48	16	20	24	25	30	32	40	45	48	50	60
Design speed (mph)	62	53	44	37	30	10	12	15	16	19	20	25	28	30	31	37
X distance (m) (1)	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Y distance (m) (2)	215	160	120	90	70	11	14	17	18	23	25	33	39	43	45	59

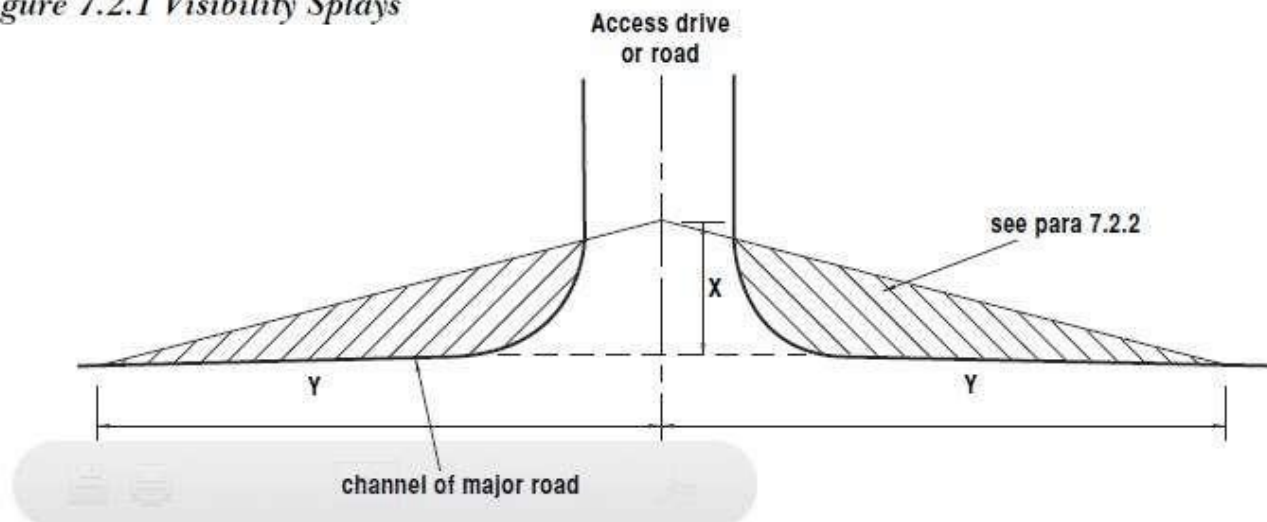
Notes

1. The X distance will be increased in special circumstance as required by the Engineer, e.g., where greater capacity is required, or specific safety issues are apparent.
2. Speed readings can determine the requirements for 85th percentile speeds therefore the Y distance can be reduced if lower speeds can be proven.
3. For higher speed roads and strategic routes, i.e., with an 85th percentile speed over 40mph, it may be appropriate to use longer SSDs, (Y Distance) as set out in the (Design Manual for Roads and Bridges).

Junctions and Accesses

The provision of adequate visibility at junctions is vital for the safety of all road users. The table below gives the basic dimensions required for the different road types.

Figure 7.2.1 Visibility Splays



Clearance of Obstructions

Visibility Splays should be clear of any obstructions that are higher than 300mm above the channel level over the hatched area of the figure above. This will then allow any planting to grow a further 300mm, but in any case, the overall height should never exceed 600mm at any time of year. Vertical obstructions to visibility such as lamp columns and trees will be accepted provided that in combination, they do not create a solid visual barrier.

Speed

Speed limits for residential areas are normally 30 mph, but 20 mph limits are becoming more common. If the road is lit, a 30-mph limit is signed only where it begins – repeater signs are not applicable. All other speed limits have to be signed where they start and be accompanied by repeater signs.

A street with a 20-mph limit is different from a 20-mph zone. To create a 20-mph zone, it is a legal requirement that traffic calming measures are installed to ensure that low speeds are maintained throughout. In such cases, the limit is signed only on entering the zone, and no repeater signs are necessary.

Any speed limits below 30 mph, other than 20 mph limits or 20 mph zones, require individual consent from the Secretary of State for Transport. Designers should note that such approval is unlikely to be given. A speed limit is not an indication of the appropriate speed to drive at. It is the responsibility of drivers to travel within the speed limit at a speed suited to the conditions.

However, for new streets, or where existing streets are being modified, and the design speed is below the speed limit, it will be necessary to include measures that reduce traffic speeds accordingly.

Difficulties may be encountered where a new development connects to an existing road. If the junction geometry cannot be made to conform to the requirements for prevailing traffic speeds, the installation of traffic-calming measures on the approach will allow the use of a lower design speed to be used for the new junction.

This section provides guidance on stopping sight distances (SSDs) for streets where 85th percentile speeds are up to 60 km/h. At speeds above this, the recommended SSDs in the Design Manual for Roads and Bridges may be more appropriate. This information can be found in Volume 6 section 2, TD 42/9s Table 7/1.

Influence of geometry on speed

Research carried out in the preparation of MfS considered the influence of geometry on vehicle speed and casualties in 20 residential and mixed-use areas in the UK. Two highway geometric factors stand out as influencing driving speed, all other things being equal.

They are:

- forward visibility; and
- carriageway width.

Improved visibility and/or increased carriageway width were found to correlate with increased vehicle speeds. Increased width for a given visibility, or vice versa, were found to increase speed. These data are summarised in Fig. 7.16.

The relationship between visibility, highway width and driver speed identified on links was also found to apply at junctions. A full description of the research findings is available in TRL Report 661.¹⁵

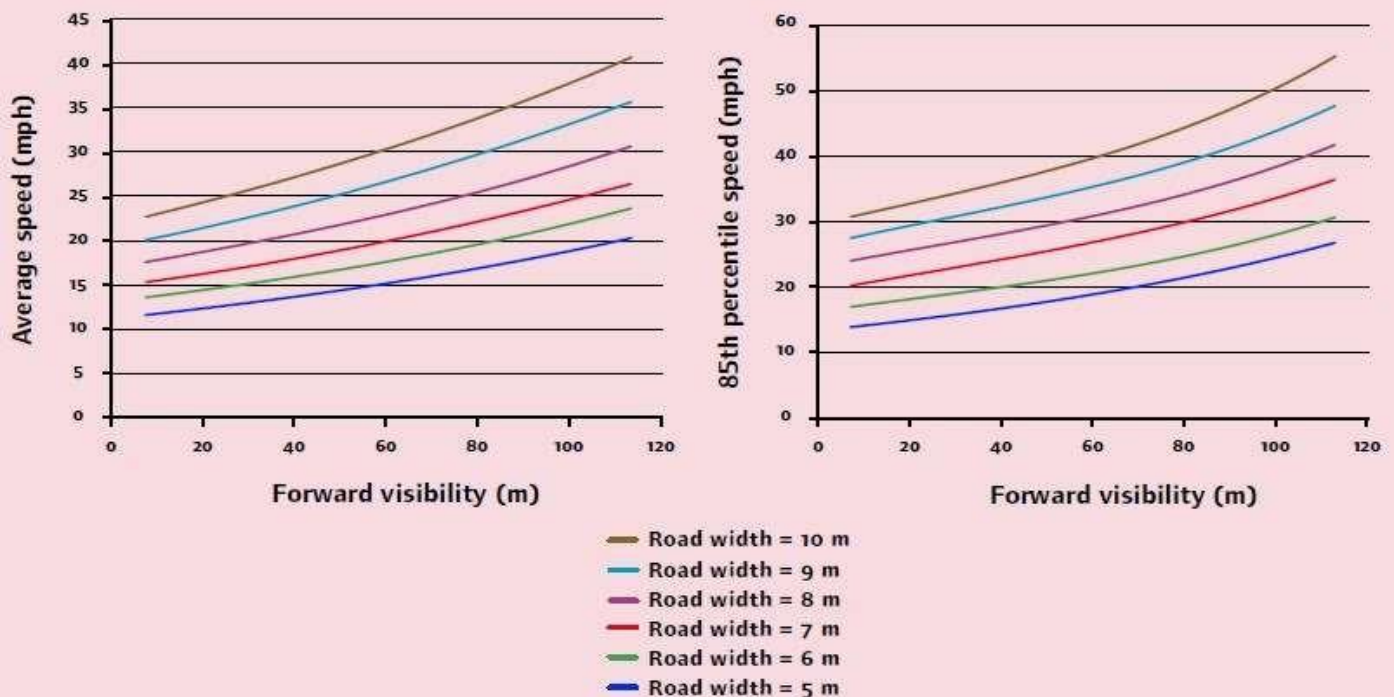


Figure 7.16 Correlation between visibility and carriageway width and vehicle speeds (a) average speeds and (b) 85th percentile speeds. These graphs can be used to give an indication of the speed at which traffic will travel for a given carriageway width/forward visibility combination.

Stopping Sight Distance

The stopping sight distance (SSD) is the distance within which drivers need to be able to see ahead and stop from a given speed. It is calculated from the speed of the vehicle, the time required for a driver to identify a hazard and then begin to brake (the perception–reaction time), and the vehicle's rate of deceleration. For new streets, the design speed is set by the designer. For existing streets, the 85th percentile wet-weather speed is used.

The basic formula for calculating SSD (in metres) is $SSD = vt + v^2/2d$, where:

- v = speed (m/s)
- t = driver perception–reaction time (seconds)
- d = deceleration (m/s^2)

The desirable minimum SSDs used in the Design Manual for Roads and Bridges are based on a driver perception–reaction time of 2 seconds and a deceleration rate of 2.45 m/s² (equivalent to 0.25g, where g is acceleration due to gravity (9.81 m/s²)). Design Bulletin 3217 adopted these values.

Drivers are normally able to stop much more quickly than this in response to an emergency. The stopping distances given in the Highway Code assume a driver reaction time of 0.67 seconds, and a deceleration rate of 6.57 m/s². While it is not appropriate to design street geometry based on braking in an emergency, there is scope for using lower SSDs than those used in Design Bulletin 32. This is based upon the following:

- a review of practice in other countries has shown that Design Bulletin 32 values are much more conservative than those used elsewhere.
- research which shows that the 90th percentile reaction time for drivers confronted with a side-road hazard in a driving simulator is 0.9 seconds (see TRL Report 332).
- carriageway surfaces are normally able to develop a skidding resistance of at least 0.45g in wet weather conditions.

Deceleration rates of 0.25g (the previously assumed value) are more typically associated with snow-covered roads; and of the sites studied in the preparation of this manual, no relationship was found between SSDs and casualties, regardless of whether the sites complied with Design.

Table 7.1 Derived SSDs for streets (figures rounded).

Speed	Kilometres per hour	16	20	24	25	30	32	40	45	48	50	60
	Miles per hour	10	12	15	16	19	20	25	28	30	31	37
SSD (metres)		9	12	15	16	20	22	31	36	40	43	56
SSD adjusted for bonnet length. See 7.6.4		11	14	17	18	23	25	33	39	43	45	59
Additional features will be needed to achieve low speeds												

The SSD values used in MfS are based on a perception–reaction time of 1.5 seconds and a deceleration rate of 0.45g (4.41 m/s²). Table 7.1 above uses these values to show the effect of speed on SSD.

Below around 20 m, shorter SSDs themselves will not achieve low vehicle speeds: speed-reducing features will be needed. For higher speed roads and strategic routes, i.e., with an 85th percentile speed over 60 km/h, it may be appropriate to use longer SSDs, as set out in the Design Manual for Roads and Bridges.

Gradients affect stopping distances.

The deceleration rate of 0.45g used to calculate the figures in Table 7.1 above is for a level road. A 10% gradient will increase (or decrease) the rate by around 0.1g.

Visibility requirements

Visibility should be checked at junctions and along the street. Visibility is measured horizontally and vertically.

Using plan views of proposed layouts, checks for visibility in the horizontal plane ensure that views are not obscured by vertical obstructions.

Checking visibility in the vertical plane is then carried out to ensure that views in the horizontal plane are not compromised by obstructions such as the crest of a hill, or a bridge at a dip in the road ahead. It also takes into account the variation in driver eye height and the height range of obstructions. Eye height is assumed to range from

1.05 m (for car drivers) to 2 m (for lorry drivers). Drivers need to be able to see obstructions 2 m high down to a point 600 mm above the carriageway. The latter dimension is used to ensure small children can be seen (Fig. 7.17).

The SSD figure relates to the position of the driver. However, the distance between the driver and the front of the vehicle is typically up to 2.4 m, which is a significant proportion of shorter stopping distances. It is therefore recommended that an allowance is made by adding 2.4 m to the SSD.

Visibility splays at junctions

The visibility splay at a junction ensures there is adequate inter-visibility between vehicles on the major and minor arms.

The distance back along the minor arm from which visibility is measured is known as the X distance. It is generally measured back from the 'give way' line, or an imaginary 'give way' line if no such markings are provided.

This distance is normally measured along the centre line of the minor arm for simplicity, but in some circumstances (for example, where there is a wide splitter island on the minor arm), it will be more appropriate to measure it from the actual position of the driver.

The Y distance represents the distance that a driver who is about to exit from the minor arm can see to their left and right along the main alignment. For simplicity it is measured along the nearside kerb line of the main arm, although vehicles will normally be travelling a distance from the kerb line. The measurement is taken from the point where this line intersects the centreline of the minor arm (unless, as above, there is a splitter island in the minor arm).

When the main alignment is curved and the minor arm joins on the outside of a bend, another check is necessary to make sure that an approaching vehicle on the main arm is visible over the whole of the Y distance. This is done by drawing an additional sight line which meets the kerb line at a tangent.

Some circumstances make it unlikely that vehicles approaching from the left on the main arm will cross the centreline of the main arm – opposing flows may be physically segregated at that point, for example. If so, the visibility splay to the left can be measured to the centreline of the main arm.

X distance

An X distance of 2.4m should normally be used in most built-up situations, as this represents a reasonable maximum distance between the front of the car and the driver's eye.

A minimum figure of 2m may be considered for private drives and in some very lightly trafficked and slow speed situations but using this value will mean that the front of some vehicles will protrude slightly into the running carriageway of the major arm. The ability of drivers and cyclists to see this overhang from a reasonable distance, and to manoeuvre around it without undue difficulty, should be considered.

Using an X distance in excess of 2.4m is not generally required in built-up areas. Longer X distances enable drivers to look for gaps as they approach the junction. This increases junction capacity for the minor arm, and so may be justified in some circumstances, but it also increases the possibility that drivers on the minor approach will fail to take account of other road users, particularly pedestrians and cyclists. (Please note that LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.)

Longer X distances may also result in more shunt accidents on the minor arm. TRL Report No. 184 found that accident risk increased with greater minor-road sight distance.

Y distance

The Y distance should be based on values for SSD (Table 7.1).

Speed readings can determine the requirements for 85th percentile speeds therefore the Y distance can be reduced if lower speeds can be proven.

For higher speed roads and strategic routes, i.e., with an 85th percentile speed over 40mph, it may be appropriate to use longer SSDs, as set out in the (Design Manual for Roads and Bridges).

Sightlines

These are required to enable drivers to see a potential hazard in time to slow down or stop comfortably before reaching it. It is necessary to consider the driver's line of vision, in both vertical and horizontal planes, and the stopping distance of the vehicle.

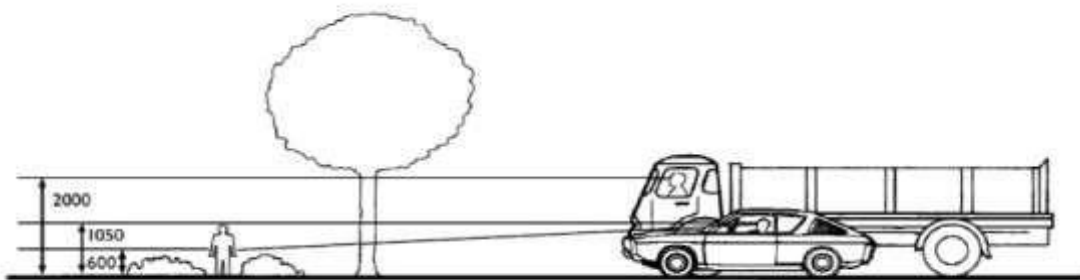
The design of sightlines is discussed in detail in both Manuals for streets and DMRB. This section draws together the advice in both documents.

The guidance given here needs to be assessed in the circumstances of each case. Sightlines should never be reduced to a dangerous level.

The diagrams and commentary given here describe the most salient points involved using both Manual for streets and DMRB.

Vertical Visibility Envelope

The required vertical visibility envelope is defined below:



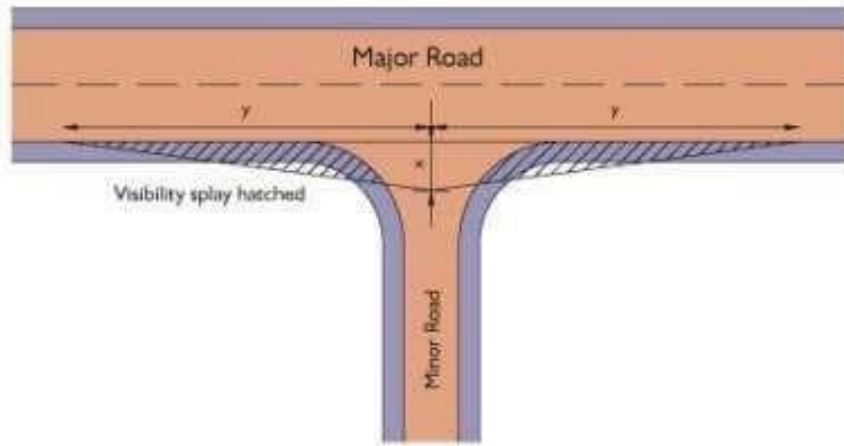
To enable drivers to see a potential hazard in time to slow down or stop comfortably before reaching it, it is necessary to consider the driver's line of vision, in both the vertical and horizontal planes, and the stopping distance of the vehicle.

As general guidance, it is suggested that a height of 600mm be taken as the point above which unobstructed visibility should be provided wherever the potential exists for conflicts between motorists and young children. This will apply along all sections of residential roads and is especially important where shared surface roads are used.

Junction Visibility

To ensure that drivers preparing to exit a minor road can see and be seen by traffic proceeding along the major road, clear visibility is required to both sides of the major road as shown below. Any junction must be constructed and maintained so that nothing is placed, installed, or planted that will obstruct the visibility splay. Where possible, visibility splays should be defined with footways to the rear of the splay to clearly define the splay and to prevent misuse.

The following junction diagram and tables indicate the X and Y dimensions to be calculated for junction visibilities.



X Dimensions

To be measured along the centreline of the side road, from the channel of the priority road.

9m	Only to be used at major new junctions at the discretion of the Engineer
4.5m	The maximum standard required for major new road junctions, for junctions of busy access roads, and for busy strategic routes.
2.4m	The minimum necessary for junctions within development to enable a driver who has stopped at a junction to see down the major road without encroaching onto it. To be used on cycle track junctions.
2m	For single dwellings or small groups of up to 6 dwellings
Less than 2m	Only in exceptional circumstances will a distance of less than 2m be considered

Turning Heads

Turning Heads are to be provided at the ends of all cul-de-sac and at other relevant places required by the Engineer. Informal shapes are encouraged, provided that minimum standards are maintained.

Careful design of turning heads in relation to house layout can often minimise excess highway space while ensuring adequate access by service vehicles. If private drives etc. are appropriately positioned parking in turning heads can be curtailed. Entrances to communal parking areas etc. can often provide an effective opportunity for vehicles to turn.

Where a footway or adoptable verge surrounds the turning head, the dimensions can be reduced, refuse vehicles, etc. can be assumed to overhang these adopted areas. Therefore, street furniture (lighting columns, etc.) should not be placed in the shaded areas, nor should there be the possibility that cars will be parked within them.

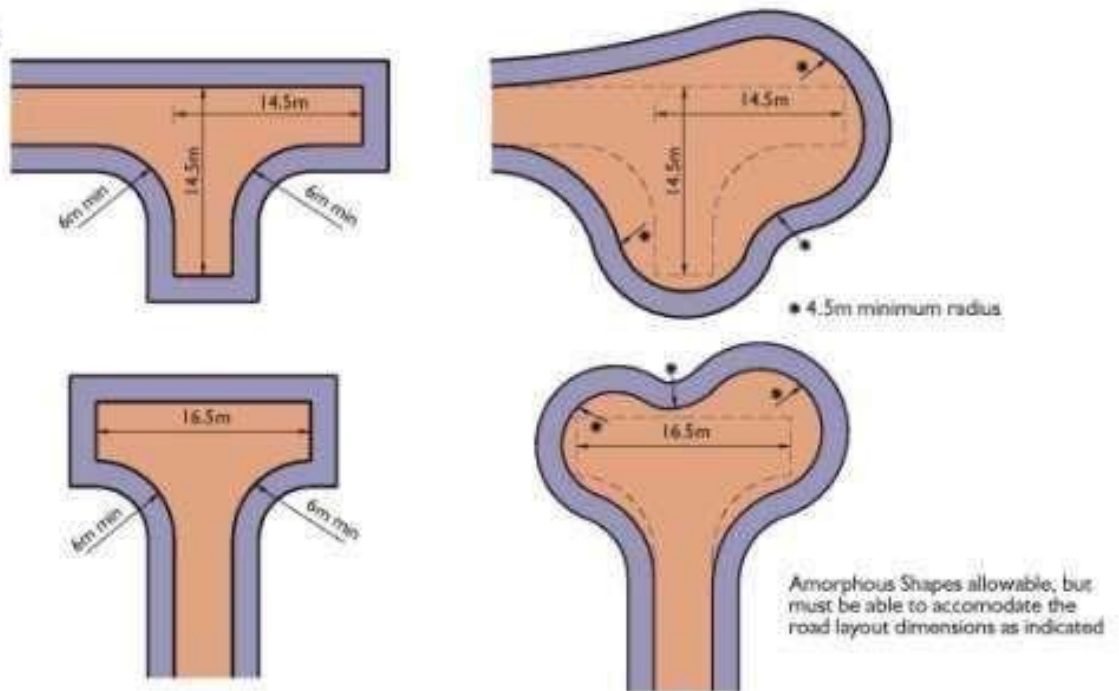
Irregular shapes are acceptable, provided that a standard turning head can be accommodated within them.

Area of overhang over verge or footway, to be kept clear of obstruction

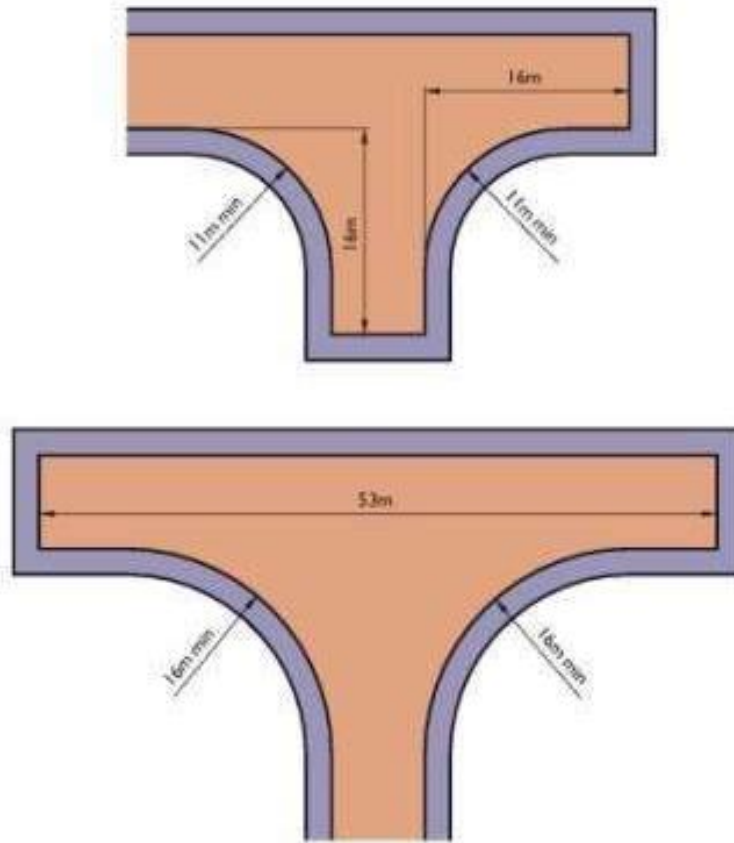
The layout of turning spaces should be designed to:

- allow for refuse vehicles to turn when they would otherwise have to reverse more than 40m
- provide an area that will be easily maintained by a mechanical sweeper

Residential Roads:



Industrial Roads:



Landscaping

A general presumption exists for the retention, wherever practically possible, of existing landscape features of value. Potential benefits may range from simple aesthetics that enhance the visual landscape through to important environmental or cultural associations.

Any potential for the feature/s to provide wildlife enhancements should be considered such as its role as a present or future wildlife corridor, provision of habitats, and so on. Therefore, the preliminary design of residential access roads, cycleways, and footpaths to serve the development should as far as possible be sympathetic to the Authorities wishes and be in accordance wherever possible of any pre-application guidance obtained and be relevant to the emerging Local Plan. Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

So, for example, if a tree of value was situated within the visibility splay, all attempts should be made to reposition the access if this can be done safely. In residential areas the Highway Authority will normally only adopt the paved surfaces and verges which are key to the functioning of the highway. Small areas of grass must be avoided, as they are likely to produce future maintenance problems.

Trees must not be planted near structures or services unless due consideration is given for future root growth, final crown size and the species potential to cast shade.

Existing trees, which will become maintainable at public expense, shall be the subject of a preadoption condition survey to ascertain their health, the results of which should be forwarded to the Engineer who may wish to seek guidance from the Natural Environment Services prior to acceptance. Commuted sum payments are likely to be required to cover their future maintenance costs.

Newly planted trees should be produced, installed, and maintained in accordance with the following British Standards:

- B.S.3936 Specifications for trees and shrubs
- B.S.4043 Recommendations for transplanting root-balled trees
- B.S.4428 Code of practice for general landscape operations

Highway landscape features should be maintained by the developer for a period of 5 Years, which may be controlled by way of planning conditions if applicable.

Thorned species will not be accepted immediately adjacent to footways and cycle tracks. If existing hedges contain thorned species, cycle tracks shall be positioned at least 3 metres from the extremities of the hedge to prevent problems with hedge-cutting debris. Existing hedges adjacent to the existing highway shall be transferred to frontages for maintenance. Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

Any new carriageway should be outside the canopy (or reduced canopy if reduction is deemed suitable) of any existing tree to prevent damage to the new construction by the tree roots. Any work under the canopy of deciduous trees or within a radius of half of the height of coniferous species shall comply with BS 5837: 2012 Trees in relation to design, demolition, and construction.

Drainage

General requirements

In general, drainage systems shall be designed in accordance with the current edition of Sewers for Adoption and with the Specification accompanying this Design Guide.

All pipes that only carry surface water from the adoptable highway are prospectively maintainable by the Highway Authority. Their design and construction shall comply with the standards required in this document.

Pipes that carry surface water from the adoptable highway as well as other areas such as roofs, private drives, etc. must be adopted by the water authority and must comply with their requirements.

Lateral connections into public sewers will remain private but shall be designed and constructed to adoptable standards. All such connections shall run approximately at right angles to the centreline of the road to minimise their length.

Adoption Requirements

Where foul or surface water sewers are to be laid under the adoptable highway or where the highway drainage is connected into a surface water sewer, written assurance must be obtained beforehand that the water authority will adopt the sewers, subject to compliance with their adoption procedure.

The Highway Authority will normally decline to adopt any highway covered by a Section 38 agreement until the water authority has confirmed the adoption of all sewers within the highway. This also includes any other sewers not within the adoptable highway, but which carry water from it.

All drains that are intended to be adopted as highway drains shall discharge to a pipe or watercourse at a point approved by the Highway Authority. Evidence will be required that the developer has right to discharge, free of any liability which may be binding upon the Highway Authority when the drain is adopted.

Private drains will not normally be permitted within the adoptable highway. All prospectively maintainable highway drains shall be located within land that is to be adopted by the Highway Authority. Only in exceptional circumstances will they be permitted in land that is to remain private. Where such circumstances do arise the landowner at the time of completing a Section 38 Agreement will be required to give a grant of easement keeping 3m each side of the pipe clear of all obstructions, which will be binding on successors in title.

The developer is strongly advised not to sell any land that will contain a highway drain before completion of such an Agreement. The Highway Authority will not accept any different form of undertaking which dilutes the rights conferred on it.

Outfalls and Watercourses

Where the outfall is into a ditch or watercourse the approval of the Environment Agency must be obtained in writing.

Where the outfall is proposed to be through an existing highway drain the developer will be required to prove its capacity and condition before approval for the connection can be given. This will include a CCTV survey of the drain and the carrying out of any improvement works found to be necessary.

Where the highway drain discharges into a watercourse, calculations shall take into account the possibility that the watercourse may be flooded.

Drainage Design

Gully spacing shall be determined using the recommendations of HA 102/00, Spacing of Road Gullies. Gullies will be required immediately upstream of block pavements, pedestrian crossing points and road junctions, and shall never be located on a crossing point. It is the developer's responsibility to demonstrate and ensure that the number and positioning of gullies is adequate to drain the highway.

The proposed drainage system is to be designed using „Micro Drainage" or similar approved. A disc containing the input data and the output must be submitted to the Engineer for checking prior to any works taking place.

The parameters to be used during the drainage design are as listed below:

Rainfall design storm	30 year contained within system, 100 year plus climate change (depending on development) no flooding to property
Time of entry	4 minutes
Design flow velocities	As per the latest version of Sewers for Adoption
Minimum gradient	1 in 150
Design maximum rainfall	None specified
Minimum pipe diameter	225mm highway drain, 150mm gully connection

The Council may consider the use of combined kerb and drainage systems depending on the situation and design submitted for approval.

In certain cases, the Council may require the provision of a larger capacity drain than would normally be needed in order to accommodate the drainage of adjoining land and/or future development.

Soakaways

Where soakaways are to be considered, it will be at the discretion and approval of the Engineer and will be considered as a last resort only (refer to Specification, Section).

The Developer is to note that a commuted sum of £5000 may be charged for each soakaway installed.

The minimum diameter shall be 1500mm.

If more than one soakaway is planned, they are to be linked by a 225mm diameter pipe.

The soakaways are to be surrounded by TERRAM or similar, laid between the chamber and the filter material. The appropriate filter material to be used will vary according to prevalent ground conditions.

Where possible, the soakaway is to incorporate an overflow link (minimum diameter 225mm) to an existing highway drain/outfall system which may include a sum for the replacement if appropriate.

Percolation tests will be required to determine capacity.

Sustainable Urban Drainage (SUDS)

PPG 25 makes clear the need for measures to control surface water run-off and prevent flooding. While issues exist as to the acceptance of SUDS by various bodies, Torbay Council expects developers to incorporate storage, attenuation, and filtration measures in accordance with “SUDS- A Guide for Developers” by the Environment Agency and “SUDS - A Design Manual for England and Wales” by CIRIA.

Torbay Council will examine all proposals for SUDS and judge them on their merits. Permeability tests and hydrology surveys will be required to verify the suitability of the designs and commuted sums will be required for ongoing maintenance of the systems. The amount of the commuted sums will be calculated by the Council and will reflect the special maintenance requirements of the proposed system. Which may include a sum for total replacement if appropriate.

The SUDS proposals for a development shall be submitted along with geology and hydrology information, at planning application stage. Any proposals for outfalls into existing watercourses or ponds shall be accompanied by an environmental impact report and obviously such outfalls will need Consent to Discharge from the Environment Agency.

Structures

Structures which are to be built under or adjacent to the highway will require structural approval in principle by the Highway Authority, Torbay Council.

Adoption of Structures by the Council

The Council may adopt certain structures adjacent to, under or over the highway. In normal circumstances, the only structures that will be considered for adoption are those upon which the Highway relies for support and are constructed on Highway land.

All structures to be adopted should have received Structural approval in principle in accordance with the procedures below and through BD 2/12.

Approval of Structures not to be adopted by the Council

The following structures although not necessarily to be adopted by the Council require Structural Approval in accordance with the procedure of BD 2/12:

- any wall or basement constructed on private land by an individual or developer that affects the support of the highway
- bridges crossing the Highway where there is no public access to the bridge
- retaining walls where any part of the retaining wall is 1.5m above the boundary of the highway nearest that point
- structures over 0.9m span (diameter) carrying sewage plus others as per BD/12

Assessment of Existing Structures

Any existing structure to be modified for the purposes of the development or to be subjected to increased magnitude or frequency of loading shall be assessed according to BD21/01.

Approval submissions

- General arrangement showing location and extent of all structures and in the case of walls detailing lengths to be adopted and/or over 1.5 m high if applicable
- Designers Risk Assessment typically

- Sufficient to determine wall heights, giving ground levels, behind and in front of wall and any features affecting loadings such as cover to culverts
- Clearances to deck soffit and piers/abutments shall be submitted for bridges
- Site investigation details and geotechnical assumptions on which the design has been based. This must be given in sufficient detail on the drawing to allow the designers assumptions to be compared with the conditions actually found on site by those responsible for construction
- Construction details and material specifications
- Design calculations with full reference to the design standards used
- For structures that are to be adopted or for structures upon which the Highway relies for support: Design and Construction Certificates and “As Built” Drawings for the CDM Health and Safety File otherwise as per BD2/12

An Introduction to BD 2/12

This Chapter describes specific TA requirements for bridges and other highway structures and must be read in conjunction with Chapters 1 and 2. The TA requirements must be applied without limitation to:

- design and execution of new structures
- assessment and related construction work, whether refurbishment, maintenance or strengthening, that affects structural integrity
- assessment relating to loading beyond that or which a structure has been designed or previously assessed
- assessment relating to loading for which a structure has been designed or previously assessed but the condition of the critical structural elements has subsequently deteriorated to the extent that a reassessment is required

Scope

The procedures described in this Chapter must be applied to the following highway structures:

- a. Bridge, buried structure, subway, underpass, culvert, and any other structure supporting the highway with clear span or internal diameter greater than 0.9m
- b. Overhead crossing carrying conveyor or utility service
- c. Moveable inspection access gantry, gantry rail and gantry support system
- d. Earth retaining structure where the effective retained height, i.e., the level of the fill at the back of the structure above the finished ground level in front of the structure, is greater than 1.5m
- e. Reinforced/strengthened soil/fill which is an integral part of another highway structure
- f. Portal and cantilever sign and/or signal gantry
- g. Cantilever mast for traffic signal and/or speed camera
- h. Lighting column
- i. High mast of more than 20m in height i.e., the vertical distance from top of post to bottom of flange plate, for lighting
- j. Mast for camera, radio, and telecommunication transmission equipment
- k. Catenary lighting support system
- l. Environmental barrier
- m. Proprietary manufactured structure or product
- n. Traffic sign/signal posts of more than 7m in height, i.e., the vertical distance from top of post to bottom of flange plate or top of foundation whichever is the lesser

Design and Construction Certificates

Design and Construction Certificates are required if the structure is to be adopted or for structures upon which the Highway relies for support. These certificates must be in the form given in these notes and must be submitted at the appropriate stage. The positions in the organisation of the signatories and their qualifications must be stated.

If a section of the work is to be undertaken by another party, such as a precast concrete supplier, then it would be appropriate for that party to take responsibility for their section of the work and complete a separate certificate.

Bridge Maintenance Manual/Health and Safety File

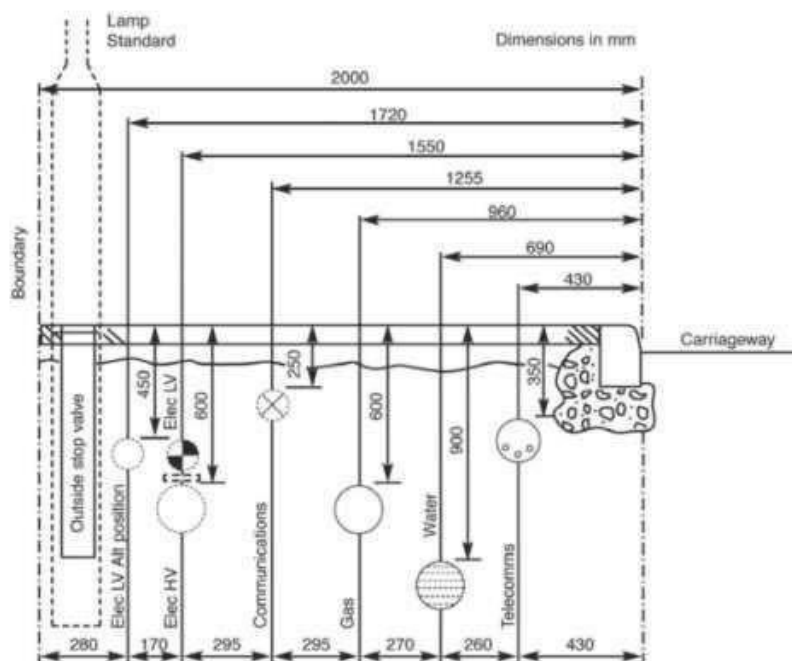
On completion of the work the Developer must provide a Bridge Maintenance Manual containing:

- Details of the materials used in construction and the supplier
- Requirements for future maintenance
- Any survey and geotechnical details undertaken on the site of the structure
- Details of problems encountered during construction that may have a long-term effect on the structure
- Any access arrangements for future maintenance
- As built drawings as electronic AutoCAD files
- Design calculations
- Special arrangements required for demolition

The above information will comprise the documentation that the Developer legally has to provide under the CDM Regulations.

Statutory and Other Services

New estate roads should be designed to accommodate services and liaison with all statutory undertakers and communications providers should be done at the earliest stage possible to ensure that their equipment is installed in an efficient manner and as much as possible to comply with the recommendations of the National Joint Utilities Group.



Although this idea is not always possible, it is important to ensure that services do not conflict.

All categories of estate road should have either footways or service strips in which services will be located. The Highway Authority will not adopt land the sole purpose of which is to contain services. Any land must have a justifiable connection with the highway and be clearly adoptable as highway.

The laying of apparatus within the carriageway will not generally be permitted although at junctions and in the case of public sewers exceptions are clearly unavoidable.

Service strips shall be dedicated to the Highway Authority as part of the public highway.

The Highway Authority will not object to the adjoining householder maintaining the service strip provided they do not erect walls, fences or structures, or plant deep rooted plants or any plant, which can exceed a height of 600mm.

The Developer shall ensure that service strips are clear of trees, walls, and hedges. Any trees shall be located so that their root systems when mature will neither damage apparatus, nor be damaged during the laying and maintenance of apparatus. Root deflection barriers should be used. Developers should consult the Local Planning Authority regarding any Tree Preservation Orders and should act in accordance with BS 5837:1991 during construction works.

Service strips shall be delineated from private property by Highway Boundary concrete marker blocks.

When selecting routes for services, dual mains installations should be the norm to prevent carriageway crossings weakening the road structure and preventing the need to dig up the carriageway.

Parking Criteria

Parking is an important consideration in the planning and design of highway networks, particularly in urban areas. General guidance on the development of parking strategies is given in the IHT publication 'Parking Strategies and Management', and the document 'Car Parking, what works where' provides a comprehensive analysis of the design of parking in residential and mixed-use areas.

On-street car parking can be a vital component of highways, particularly where routes pass through town centres and commercial areas. The decision whether or not to provide on-street car parking should take into account its positive and negative effects, as summarised in MfS1:

Positive effects

- A common resource, catering for residents', visitors', and service vehicles in an efficient manner.
- Able to cater for peak demands from various users at different times of the day, for example people at work or residents.
- Adds activity to the street if short stay and turnover promoted.
- Typically well-overlooked, providing improved security.
- Popular and likely to be well-used.
- Can provide a useful buffer between pedestrians and traffic.

Negative effects

- If there are few places for pedestrians to cross with adequate visibility it can introduce a road safety problem, particularly if traffic speeds are above 20mph.
- Can be visually dominant within a street scene and can undermine the established character.
- May lead to footway parking unless the street is properly designed to accommodate parked vehicles.
- Vehicles parked indiscriminately can block vehicular accesses to premises and emergency services.
- Cars parked on-street can be more vulnerable to opportunistic crime than off-street spaces.
- Providing parking bays potentially reduces footway space, which could also be used for cycle parking.

Where car parking is provided, a good solution is to break it into discrete groups of spaces with build outs that provide opportunities for pedestrians to cross with good visibility.

On-street parking and servicing

Car parking alongside carriageways can be longitudinal, echelon or at right angles to the kerb.

Longitudinal parking will be more appropriate where traffic speeds and volumes are higher, since vehicles entering and exiting the spaces cause less interruption to traffic flow.

In town centres and other locations where speeds are low, echelon and right-angled parking may be the best solution, since it is more efficient and creates a stronger statement that the area is for 'place' activities as well as for movement.

Echelon parking may be more difficult for pedestrians to pass through than longitudinal and right-angled parking, depending on the spacing of parked vehicles, and can provide a greater barrier to crossing the street. This can be solved by leaving regular gaps between parked vehicles, however. It is easier for vehicles to enter and exit echelon than right angle spaces, and so the former have less impact on through traffic.

With echelon and right-angle parking, care has to be taken that overhanging vehicles do not have an adverse impact on the available footway width. This can be addressed by providing generous footways or using street furniture or wheel stops in the form of dished channels to prevent vehicles from encroaching too far.

On-street servicing bays are often required in urban centres where commercial premises can only be accessed from the front. Where they are designed as laybys, they can be difficult to keep clear of parked cars and take space away from pedestrians that is empty for much of the time.

Some authorities are placing loading areas on strengthened areas of the footway, which makes it much less likely that space will be used for parking and allows pedestrians to use the space when there are no vehicles present.

This approach has been used in numerous locations in London in recent years. The minimum widths required to manoeuvre to/from 2.4m wide parking spaces are as follows:

- 90° - 6m
- 60° - 4.2m
- 45° - 3.6m
- 30° - 3.6m

Where parking is provided on street, this manoeuvring width will generally be provided by the carriageway. For echelon and right-angle parking, manoeuvring space can be reduced by providing wider spaces.

Off-street parking spaces behind/adjacent to the adopted highway

In order to comply, the parking space must be:

- At least 5.5m long, where the parking area is between the back of the pavement or property boundary (e.g., the face of any wall, fence, or hedge) and the front of your building, or
- At least 6m long, where the parking area is in front of a garage or door where adequate means of escape needs to be provided, e.g., a front/back door, escape window, etc.

The parking space must be at a right angle to the highway, with the vehicle able to enter and exit the property in one movement. There must be no adjusting movements of a vehicle made on the highway when entering or exiting the property.

7.10 - Street Lighting

Overall Design and Specification

- 7.10.1 The specification is intended as a guide and used to bring consistency within the policies and lighting stock of Torbay Council. It should be borne in mind that all proposals put forward by the Developer are subject to confirmation by Torbay Council's Street Lighting Section.

It is desirable that the installation of any street lighting scheme is carried out by the current term maintenance contractor, who will be able to advise the developer of Torbay Council's lighting specification and carry out all the requirements as detailed in these guidelines. Contact details are:

Enerveo

Heron Road, Sowton Industrial Estate, Exeter, Devon EX2 7FB

Contact Jerry Kay (New Business Manager) - 07774763952

- 7.10.2 Street lighting must be planned as an integral part of the layout of roads and footpaths. Adequate provision is needed to increase the sense of personal security, to reduce nighttime accidents, to discourage crime, and to provide residents with a sense of well-being.

The street lighting section will generally check completed designs but if the developer wishes, will undertake the designs of the scheme. For the latter, a charge will be levied depending on the size and complexity of the requirements.

Any design should have due regard for environmental factors to include energy consumption, carbon emissions, light intrusion, animal considerations i.e. bats and confirm to standards laid down in EN 13201 BS5489. We are looking for P4 as a lighting class on switch on and would like to achieve P5 on the first dimming phase between 10pm and 12.30am

The minimum information required when submitting a design for approval will be :

- i) Lighting class to which the scheme has been designed, and information used for its selection.
- ii) Type of luminaire, light source and column height.
- iii) Isolux drawing indicating maximum, minimum, average horizontal illuminance lux levels, and min/average ratio.
- iv) Lamp wattage, maintenance factor and TI value.
- v) The scheme drawing will be of a recognised scale and submitted both in DWG and PDF format, and contain the positions of the proposed lighting plus any existing street lights where the new road abuts an existing highway. It should be made clear the street light position in relation to the surrounding properties and access ways.
- vi) The drawing will indicate the lantern(s) specification, gear type including dimming facilities, photocell to be used and column type.

The Engineer reserves the right to amend the final location of any street light which may have resulted by amendments to the infrastructure or inaccurate drawings on which the design was based.

Supplies

- 7.10.3 Street lighting electrical supplies, cut-outs and cable layout will be a matter for the local Distribution Network Operator (DNO) which for the area of Torbay is National Grid (NGED) . For more information contact:

The Unmetered Connections Team

**National Grid,
Osprey Road
Sowton Industrial Estate
Exeter EX2 7WP**

The final connection cannot be made without evidence that the relevant Supply Meter Number (MPAN) has been registered.

Before energisation of any street light, it is the Developers responsibility to ensure that the supply has been registered with an authorised energy supplier and that any electricity charges is paid to that supplier until the site is adopted under the Section 38 Agreement, the responsibility for payment will then become Torbay Council's. The trading of this energy will be carried out half hourly (HH) to tie in with Torbay Council.

For illuminated island bollards, NGED will terminate their supply in an approved feeder pillar situated at the rear of the adjacent footpath. Ducting, with drawstring, will then be laid from the pillar to the centre of the nearest bollard and then to all the others in turn. The cable from the pillar will then be the responsibility of Torbay Council upon completion of the Section 38 agreement. However Solar powered bollards as specified below are the preferred option.

Materials

7.10.4 Materials will generally conform to those specified for standard maintenance works for Torbay. Details can be obtained from the Highways Street Lighting Section and will be included on the plan to any design carried out by the group.

Should the developer wish to use specific or ornate equipment, the manufacturer and type must be agreed with the street lighting section before any design is carried out.

It is expected that the developer will provide additional items of specialised materials i.e. lanterns or columns to the Highway Authorities Store for maintenance purposes. The quantity will depend on amount of units within the scheme.

It should be borne in mind that materials can take 10 weeks from receipt of order to delivery, specialist equipment will take longer. This time scale must be considered when issuing instructions to Contractors or Manufacturers to enable the scheme to be completed on time.

Detailed Design

7.10.5 Details of the layout and design of a street lighting scheme will form part of the Section 38 submission. It will show exact location, height of column, bracket projection (if any), lamp type and wattage.

Details of equipment to be used will be specified on the drawing including any special requirements. Standard equipment currently used are:

- i) Lighting columns/sign posts – C.U.Phosco galvanised steel.
 - 5m Sign Post - R2505T01/GFR/PL
 - 6m height column – R2506T01S355/GFR
 - 8m height column – R2608A03/GFR
 - 10m height column – R2710001H50/GFR
- ii) All columns situated in areas not accessible by vehicles i.e. footpaths, will be of the raised and lower type
 Raise and Lower columns shall be
 5 metre C.U. Phosco - RM505TO1DL2/GFR
- ii) Lighting columns will no longer be painted in Torbay, sign posts will normally be painted grey RAL 18-B-25, however some units will be black to form part of the street scene.
- iii) Columns should be sited to the back of footpath wherever possible, or at least 0.5m behind the kerb face if this is not practical. If columns are to be positioned in grass or soft verge then a concrete plinth 0.5m x 0.5m x 0.1m deep will be provided that slopes away from the column base. The planting depth will be as per manufacturer's specifications.
- iv) Luminaires/Lanterns

Residential Roads

- 6 metre columns – Holophane S-Line 19w LED 2700K post top electronic driver. With 7-pin NEMA socket. Zodian Z Cell 35/18.

Residential Dimming regime

DUSK - 22:00 = 100%, 22:00 - 00:30 DIM TO 70%, 00:30- 06:00 DIM TO 50%, 06:00 – DAWN = 100%.

Main Roads

- Columns over 6m, Holophane R-Line, 91watt, 3000k. With 7-pin NEMA socket. Zodian Z Cell 35/18.

Main Road Dimming Regime

DUSK - 00:30 = 100%, 00:30 – 06:00 DIM TO 77%, 06:00- DAWN 100%

As part of Torbay Council's continuing aim to reduce energy and carbon emissions Each Luminaire must include the option to provide Dimming in electronic, step less 1% increments. This provides an average wattage of 11.25 over a 24hr period, should you wish to provide an alternative that provides similar savings Discussions with the street lighting section are essential for agreement of the final specification and requirements.

Some locations have a style and colour of their own and should be taken into account when designing a scheme. In environmentally sensitive areas, e.g. Conservation Areas, details of the type of lighting proposed should be indicated at the time of the planning application.

If the Developer has had this specification for over 6 months, before installation of the street lights commences, he should contact the street lighting section to ensure the information he has is still current quoting the date on the last page.

Torbay Council are in the process of adopting a Central Management System provided by Telensa. Therefore, prior to full implementation of the system. It is a requirement that developers purchase and provide to the lighting contractor, Telecell Nodes for each lighting unit within the scheme. For developments with over 25 units, a Basestation will also be required. Details are as below.

Base Station PRICE – Please contact Telensa [uk.sales@telensa.com] with project name and location for details of nearest reseller / Telensa partner

Product name: Base Station 4 ETSI Bracket for Straps (Metal pole mounting)

Ordering code: B4-E1-B (Base Station) + B4-ANT-E (Antenna)

Description: Contains an Ultra Narrow-Band (UNB) radio, a host processor and two wireless modems fitted with dual SIM for connectivity back to the Central System Server. If a suitable cellular backhaul service is not available (e.g. 4G or 3G) then Ethernet can be used for backhaul. Contains internal light meter which is used to measure ambient light at dawn and dusk; the light level readings are used when the lamps are programmed to switch according to measured light levels. Antenna must be ordered together with Base Station. Manufacturer: Telensa

Telecell PRICE – Please contact Telensa [uk.sales@telensa.com] with project name and location for details of nearest reseller / Telensa partner

Product name: Telecell T2 ETSI 240V NEMA Grey GPS
Telecell T2 ETSI 240V NEMA Black GPS

Ordering code: T2E1N-G-3
T2E1N-B-3

Description: Telecell communication node suitable for 3, 5 & 7 pin NEMA ANSI sockets. Contains internal antenna. IP66, IK08. Consumption 0.7W. 0-10V or DALI dimming. Connects to Base Station via UNB radio. Manufacturer: Telensa

N.B.

Road lanterns ordered should be fitted with a 7-pin NEMA socket and should contain a DALI dimmable driver

N.B.

Decorative, heritage lanterns or bollards can be fitted with a 2-part internal telecell with an option of small, external antennae. Driver requirements as for road lanterns. For further information, contact sales@telensa.com

Required Information

- 7.10.6 The developer must provide the Highway Authority with all information relating to the type of equipment used and date of installation on the appropriate forms, including electrical test results and certificate.

Information of the exact column location, street light number, lantern details and installation date will be required as soon as practicable following erection of the street light, the Authority will then enter the details on its Street Lighting Inventory records.

Should the developer wish the Authority to undertake any of this work, the cost will be borne by the developer.

Full inventory requirements can be obtained from the Highways Street Lighting Section.

Illuminated Signs and Bollards

- 7.10.7 Illuminated signs and bollard are also the responsibility of the street lighting section if included in the Sect.38 agreement. Wherever possible signs should be attached to streetlights so as to avoid street clutter.

The sign face material must be of 3M diamond grade reflective sheeting or equivalent.

Where appropriate, an LED solar powered bollard should be used to confirm with Torbay Councils environmental policies.

Details of equipment to be used will be specified on the drawing including any special requirements. Standard equipment currently used are:

- Bollard Shell – Simmons Simbol shell
- Bollard Base - Simmons Global
- Solar Bollard – Pudsey Diamond Solabol
- Sign light – TMP Apollo Alpha LED

Installation

- 7.10.8 All installations must comply with the Electricity at Work (Health & Safety) Act 1989, Institute of Electrical Engineers (IEE) 18th Edition wiring Regulations, Institute of Lighting Engineers (ILE) Code of Practice for Electrical Safety in Lighting Operations subsequent revisions and comply with the specification and layout on the agreed street lighting drawing.

Once a streetlight or sign has been energised, the developer shall attach by means of a non-metallic cable ties a stiffened unit ownership sign a sample of which is given below.

Natural Habitats/ Bats

Lighting in the vicinity of a bat roost causing disturbance and potential abandonment of the roost could constitute an offence both to a population and to individuals (Garland and Markham, 2007). It is therefore important that the use of an area by bats is thoroughly assessed before artificial lighting is changed or added in the vicinity of a roost or where bats may commute or forage.

If bats are suspected as being present on-site ecological advice should be sought – and potentially survey data collected – in advance of any lighting design or fixing of scheme layout.

Maintenance

THIS UNIT IS THE RESPONSIBILITY OF THE DEVELOPER AND
NOT TORBAY COUNCIL.

SHOULD ANY DEFECT OCCUR PLEASE CONTACT THE
DEVELOPER ON THE DETAILS BELOW

DEVELOPERS NAME
FULL POSTAL ADDRESS
TELEPHONE
Daytime / Emergency

This sign shall remain attached until the agreed date of adoption.

The unit number as agreed with the street lighting section will be Self-adhesive numbers, as approved by the *Service Manager's* Representative, shall be used they will require the number/text to be 50mm high and coloured black, with a white square background which shall be at least 10mm greater than the number. The number shall face oncoming traffic for signs and bollards, whereas for columns, pole brackets, combi boxes and beacons they shall face the road.

All units shall have their lamps replaced no more than 3 months prior to adoption where applicable, and if required repainted to current specification.

Specification for Estate Roads: Construction and Materials

Introduction

This part of the Design Guide specifies how developers can construct roads, footpaths etc. in such a manner that they can be adopted as highways maintainable at public expense. It should be considered in conjunction with Parts 1, 2 and 3 of this Guide, which covers highway design and layout.

Purpose and status of this document

Whether Developers carry out the works themselves, or employ a contractor to undertake the works, they must prepare a statement of specification which shall be considered an integral part of the Section 38 Agreement.

The SHW

The specification applicable to a particular Agreement should be prepared on the basis of this Part of the Guide and as further enlarged upon by the Highways Agency's Manual of Contract Documents for Highway Works Volume 1, Specification for Highway Works (hereafter referred to the SHW). The SHW can be viewed here:

www.standardsforhighways.co.uk/mchw/index.htm

This specification is a general parent specification that covers the provision of all anticipated works.

This specification and the SHW

This part of the Guide gives the requirements for the vast majority of cases. Where a matter is not covered herein, however, the current Specification for Highway Works applies and is to be consulted.

The specification prepared by the developer shall cover all carriageway, footway, margin, verge, footpath, cycleway, surface water drainage system, service provisions and street lighting being constructed or installed as part of a development and which the Highway Authority will adopt as a highway maintainable at public expense.

Please note that LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

Definition of 'Engineer' and 'Developer'

In this part of the document, the term 'engineer' shall mean the Authority's Service Manager with responsibility for Highways Management or their representative. The term 'developer' means the principal of the Section 38 Agreement with whom all negotiations are transacted; where the Developer employs a contractor, neither are absolved from the requirements of this specification.

It is strongly advised that copies of the relevant parts of this specification is made available to groundworks and surfacing works contractors and also forms part of any contract review process.

Ground investigation before start of works

For the purposes of determining the required highway structure, the developer shall be required to commission the Devon County Council's UKAS accredited Materials Laboratory, Exeter (tel. 01392 386500, email: materials.laboratory@devon.gov.uk) to undertake a ground investigation. Adequate notice shall be given to enable the investigation to be scheduled and the resultant report produced and issued or any accredited UKAS materials laboratory.

Ground investigation will also include, but not be limited to, determination of permeability where a SUDS system is proposed, and corrosivity to any buried steel structures. The developer will render any assistance required in conducting these tests, e.g., provision of water bowser and soakaway medium.

A choice to use maximum construction thickness does not obviate the need for trial pit or borehole investigation where there is a potential for deeper lying problems, e.g., soft spots caused by peat, limestone cavities, etc.

Where the site is underlain by deep deposits of made ground, peat, etc., special consideration may need to be given in relation to the investigation and any measures required for the construction of the highway.

Section 1: General items

1.1: Notice for Inspection

The Developer shall give the Engineer 14 clear days' notice in writing of the date upon which roadworks will start, and then two days' notice for any covering up of works during the course of the development. This will enable the Engineer to arrange the inspection of the stages of road construction without delay. No work shall be covered up without the

Engineers approval. Where work is covered up without the Engineer's approval, it is at the Developer's risk, and the Developer will bear any costs in demonstrating that the work is satisfactory.

It is the Developer's responsibility to ensure that all work is carried out in accordance with the Specification or with supplementary advice given by the Engineer. All work shall be carried out strictly in accordance with the approved plans. (See also Part 3, Appendices 3D and 3E.)

1.2: Work on Public Highways

If, in the development of an estate, it is necessary to carry out works affecting an existing public highway (including carriageway, footway, footpath, verge or public right of way), the Developer shall make a written application to the Engineer for permission to carry out these works, which, unless covered by a Section 38 Agreement for the estate road works, will require a separate Agreement with Torbay Council as Highway Authority. Plans of the proposed work will be required by the Engineer, and the Developer shall give an appropriate indemnity to Torbay Council in respect of the proposed work, together with an inspection fee. Notice to open up excavations in a public highway may need to be given in accordance with the New Roads and Streetworks Act 1991.

Torbay Council has Embargo periods on its Highway network which Developers/Contractors must strictly adhere to when commencing their works. To view the Embargo Periods please visit www.torbay.gov.uk.

Before undertaking any works that may affect apparatus belonging to a Statutory Undertaker, the Developer must give at least 28 days' notice to the appropriate body. If permission is refused, the Engineer may carry out the works at the Developer's expense. An estimate of the cost of work will be sent to the Developer prior to the commencement of work and confirmation shall be given by the Developer of their agreement to bear the cost of the work.

No work on the public highway shall be commenced before these requirements have been met. The Developer shall also ensure that at all times adequate access is maintained to all land and premises. If at any time it is found necessary to close any existing means of access, the Developer shall, at the Developer's own expense, provide adequate temporary means of access.

Road closures require a minimum of 3 months' notification to the Engineer, and the Developer is to supply, erect and maintain diversionary signing at the Developer's own expense.

Work on the public highway is to be carried out expeditiously and in such a manner as to cause no unnecessary inconvenience to the public.

The developer shall comply with the Streetworks and Works for Road Purposes Communications Policy.

1.3: Safety

Traffic safety

Where work has to be carried out on or adjacent to an existing public highway or a highway to which the public have access, the Developer shall comply in all respects with the recommendations contained in Chapter 8 Traffic Safety Measures for Roadworks of the Traffic Signs Manual (HMSO May 1991). Traffic signs, lamps, barriers, and traffic control signals shall be in accordance with the current editions of the Traffic Signs Regulations and General Directions. The Engineer may require additional measures in certain instances to safeguard the highway user.

Temporary traffic signals

Temporary Traffic Signals may be used with the permission of the Engineer, with a minimum of 14 days' notice. Diesel or petrol generators are not to be used outside the hours of 8am to 6pm in residential areas.

Use of explosives

The use of explosives will be subject to Regulation 19 of the Construction (General Provisions) Regulations 1961. The use of explosives within the highway will not be permitted except with the written consent of the Engineer, and then it

will be subject to any conditions that they impose. In all cases where this permission is given, the Developer shall carry out all blasting operations in compliance with the relevant requirements of the Police and the Home Office. The Developer shall be responsible for all costs resulting from accidents or damage due to the use of explosives. If, in the Engineer's opinion, the operations are being carried out in a dangerous or unsatisfactory manner, the Engineer may withdraw permission.

Danger to children on construction sites

Developers should take account of the serious dangers to children on construction sites particularly when the site is vacated after working hours. Developers should therefore ensure that all reasonably practical precautions are taken. This relates in particular to:

- Liaison with school heads and publicity visits to schools
- Exclusion of all children from the site during working hours, except for properly supervised educational visits
- Provision of perimeter fencing to the site
- Guarding to edges of excavations
- Safe stacking of materials, e.g., pipes, topsoil, etc.
- Removal of access to elevated areas
- Isolation of electricity and other energy sources
- Correct storage of hazardous materials

1.4: Pollution & Nuisance

The Developer is to carry out work in such a manner that avoids pollution, nuisance, or danger to adjacent occupiers or users of the public highway.

Measures shall be taken to prevent the generation of excessive dust or noise during construction operations.

Guidance on measures to reduce dust and noise during construction can be found in BRE Report 456 and BS 5228, respectively.

Under the Control of Pollution Act 1974, the District Council can impose maximum noise levels permissible during the construction of works and can enforce them; the District Council can also restrict working hours in sensitive areas. The Developer should contact Torbay Council Environmental Protection before work starts to ascertain the permissible noise levels.

Measures to prevent degradation of local air quality shall include measures such as ensuring that all plant, both static & mobile, are regularly serviced and where possible comply with the most recent Euro standard.

For works within designated Air Quality Management Areas, it is recommended that advice is sought from the Environmental Health department of Torbay Council.

Measures shall be taken to prevent the generation of excessive mud onto the Highway network by use of a wheel wash when exiting the site. The Council has powers to enforce this through the Highways Act 1980.

1.5: Services

The procedures adopted for the excavation and reinstatement of trenches must be in accordance with the normal safe practices for such work and subsequent appropriate sections of this document.

Laying mains

The Developer shall be responsible for contacting the Statutory Undertakers at the commencement of works to determine what cables, mains, and services exist and are proposed, and they shall be responsible for ensuring that such cables, mains, and services are completed before commencing any construction work that may be affected. Appendix 4B shows the standard detail indicating the relative location of services.

Protection of mains

The Developer shall comply with the requirements of the New Roads and Streetworks Act 1991 and shall take all reasonable measures required by a Statutory Authority for the full protection of its mains, pipes, cables, or any apparatus during the progress of the works (see also under 'Service Ducts'). Where privately owned services pass through the site and are affected by the works, the Developer shall provide an alternative service to the satisfaction of the owner of the service and of the Engineer.

Co-ordination of works

The Developer shall be responsible for the co-ordination of all Statutory Authorities works related to the development.

1.6: Standards of Materials and Samples

Submission of samples and test certificates

Unless otherwise specified, all materials shall comply with the current edition of the appropriate British Standard or British Standard Code of Practice (BS), European Standard (EN) or Harmonised European Standard Specification that supersedes the relevant BS.

All materials shall be transported, stored, and used in accordance with the requirements or recommendations of that Specification. Where available and unless otherwise specified, materials and articles produced under a Sector Scheme for Quality Management in Highway Works, KiteMark or Safety Mark, Highways Authorities Product Approval Scheme (HAPAS) or other accredited third part certified scheme shall be used.

Samples of construction materials will be taken as considered necessary by the Engineer. The Developer will provide all necessary assistance. The names of the suppliers shall be submitted for approval in advance of materials being ordered, and no source of supply shall be changed without the Engineer's consent prior approval. Bituminous materials may only be obtained from plants accredited to the National Sector Scheme for Asphalt Production (Sector Scheme No. 14). When any material or article is required to comply with a European or British Standard such material or article or its container shall bear the stamp of the UKAS registered certification trademark. Alternatively, the Contractor shall submit test certificates furnished by the supplier or manufacturer of the material or article indicating compliance with the relevant British Standard. The test certificates should be from a UKAS laboratory accredited for the particular test. A UKAS testing service is available from the Devon County Council Materials Laboratory. Subbase shall be from a DCC-approved source that has been assessed as capable of supplying compliant material under an appropriate quality control regime. Certificates of compliance for frost heave and required aggregate properties from a UKAS accredited laboratory shall represent the current production quality and be no more than 12 months old.

Storage of materials

All materials liable to deterioration or damage shall be stored in such a way that they shall be in accordance with the Specification at the time of use.

1.7: Developers' Responsibilities

Damage to highways

The Developer shall be responsible for any damage to existing roads, footways, verges, drains and Statutory Undertakers property, whether forming part of the works or not, which have arisen from the works, the transport of men, materials, and plant to or from the works, or because of the diversion of normal or extraordinary traffic from their customary routes due to the construction of the works. The Developer shall repair and make good all damage to the satisfaction of the Engineer or shall pay for the repairs to be carried out by the Engineer. The Developer shall be responsible for arranging with the Engineer for any necessary joint survey.

Mud, materials, or equipment on highway

Materials are not to be stored on the public highway, nor is equipment to be deposited on the highway so as to damage or obstruct it. The Developer shall keep adjacent carriageways, footways, footpaths, drains, and ditches near the works free from mud, debris, or dust arising from the works. Surface water from the works shall not be permitted to flow on to any existing public highway.

Clear-up on completion

The whole of the works shall be left in a neat and tidy condition on completion, free from refuse, litter, and debris of all kinds.

Maintenance period

For a period of at least 12 months after completion of the works, the Developer will be required to fully maintain the new road (including sweeping, gully emptying, grass cutting, shrub beds, etc.), and repair any defects to any part of the works that may arise. Such repairs shall be carried out to the Engineer's satisfaction.

1.8: Recycled Materials, Secondary Aggregates, and Energy Minimisation

Torbay Council encourages the use of recycled materials and secondary aggregates within highway construction. Wherever possible and practicable, consideration should be given to maximise the use of these materials when it can be shown that there will be no detriment to the durability and serviceability of the highway. Approval has already been given for many more sustainable materials. These include bituminous materials that contain a percentage of reclaimed aggregates, glass, and concrete. These materials are readily available from many quarries within and bordering Devon. Where any doubt exists, guidance can be sought from Devon County Council Materials Laboratory.

It is widely recognised that minimising our use of energy, particularly from the so-called 'fossil fuels', is an essential element in society's drive for greater sustainability. This specification, although containing no specific element of energy minimisation, seeks to achieve the most durable construction, which in itself should minimise both materials demand and energy usage over the whole life of the highway. One example of how energy usage can be reduced is by obtaining materials from local sources. If the Developer wishes to propose any further ways in which overall energy demand can be reduced whilst still achieving the required level of durability, this will be considered.

Section 2: Site Clearance

2.1: Underground obstructions

Underground structures and chambers shall be demolished, properly cleaned out, filled with acceptable material, and compacted in compliance with the below section "Forming of Embankments and Fills". Disused foul and surface water drains within 1.0m of formation level shall be removed and trenches backfilled in accordance with the paragraph "Upon completion". Other disused drains shall be effectively stopped up.

2.2: Existing Mature Trees, Stumps, and Roots

No existing trees shall be felled in contravention of a Tree Preservation Order. Any trees that are to be felled must be with the full written consent of the Planning Authority. Where shown on drawings approved by the Planning Authority, trees shall be uprooted or cut down as near to ground level as possible. All felled timber shall be removed from the site.

Stumps and tree roots within the vicinity of roadworks shall, unless otherwise agreed with the Engineer, be totally removed, and disposed of. Holes left by the stumps or roots shall be filled with acceptable material and compacted in compliance with the section "Forming of Embankments and Fills".

Section 3: Drainage and Service Ducts

NOTE: If roof water or water from any source other than the highway is to be carried by a surface water drain, then the drain will be defined as a sewer which will be the responsibility of South West Water or its agents to whom reference should be made for its requirements.

The requirements of this Section, therefore, apply to:

- the excavation of surface water drains carrying highway water
- the laying of pipes etc. of surface water drains carrying highway water
- the backfilling of all trenches whether they contain highway surface water sewers, other surface water sewers, or foul sewers, where they lie within the carriageway, together with their associated utility access holes, catchpits, etc.

3.1: Pipes for drainage

The class of pipe should be calculated in accordance with Simplified Tables of External Loads on Buried Pipelines (HMSO). The internal surfaces of all pipes and fittings shall be subject to the approval of the Engineer in respect of smoothness. Surface water drainage pipes shall have a minimum diameter of 225mm.

Acceptable materials for sewers

Pipes for drainage shall be selected from the following alternatives, and as more fully described in Table 5/1 of the Specification for Highway Works:

- Vitrified clay pipes shall be normal, or surface water pipes as defined in BS65. They shall have Type 1 flexible joints unless otherwise approved by the Engineer and be of the strength stated on the approved drawings.
- Concrete pipes (with Portland cement or sulphate-resisting cement when necessary) shall comply with BS5911 – 3:2010, have flexible joints and be of the strength class shown on the approved drawings.
- Unplasticised polyvinyl-chloride (UPVC) solid wall concentric external rib-reinforced pipes shall comply with BS4660 or BS EN 14011:2009 and with the relevant provisions of WIS (Water Industry Specification No 4-31-05).
- Cast iron or ductile iron pipes shall be Class B, have spigot and socket flexible joints, shall comply with BS437 or BS EN 545 and shall be used where agreed with the Engineer.

Pipes and fittings other than those included in Table 5/1 may be used with the approval of the Engineer, provided that they hold a current British Board of Agreement Roads and Bridges Certificate stating that they are a suitable alternative for the usage specified in Table 5/1. Rigid jointed pipes are not normally permissible.

Pipes for land drainage, including French Drains, shall comply with the paragraph above and SHW clause 501.3 and Table 5/1 of the Specification for Highway Works.

3.2: Excavation for Pipes and Chambers

Trenches

Excavation in trenches and pits within the boundaries of highways to be adopted shall have vertical sides unless the specific approval of the Engineer is obtained to batter them. The sides of trenches and pits shall be adequately supported at all times so as to maintain the stability of the adjacent ground. Trenches and pits shall be kept free of water at all times and shall remain open only for the minimum period necessary before backfilling.

Widths of pipe trenches shall be either a maximum of external pipe width plus 600mm or a minimum of the external pipe width plus 300mm, unless otherwise required by the Engineer.

Overbreak

In the event of an overbreak, slip, or if the Developer allows the bottom of trenches or pits to become unsuitable, the loose or unsuitable material shall be removed, the bottom of sides trimmed horizontally and vertically, and the excess excavation treated as follows:

- In the bottom of the trench or pit, the excess excavation shall be filled with concrete Mix ST2 to BS 8500-2 and BS EN 206-1 or granular material for which specific written approval has been obtained.
- Where the pipe or manhole is designed to have a concrete protection, the excess width of excavation shall be filled with extra concrete of the quality of the proposed protection.
- Where the pipe or manhole is not designed to have a concrete protection, the excess width of excavation shall be filled with the pipe surround material shown on the drawings as agreed with the Engineer, e.g., pipe bedding material or selected fill.

3.3: Sub-soil drains

When required

An adequate system of sub-soil drainage is to be constructed where:

- the winter height of the water table is within 600mm of formation, or
- the sub-soil is unstable because it is waterlogged, or
- springs, drains or watercourses are encountered, or
- there is likelihood of water running off or out of adjacent ground.

Sub-soil drains shall be accurately laid in trenches to suitable alignments and gradients. The gradients shall be sufficient to produce a self-cleansing velocity of 0.75m per second. Pipelines shall be properly linked with junction pipes, discharge into catchpits or manholes and outfall into the surface water drainage system.

Sub-soil drains shall consist of perforated earthenware, concrete or open jointed pipes complying with the appropriate British Standard and Section 5.1 below. Sub-soil drains shall be surrounded with a free-draining filter material as Type A, as shown in Table 1. French drains shall be surrounded with filter material Type B and shall be filled with this material up to ground level. Standard Construction Details are shown in Appendix 4A.

Additionally, the filter material Type A or Type B shall, where more than 2% of the material passes a 425µm test sieve, be non-plastic. The material shall have a soaked 10% fines value of not less than 50kN and have a water-soluble sulphate content of less than 1.9 grams per litre.

Land drains

Existing land drains and springs severed by the work shall be connected into the surface water drainage system.

Table 1: Grading and geometrical requirements for filter drain material

Type A	Type B
--------	--------

Standard	BS EN 13285	BS EN 13242
Size (mm)	0/20	20/40
Grading and oversize categories	G _f (with additional sieve)	GC80-20
Oversize category	OC80	–
Category for tolerances at mid-size sieves	–	GTNR (no requirement)
Category for maximum fines	UF ₃	FNR (no requirement)

Table 2: Summary grading requirements

Sieve size (mm)	Percentage by mass passing	
80	–	100
63	–	98 – 100
40	100	80 – 99
20	80 – 99	0 – 20
10	50 – 90	0 – 5
4	30 – 75	–
2	15 – 60	–
0.5	0 – 35	–
0.125	0 – 4	–
0.063	0 – 3	–
% in size fraction		
4/10	5 – 35	–
2/4	5 – 35	–

3.4: Pipe Laying

All pipe laying shall commence at the outfall unless agreed with the Engineer, and pipes shall be laid true to line and level as shown on the approved drawings. Pipes should be laid as soon as possible after excavation of the trench.

Pipe bedding material

To prevent the intrusion of fine-graded soils such as clays, silts, or fine sands into the bedding or the pipe or sub soil and French drains, especially under wet conditions, a permeable geotextiles material approved by the Engineer shall be used as a separator.

Concrete protection

Concrete surround shall be provided to pipes having less than 1.2m cover unless otherwise agreed with the Engineer. Where concrete surround is required, it shall be concrete Mix ST2 to BS 8500-2 and BS EN 206-1 with separation at the joints of expanded polystyrene or other approved material as agreed with the Engineer. After inspection and testing the pipeline, the concrete shall be placed in compacted layers to a height of 150mm above the pipe. In the case of flexible pipes, an alternative method is to protect the pipe by a bridging slab, minimum thickness 150mm, formed from concrete class C20P.

Backfilling of trenches

The fill material to be used up to carriageway formation level shall, in the absence of quantifiably suitable on-site material, be suitable imported recycled or secondary material, or Type 1 granular sub-base material to SHW clause 803 and shall be deposited and compacted in compliance with SHW clause 505.

Upon completion

Upon completion of the works, all maintenance holes and pipes shall be rodded or flushed from end to end with water and left clean and free from obstructions, witnessed by the Engineer. In certain cases, video inspection may be required e.g., where the whole drainage system is to be adopted by the Highway Authority. All testing or inspection is to be at the Developer's expense.

3.5: Manholes and Inspection Chambers

Maintenance holes and inspection chambers shall be constructed as specified below and in accordance with the standard details shown in Appendix 4A. Manholes may be constructed of precast concrete ring sections (to the requirements of BS5911) or brickwork and must be to the Engineers satisfaction and watertight on completion. All maintenance holes on sewers of 600 mm diameter or greater must be provided with safety chains (galvanised wrought iron close link 10mm) on the downstream side. Benching shall be at least 335mm wide on one side. Step irons for maintenance holes shall be galvanised malleable cast iron complying with BSEN 13101.

3.6: Manhole covers and frames

Maintenance hole covers and frames in carriageways shall:

- comply with the requirements of EN124 ref E600 150mm and be Kitemarked
- be of ductile iron or other approved material
- be square in plan
- be of ductile iron
- have clear opening of 675mm
- have a polished Skid Resistance Value (SRV) of >45 (for guidance on covers that meet this requirement, please contact the Materials Laboratory on 01392 386500)

In footways and verges, the requirements are similar, except that the covers may be to EN124 ref B125 as agreed with the Engineer.

Manhole covers and frames are to be bedded on an approved polyester resin or proprietary cementitious high strength mortar, used in accordance with the manufacturer's instructions, on at least two and not more than four courses of 225mm Class B Engineering brickwork and shall be fixed so as to be flush with adjacent surfaces. For the treatment of manhole covers in block paving see section "Paviours in Carriageway - Overall Requirements".

3.7: Gullies

Gully pots for carriageways

Gullies shall be trapped as described in clause 508 of the Specification for Highway Works and be in accordance with the standard details shown in Appendix 4A. Where in-situ gullies are formed with permanent shuttering such as plastic, such shuttering is to have a current British Board of Agreement Roads and Bridges Certificate.

Gully pots for footways

Gully pots for footways shall be:

- salt-glazed ware to BS65 round street gully with rodding eye, stopper and chain and trap, 300mm diameter x 600mm deep with 150mm diameter outlet, or
- concrete to BS5911 Part 2 unreinforced street gully with rodding eye, stopper and chain and trap, 300mm diameter x 600mm deep with 150mm diameter outlet, or
- in-situ concrete formed with permanent shuttering (e.g., plastic gullies) such shuttering to have a current British Board of Agreement Roads and Bridges Certificate.

Gully connections

Gully connections shall be of pipe complying with the requirements of the above section "Acceptable materials for sewers" and shall be of a minimum of 150mm diameter. The pipes including collars shall be bedded and surrounded, unless otherwise agreed with the Engineer, with concrete Mix ST2 to BS 8500-2 and BS EN 206-1 to a minimum thickness 150mm, over the full length of the connection, in accordance with the above paragraph "Backfilling of trenches".

Gully gratings and frames

Gully gratings and frames in residential estate roads shall:

- be certified as complying with the requirements of EN124 ref C250
- have dimensions to be agreed with the Engineer
- be hinged and/or lockable where required by the Engineer
- have flanges on three sides only (except where agreed with the Engineer) so that they can be placed immediately adjacent to the kerb face.

Gully gratings and frames in commercial estate roads shall:

- be certified as complying with the requirements of EN124 ref D400 or C250, as agreed with the Engineer
- be double triangular 450mm x 450mm
- be of ductile iron.

Gully gratings and frames shall be so fixed as to be 3 mm below the surface of the road channels, carriageway, or footway surface.

Double gullies shall be provided at low points.

Connections to existing drainage

Existing sewers, drains and culverts shall be properly connected to the new system as construction proceeds. (See also the requirements of paragraph 1.2.2). When ironwork has to be reset on trafficked roads, it shall be bedded on an approved polyester resin.

3.8: Service Ducts

All service ducts shall be constructed in accordance with the requirements of the Statutory Undertaker concerned.

Service ducts shall have smooth internal bore and be constructed of:

- unplasticised polyvinyl chloride pipes complying with class B or C, of BS 3506 or BS 4660 or BS EN 1401-1, bedded on and surrounded with concrete mix ST2, or
- steel pipes and joints complying with BSEN 10311, BSEN 10224, or
- internally glazed vitrified clay ducts with plastic flexible sleeve joints, which when tested in accordance with Appendix B of the BS 65 shall conform with its extra strength requirements, or
- glazed earthenware pipes with Type 1 sockets and flexible joints, manufactured in accordance with the extra strength requirements of BS 65.

Inspection pits for Statutory Undertakers' apparatus shall be consistent with those authorities' requirements. Covers for all pits (including draw pits) shall be capable of sustaining vehicle loading and shall not be constructed in plastic.

All Statutory Undertakers and the Highway Authority must be advised at least 7 days in advance of any proposed and approved works taking place. When excavating within a highway, any highway drains, sewers, or statutory undertakers' apparatus must be located in advance of machine excavation. If any apparatus is encountered during

excavation, the Highway Authority or Statutory Undertaker must be notified immediately, and no pipe or cable shall be disturbed without their approval.

Some Statutory Authorities have free phone numbers for use in determining the location of their services.

3.9: Soakaways and Sustainable Drainage Systems

Soakaways for highway surface water drainage shall, where permitted by the Engineer, be designed in accordance with Building Research Establishment Guidance in BRE Digest 365. Alternative designs based on CIRIA guidance or Environment Agency recommendations may also be considered.

In the absence of any additional allowance for Climate Change impacts being made in national guidance, a capacity factor of +20% will be applied.

Guidance on acceptable forms of SuDS can be found in Part 3 of this design guide.

Section 4: Earthworks

Note: The classification and confirmation of acceptability of earthworks materials shall be carried out by the Engineer based on soils information to be provided in accordance with paragraph 0.3.1. If pre-construction testing was undertaken during design, a reassessment of the CBR and moisture content of soils may be necessary at the commencement of works, and any changes to construction thicknesses etc. are to be made where required.

The references to the Highways Agency's Specification for Highway Works in this section can be found here: www.standardsforhighways.co.uk/mchw/vol1/pdfs/series_0600.pdf

4.1: Classification and Use of Earthwork Materials

Unacceptable material

Unacceptable material shall not be used in the Permanent Works. This includes:

- Peat and material from swamps, marshes, and bogs
- Logs, stumps, and perishable material
- Material in a frozen condition
- Clay having a liquid limit determined in accordance with BS1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS1377: Part 2, exceeding 65
- Material susceptible to spontaneous combustion
- Non-hazardous materials other than those permitted in Table 6/1 of the Specification for Highway Works
- Material having hazardous chemical or physical properties requiring special measures for its excavation, handling, storing, transportation, deposition, and disposal

Acceptable material

Acceptable material is material excavated from within the site or imported onto the site, which meets the requirements of Table 6/1 in the Specification for Highway Works for acceptability for use in the Permanent Works.

Stripping topsoil

Turf and topsoil shall be stripped from the whole area of the road works and stored in stockpiles of height not exceeding 2 metres, unless otherwise agreed with the Engineer.

Corrosion potential

All earthworks materials, including capping and fills within 500mm of metallic items (including lighting columns and signposts), shall be quantified as non-aggressive if the following conditions are met: (all tests in accordance with Series 600 of the Specification for Highway Works)

- pH Value: 6 minimum 9 maximum
- Chloride ion content: 0.025% maximum
- Water soluble sulphate content: 0.25g/l maximum
- Resistivity: 5000ohms.cm minimum
- Redox Potential: 0.43volts minimum

4.2: Excavation

Excavation shall be carried out to the widths and depths shown on the approved plans and cross-section, or to such other dimensions as may be considered necessary by the Engineer to secure an adequate foundation.

If the correct depth of excavation is exceeded, the levels shall be made up with approved granular material to adhere to SHW clause 803 or other material approved by the Engineer.

If any soft areas are encountered within the area of the formation or the formation becomes puddled or soft, the affected material shall be removed and replaced with acceptable material, which shall be deposited and compacted as specified for the formation of embankments. The low spots shall be suitably drained by land drains where required by Engineer.

Construction plant shall not run on the formation unless the Developer maintains the level of the bottom surface at least 300mm above formation level. Any damage to the subgrade shall be made good by the Developer as specified above.

Trimming side slopes

The side slopes of cuttings and embankments shall be trimmed to the slope shown on the approved drawings or to such other gradually changing slopes that the Engineer may direct. Should the slopes of any cuttings be excavated beyond the widths shown on the drawings, the Developer shall make good each affected area in a manner satisfactory to the Engineer.

4.3: Forming of Embankments and Fills

Embankments and other areas of fill shall be formed of material defined as acceptable material in Paragraph 4.1. Where embankments traverse areas subject to flooding, they should be constructed in granular material up to 300mm above anticipated maximum flood level.

Embankments shall be built up evenly over the full width and shall be maintained at all times with a sufficient camber and a surface sufficiently even to enable surface water to drain readily from them. During the construction of embankments, the Developer shall control and direct construction traffic uniformly over their full width. Damage to compacted layers by constructional traffic shall be made good by the Developer.

Unfinished and unprotected embankments

It is not good practice to allow road embankments to remain unfinished or unprotected for any length of time. Weather protection should be provided by placing 300mm minimum compacted thickness above formation level. The material should be of the same type as that used in the sub-formation.

Handling of fill materials

A method statement for the transportation, storage, handling, placement & compaction of fill materials shall be provided for approval prior to commencing any such works.

4.4: Permeable Backing to Earth-Retaining Structures

Permeable backing to earth-retaining structures shall consist of one of the following materials:

- Granular material 4/20 Gc 90/15 in accordance with BS EN 12620:2002, to a minimum thickness of 300mm
- Precast porous concrete blocks laid in stretcher bond with dry joints in 225mm thick walling

4.5: Compaction of Embankments and Fills

Fill shall be acceptable excavated material or granular filling as described in Paragraph 4.1. It shall be spread and compacted as soon as practicable after deposition in layers in accordance with Table 2 below.

The developer shall supply a documented procedure for the formation and compaction of embankments and/or fill. This is to include details of site control procedures for the materials and their placement together with measures to verify that the required results have been obtained at all stages in the works. Such measures should include the use of SPT or similar methods for quantifying that adequate levels of compaction have been achieved.

In accordance with BS1377: Part 9: 1990 Clause 2.1/2.2, the Engineer may at any time carry out comparative field density tests on material which they consider has been inadequately compacted. If the test results, when compared with the results of similar tests made on adjacent approved work in similar materials, show the state of compaction to be inadequate, the Developer shall carry out such further work as the Engineer may decide is required, and the costs of testing reimbursed to the Engineer.

The Developer shall, not less than 72 hours before they propose to carry out compaction processes, apply to the Engineer for permission in order that the Engineer may make proper provision for the supervision of compaction in the permanent work.

Where materials of widely divergent characteristics are used in embankments and fill areas, they shall be spread and compacted in separate clearly defined areas.

4.6: Capping Layers

In cases where the CBR value of the sub-grade soil is less than 5%, a capping layer of material complying with SHW Types 6F2, 6F3 or 6F4 may be provided. This shall comprise non-argillaceous material and, where the material size permits, shall have a CBR value of at least 15% when tested in accordance with BS1377: Part 4:7 at the in-situ moisture content following compaction. Appropriate thicknesses of capping layer are given in section 7.1.

If the capping layer is within 350mm of the road surface it shall be non-frost susceptible. This requirement shall be deemed to be met if the material after compaction, when wet sieved, produces 8% or less passing the 63µm sieve.

4.7: Preparation of Formation

Immediately prior to laying the sub-base, the formation shall be prepared as follows:

1. All surfaces shall be cleaned and any wet materials, mud, slurry, unsound or unstable material removed.
4. The surface shall be brought to the formation level shown on the approved drawings by the addition of fill material or by grading-off high spots.
5. The formation shall then be compacted in accordance with Table 2.
6. The surface shall be regulated and trimmed to within a tolerance of plus 20mm or minus 30mm of true level and given one further pass with the roller.

Where the formation is not immediately covered with sub-base or base course material, it may be protected by a membrane of 125µm thick impermeable plastic sheeting with 300mm laps set to prohibit ingress of moisture.

If the Developer allows the moisture content of accepted compacted material to reach a value above the maximum permitted for the material for compaction, the Developer shall allow the material to revert to an acceptable moisture content and if directed by the Engineer, make good the surface by re-compaction before laying the sub-base in accordance with Paragraph 4.7 Parts 1 to 4 (inclusive) above.

4.8: Earthworks to Be Kept Free of Water

The Developer shall arrange for the rapid dispersal of any water shed onto earthworks or completed formation, or which enters the earthworks from any source. Where practicable, the water shall be discharged to the permanent outfall for the piped drainage system.

The Developer shall provide (where necessary) temporary water courses, ditches, drains, pumping, or other means of keeping the earthworks free from water. Adequate means for trapping silt shall be provided before any water from the site is discharged into permanent drainage systems.

4.9: Verges

Preparation

Verges which are to be seeded shall be carefully prepared by being thoroughly dug over or ploughed one spit deep, levelled and thoroughly cleared of existing turf, weeds, rubbish, large stones etc. ready to receive topsoil. The top 100mm shall be approved topsoil (lightly compacted) and then the top 25mm worked to a fine tilth.

Immediately prior to seeding or turfing, fertiliser shall be applied to the prepared verge at a rate of not less than 75g per square metre. The fertiliser shall consist of a compound containing not less than 10% nitrogen, 15% phosphoric acid and 10% potash, and shall be submitted for the Engineer's approval.

Seeding

Grass seed as specified below shall be evenly sown at the rate of not less than 1kg to 30 square metres and lightly raked into the soil. In case of failure the sowing shall be repeated until the grass is established. The seeded area is to be maintained, including mowing, until the road is adopted.

Turfing

The grass seed shall be a tested mixture from an approved source; certificates of purity and germination shall be provided at the request of the Engineer. Unless otherwise agreed with the Engineer, the following mixture shall be used:

Chewing's fescue (<i>Festuca rubra</i> subsp. <i>commutata</i>)	24%
Smooth-stalked meadow-grass (<i>Poa pratensis</i>)	24%
Hard Fescue (<i>Festuca rubra</i>)	24%
Browntop (<i>Agrostis tenuis</i>)	8%
Perennial ryegrass (<i>Lolium perenne</i>)	20%

Where the area is to be turfed, turves shall be clean and strong and shall comply with BS3969. The turfs shall be well bonded and tamped into the prepared topsoil bed. Where turfs are required to be laid on side slopes they shall be laid diagonally and pegged as necessary using wooden pegs left flush with the surface.

All turfs shall be laid within 1 week of cutting during the period 1st April to 31st August or within two weeks of cutting during the remainder of the year. Laid turfs shall be maintained and may require additional watering until the road is adopted.

Trees

Trees planted in verges shall be nursery grown standard trees and shall be planted within seven days of being taken up from the nursery during the months of October to March inclusive. A list of recommended trees and shrubs is given in Appendix 4C.

The trees shall be planted in prepared holes at least 1.0m x 1.0m x 0.5m deep with the bottom broken up to a further 0.3m depth. The tree roots should be properly spread out in the hole and topsoil backfilled in layers gently trodden in with the foot. Trees shall be staked, fastened, and protected, as necessary.

The position of the trees is to be as shown on the drawings or as agreed with Engineer.

Section 5: Road Pavements - General

5.1: Construction Thicknesses

The required minimum depth of construction for each type of Residential and Commercial Road is given in the tables below.

Table 3: Construction Thicknesses in New Development Highway Types Residential

Road type and million standard axles	Block paved, Shared Surfaces, Home Zones (0.1 msa)	Minor Access Roads (0.1 msa)	Major Access Roads (0.2 msa)	Distributor Roads (up to 1.5 msa)	Design mix, Heavy Traffic Junctions to prevent rutting (at Engineer's discretion)
Surface course	80mm block pavers	40mm of 0/6mm SMA	40mm of 0/10mm SMA	40mm of 0/10mm SMA	Depths to manufacturer's design
Binder course	—	60	60	60	[4] See below
Sand bedding course	25 [2]	—	—	—	
Base (roadbase)	50 [1]	80	85	100	

Table 4: Construction Thicknesses in Commercial Estate Roads

Area in acres and hectares	Under 15 acres Under 6 hectares	15 to 69 acres 6 to 27 hectares	70 to 120 acres 28 to 48 hectares
Surface course	40mm of 10mm SMA	40mm of 10mm SMA	40mm of 0/14mm SMA
Binder course	60	60	60
Base (roadbase)	150	155	200

Table 5: Foundation thickness for all types of road

CBR of subgrade	Sub-base alone [3]	Sub-base plus capping layer	Geotextile required?
≤1%	Not permitted	Special conditions apply with the Engineer	To be agreed
<2% but >1%	Not permitted	150 + 600	Yes
2%	Not permitted	150 + 450	Yes
3%	Not permitted	150 + 350	Yes
4%	Not permitted	150 + 300	
5%	240(350)	150 + 250	
6%	220(290)		
7%	200(250)		
8%	190(225)		
10%	170(225)		
15%	150(225)		

Footnotes

1. A 50mm of dense asphalt concrete binder course is required when the sub-base is to carry construction traffic in which case the depth of the sub-base may be reduced by 50mm.
2. Thickness of sand is given in Paragraph 11.8.5.
7. For figures in brackets, see Paragraph 5.2 below.
3. At stressful areas such as bends, bus bays and junctions where rutting will occur, Torbay Council will require a Premier bituminous design mix at the Engineer's discretion and at the Developer's cost.

5.2: Surface Levels and Surface Regularity of Pavement Courses

Water table

The water table should not rise to within 600 mm of the formation; subsoil drainage or raising the embankment may prevent this, but if neither of these are practicable the construction thicknesses shown in brackets in Tables 3 and 4 are to be used.

Surface regularity

The level of any point on the constructed surface of the pavement courses shall be the design level subject to the following tolerances:

- Surface course: $\pm 6\text{mm}$
- Binder course: $\pm 6\text{mm}$
- Base: $\pm 15\text{mm}$
- Sub-base: $+10\text{mm}$ to -30mm

Notwithstanding the tolerances permitted in surface levels of pavement courses, the cumulative tolerance shall not result in a reduction in thickness of the pavement (excluding the sub-base) by more than 12mm from the specified thickness.

The surface course thickness stated above is the minimum acceptable, i.e., there is no lower tolerance. It is therefore advisable to ensure that the target thickness of the surface course in the laying operation takes this into account.

Checking of longitudinal surfaces

A straight edge 3 metres long shall be used to check longitudinal surface regularity.

The maximum allowable difference between the surface and the underside of the straight edge, when placed parallel with, or at right-angles to, the centre line of the road at points decided by the Engineer shall be:

- For pavement surfaces: 3mm
- For binder courses: 6mm

On lengths of surface course in excess of 75 metres, a calibrated rolling straight edge will be used. Tolerances are listed in the table below:

Length tested	Maximum number of irregularities		
	Greater than 4mm	Greater than 7mm	Greater than 10mm
75m	9	1	0
300m	20	2	0

Surface irregularities out of specification

Where surface levels or irregularities do not comply with the above, the Developer will be required to rectify the matter to the satisfaction of the Engineer. The minimum area the Engineer would accept would be 15m x lane width.

Use of surfaces by traffic and construction plant

Where the Developer proposes to use the sub-base for construction plant, they shall improve the sub-base to accommodate the method of construction and the type of plant and vehicles which they propose to use. This is in order to avoid damage to the sub-base, the subgrade, and any capping.

Any permanent thickening shall be across the whole width of the pavement unless otherwise agreed with the Engineer. Temporary thickening shall not impede drainage of the sub-base or the subgrade.

Order of work

All drainage and sewerage works, statutory undertakers' mains and services, street lighting cabling and ducting, etc. shall be installed and the trenches properly reinstated before carriageway binder course is laid.

Traffic calming features

For ramps, plateaux, and other sections where texture changes are required in estate roads, the sub-base and upper bituminous layer shall be laid to provide a smooth-running temporary surface for construction traffic and afterwards shall be carefully removed over the necessary area and to the required depth in order to construct the ramp, table, etc.

Weather conditions for laying bituminous materials

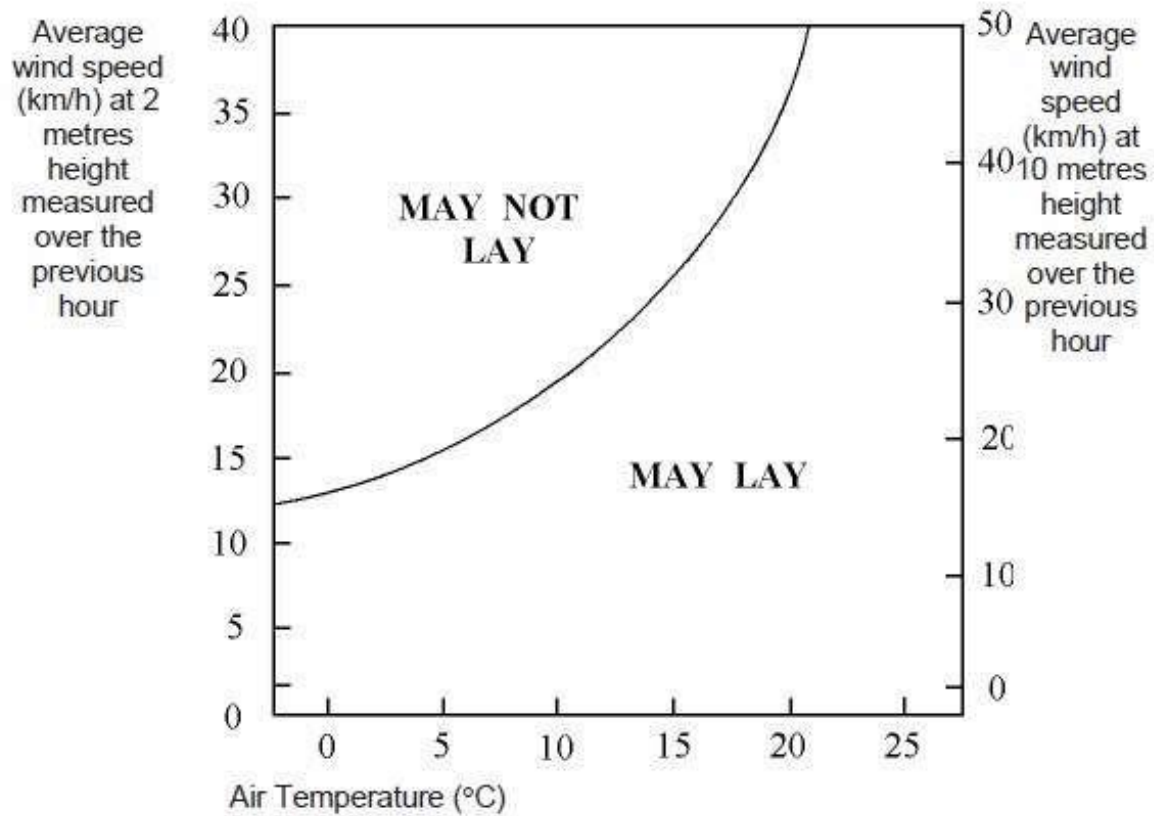
Laying of road pavement materials containing bitumen binders may proceed during light precipitation, provided that both the surface to be covered and the air temperature are above 0°C, except where otherwise specified in this clause. Responsibility for working methods shall remain with the Contractor including all necessary adjustments to suit changes in weather conditions.

Laying of road pavement materials containing bitumen binders may proceed provided that the temperature of the surface to be covered is 0°C or more, the air temperature is at or above – 1°C and rising and the surface to be covered is dry, unfrozen, and free from ice, snow, salt, and grit, except where otherwise specified in this clause.

Wind speed

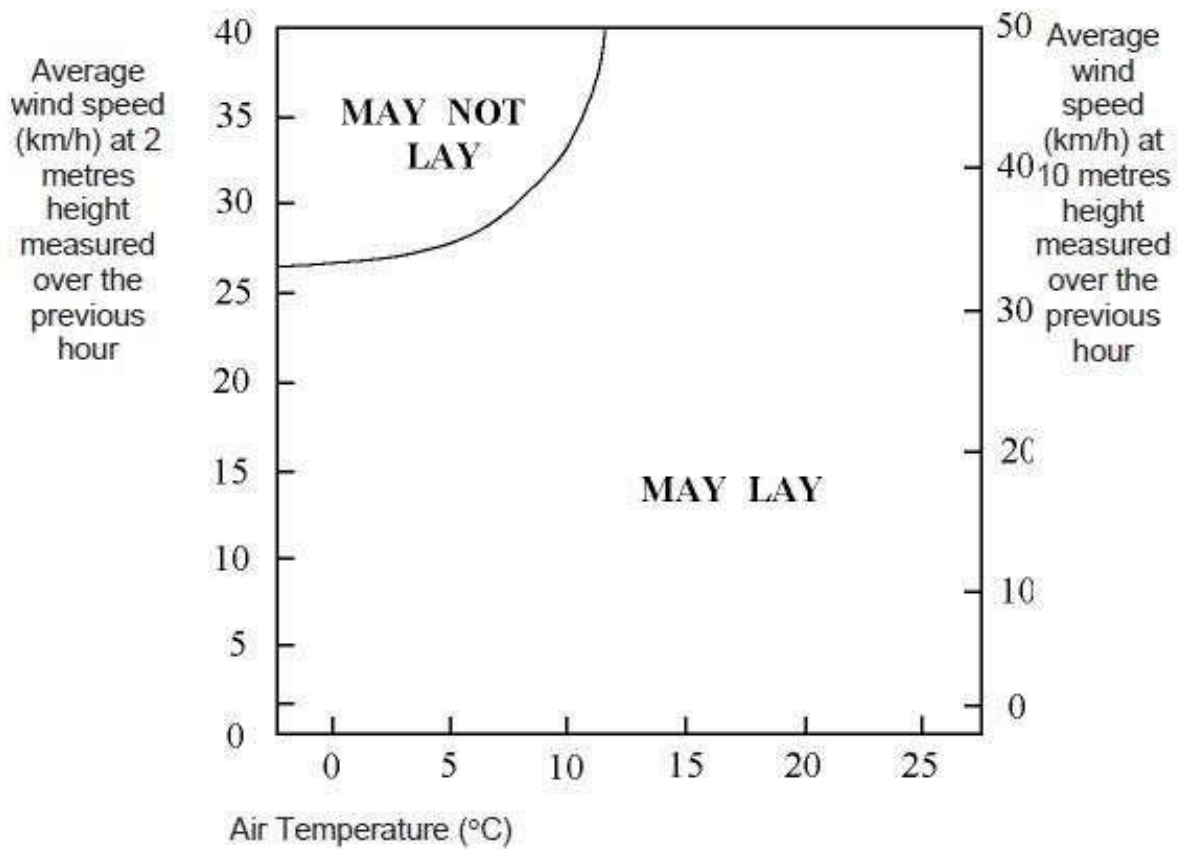
Wind speed shall be measured by anemometer positioned near the laying site to accurately reflect conditions at the laying site. The anemometer shall be fitted with a digital accumulative device. Although compaction will be assessed by means of the air voids test it is strongly recommended that the acceptable laying conditions given in the following charts are adhered to. In the case of hand-laying work, additional allowance may need to be made to achieve the specified level of air voids, e.g., higher ambient temperature and lower wind speed.

Figure 7/1: Wind speed and air temperature: laying restraints for up to 35mm thickness of SMA surface course



Figure

7/2: Wind speed and air temperature: laying restraints for dense concrete asphalt surface course or binder course



Section 6: Road Pavements - Unbound Materials

6.1: The Sub-base

The sub-base shall be granular material Type 1 to SHW clause 803. If the material is to be placed within 350mm of the surface, a certificate of frost heave compliance shall be provided. The test will have been carried out no longer than 12 months prior to supply.

Other sub-base materials will be considered on a site-specific basis. Details of such alternatives shall be notified to the Engineer at least 2 weeks prior to intended use.

The material shall be transported, handled, and laid without drying out or segregation. It shall be spread evenly in layers to the required shape and total thickness shown on the approved drawings either by hand or machine and compacted as shown in Table 6 below.

6.2: Sub-base Protection for Block Paved Roads

Where carriageways are constructed in concrete or clay pavements, if the sub-base is to be used as a running surface by construction traffic, a layer of 0/20mm nominal size dense bitumen base-course macadam shall be laid to a minimum thickness of 50mm.

The bituminous layer shall have holes (between 100mm and 150mm diameter) drilled at the rate of one per square metre and filled with 2.8/6.3mm clean chippings prior to laying paving blocks.

Any damage or deformation to the carriageway shall be made good to the Engineer's satisfaction.

6.3: Compaction Requirements for Granular Materials

During the compaction, the surface profile shall be trimmed so that the finished surface levels are within plus 10mm and minus 30mm of those shown on the approved plan.

Table 6: Compaction requirements for granular materials

Type of compaction	Mass	Number of passes for layer greater than thickness:		
		110mm	150mm	225mm
Smooth-wheeled roller	Over 2700kg	16	Unsuitable	Unsuitable
or:	Up to 5400kg			
Vibratory roller operating without vibration	Over 5400kg	8	16	Unsuitable
(Mass per metre width of roll)				
Pneumatic-tyred roller	Over 4000kg	12	Unsuitable	Unsuitable
	Up to 6000kg			
(Mass per wheel)	Over 6000kg	12	Unsuitable	Unsuitable
	Up to 8000kg			
	Over 8000kg	10	16	Unsuitable
	Up to 12000kg			
	Over 12000kg	8	12	Unsuitable
Vibratory roller	Over 700kg	16	Unsuitable	Unsuitable
	Up to 1300kg			
(Mass per metre width of vibrating roll)	Over 1300kg	6	16	Unsuitable
	Up to 1800kg			
	Over 1800kg	4	6	10
	Up to 2300kg			
	Over 2300kg	3	5	9
	Up to 2900kg			
	Over 2900kg	3	5	8
	Up to 3600kg			
	Over 3600kg	2	4	7
	Up to 4300kg			
	Over 4300kg	2	4	6
	Up to 5000kg			
	Over 5000kg	2	3	5
Vibrating plate compactor	Over 1400kg	8	Unsuitable	Unsuitable
	Up to 1800kg			
(Mass per unit area of baseplate)	Over 1800kg	5	8	Unsuitable
	Up to 2100kg			
	Over 2100kg	3	6	10
Vibro-tamper	Over 50kg	4	8	Unsuitable
	Up to 65kg			
(Mass in kg)	Over 65kg	3	6	10
	Up to 75kg			
	Over 75kg	2	4	8
Power rammer	Over 100kg	5	8	Unsuitable
	Up to 500kg			
	Over 500kg	5	8	12

Section 7: Road Pavements - Bituminous Bound Materials

7.1: Overall Requirements

From 1st April 2008, all bituminous surfacing shall be carried out by companies certificated to National Highways Sector Scheme 16 for the Laying of Asphalt Mixes. Details are available here:

www.ukas.com/Library/downloads/publications/NHSS%2016.pdf

Only materials supplied by a manufacturer certificated as complying with the Quality Assurance Sector Scheme No. 14 for the manufacture of asphalt (bituminous materials) will be acceptable. All delivery tickets will be made available to the Engineer when required.

The surfacing contractor shall only use material supplied by coating plants that have a current Q level (as defined in the National Sector Scheme for the Production of Asphalt Mixes) no worse than Q4 provided that the plant has maintained a Q level of Q3 or better in two of the previous four weeks.

Details of any non-complying material notified by the supplier to the surfacing contractor shall be passed on to the County Council's Materials Laboratory immediately. No material shall be accepted under the supplier's concession arrangements in respect of any non-compliance with the required specification.

Transporting of bituminous materials

Bituminous materials shall be transported in clean vehicles that have fully insulated bodies and shall be double sheeted or quilted when in transit or awaiting tipping.

A Skip Net/Easysheet-type system is also acceptable.

The use of dust, coated dust, or water on the interior of the vehicles to facilitate discharge of the mixed materials is permissible, but the amount shall be kept to a minimum by tipping or brushing prior to loading. Under no circumstances is diesel to be used.

Laying of bituminous materials

Bituminous materials shall be spread, levelled, and tamped by approved self-propelled pavers.

The materials shall be supplied continuously to the paver and laid without delay, as soon as possible after arrival at the site.

The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously and it shall be so operated whenever practicable.

The rate of travel of the paver and its method of operation shall be adjusted to ensure an even and uniform flow of material across the full laying width, freedom from dragging, tearing and segregation of the material.

Diesel is not to be used for lubrication or cleaning of any part of the paver that may come into contact with the bituminous material, e.g., the screed mechanism or hopper.

Compaction of bituminous materials should commence as soon as the uncompacted material will bear the effects of the rollers without undue displacement or surface cracking. Compaction should be substantially completed before the temperature falls below the minimum rolling temperatures. Rolling shall continue until all roller marks have been removed from the surface.

Compaction shall be carried out preferably using self-propelled vibratory rollers operated in accordance with the manufacturer's instructions (particularly in respect of amplitude and frequency of vibration), or by using 8-10 tonnes dead weight smooth-wheeled rollers having a width of roll of not less than 450mm, or a combination of these rollers.

Vibratory rollers should be capable of achieving at least the standard of compaction of an 8-tonnes deadweight roller.

Hand-laid work

Hand laying of any bituminous materials will be permitted only in the following circumstances:

- Laying regulation courses of irregular shape and varying thickness
- In confined spaces where it is impracticable for a mini paver to operate
- In footways

Adequacy of compaction of bituminous materials

The adequacy of compaction of bituminous materials will be determined by the Engineer from the attained air void content of the laid material using the method specified in BS598: part 104, except that 100mm diameter cores shall be used.

The Engineer will take samples in accordance with the following:

- Pairs of 100mm diameter cores shall be taken when the new material has attained ambient temperature.
- For sites exceeding 1000 square metres in area, three core pairs per 1000 sq. m.
- For sites of less than 1000 square metres, three core pairs for the complete site.

The air void content of each of the individual layers will be determined and shall not exceed the limits given in Table 7 below.

Table 7: Air void content limits

Material	Mean of 6 cores		Mean of any pair	
	Min %	Max %	Min %	Max %
Dense macadam base (asphalt concrete, BS4987-1 clause 5.2)	2	7	1.5	9
Dense macadam binder course (asphalt concrete, BS4987-1 clause 5.2)	2	6	1.5	8
Stone Mastic Asphalt (SMA), 14mm nominal size	2	6	1.5	7
Stone Mastic Asphalt (SMA), 10mm nominal size	2	8	1.5	9
Stone Mastic Asphalt (SMA), 6mm nominal size	2	10	1.5	11
Dense macadam and close (asphalt concrete) graded macadam surface courses - machine laid, BS4987 clause 7.5	2	9	1.5	11

Footnotes

1. The maximum permissible air void content given in Table 7 may be increased by 1% for hand laid materials in accordance with Paragraph 7.1, section "Hand-laid work".
8. Air voids results will be rounded to the nearest whole number for the purpose of assessing compliance over a core pair and to the nearest 0.5% for single core pair compliance.
9. The measured mix density will be used in the calculation. This figure is based on data from laboratory analysis of the mix density. The figure used will be the most recent mix density measured for the same material type from the supplying quarry. For referee purposes, a 200mm diameter core may be extracted for subsequent analysis of mix density.

Making of joints

Where joints between laying widths or transverse joints have to be made in surface courses, the material shall be fully compacted, and the joints made flush by cutting back the exposed joints to a distance of not less than the specified thickness. This cutting back shall result in the removal of any visually segregated material.

All loosened material shall be discarded, and the vertical face so formed shall be coated completely and evenly with a suitable bitumen-based product immediately prior to the abutting part of the layer being placed. A cold thixotropic bitumen can be used, as per BS4987: Part 2.

Delivery temperatures

The delivery temperatures for bituminous bound materials shall comply with the recommendations of BS4987, as summarised in Table 8 below. A calibrated thermometer suitable for checking the above-specified temperatures shall be provided by the Developer and kept available for use by the Engineer. The calibration will have been carried out within the previous 12 months and will provide clear evidence of traceability to National Standards, e.g., via a UKAS certificate.

Table 8: Delivery temperatures (°C)

Material	Max. temperature on delivery	Min. temperature of mixture immediately prior to laying	Min. temperature immediately prior to rolling
85 pen SMA	190	140	130
125 pen SMA	185	140	125
125 pen DBM (concrete asphalt, laid by machine)	160	120	95
125 pen DBM (concrete asphalt, laid by hand)	150	120	95

Tack coat emulsion

A bituminous tack coat emulsion of K1-40 or K1-60 to BS434 shall be applied to the clean, dry, or barely damp surface immediately prior to laying successive courses of (concrete asphalt) bituminous materials, i.e., between base and binder course and before any regulating layer. It shall be applied at a metered rate in accordance with Table 9 and Table 10 below.

K1-70 emulsion, formulated with bitumen and having a maximum penetration value of 220dmm and less than 1% w/w of added volatile flux oil, may also be used.

If the surface is contaminated, the carriageway shall be thoroughly washed to effectively remove the detritus. The bitumen emulsion spray shall be applied evenly, and no puddles shall be allowed to form. The emulsion shall be allowed to break (turn from brown to black) before the next course is laid. For all areas of machine laid surfacing this tack coat shall be applied by mechanical means fitted with a spray bar certificated as complying with the requirements of BS 1707. A certificate to this effect will be available for inspection when required. Calibration is to be carried out at least annually using a K1-40 or K1-60 grade of bitumen emulsion.

Table 9: Recommended tack coat application target rates in kg/m² of residual bitumen for newly laid asphalt - new construction

Binder content upper layer	Binder content lower layer		
	≤ 4.0%	4.1% - 5.0%	≥ 5.1%
≥ 5.1%	0.15	0.15	0.15
4.1% - 5.0%	0.20	0.15	0.15
≤ 4.0%	0.25	0.20	0.15

Table 10: Recommended tack coat application target rates in kg/m² of residual bitumen for trafficked surfaces

Binder content upper layer	Nature of lower layer/existing surface - see note below		
	Fretted/binder	Planed asphalt	Binder rich lean
≥ 5.1%	0.20	0.15	0.15
4.1% - 5.0%	0.25	0.20	0.15
≤ 4.0%	0.25	0.25	0.20

Footnote

Application rates in this standard are quoted in kg/m² of residual bitumen. This differs from previous standards, which quoted rates in l/m² of total emulsion. For example, the rate 0.15 kg/m² residual bitumen would approximately equate to 0.35l/m² of K1-40 or 0.25l/m² of K1-60 emulsion.

Other requirements

The carriageway shall not be used as a haul road for heavy construction loads until after the binder course has been laid, but before the surface course is laid.

A polymer-modified bond coat applied in accordance with the manufacturer's instructions will be required to be applied immediately prior to laying the SMA surface course. The bond coat shall be applied in accordance with the manufacturer's recommendations. Bond coats shall be applied by a calibrated sprayer, as detailed above under "Tack coat emulsion".

Any damage or deformation to the carriageway shall be made good to the Engineer's satisfaction prior to the laying of the surface course.

7.2: The Base (Roadbase)

Before laying base (roadbase) material, the sub-base surface shall be clean and free from standing water.

Base material shall consist of 0/32mm size asphalt concrete to BSEN 13108.

The binder shall be 125 pen to BSEN 12591. For Commercial Estate Roads, the grade shall be 50 pen.

7.3: The Binder Course

Binder Course material shall be asphalt concrete binder course to BSEN 13108 with 0/20mm nominal size crushed rock aggregate. The material shall be spread evenly to the correct profile and compacted.

If the binder course is used as a temporary running surface (or if laying of the surface course does not take place within three days), the surface of the binder course shall be thoroughly cleaned, and a bond coat applied before the surface course is laid. An aggregate of PSV >50 will be required in the upper layer of the binder course if it is trafficked for longer than 28 days. The Engineer shall be consulted on the actual PSV requirements.

The binder shall be 100/150 grade (125 pen). For Commercial Estate Roads, the grade shall be 40/60 grade (50 pen).

7.4: The Surface Course

Residential estates

Surface course material shall be as shown in Table 3. The penetration grade of the bitumen shall be 85pen. Guidance on an appropriate material can be obtained by contacting Devon County Council's Materials Laboratory.

Hand-raking of surface course material which has been laid by a paver and the addition of such material by hand-spreading to the paved area for adjustment of level will be permitted only at the edges of the layers of material and at gullies and maintenance holes, or where otherwise agreed with the Engineer. Segregation is to be avoided in all cases.

Gritting of SMA

On all carriageways and any bridleways where SMA is used, this shall be gritted using clean 3mm crushed quartzite or approved 3mm steel slag complying with the grading requirements in Table 8. This shall be applied evenly during the initial rolling at a metered rate of 0.6 - 1.0kg per square metre. The excess will be thoroughly removed upon the completion of final rolling and before opening to traffic.

PSV of aggregate

The Polished Stone Value (PSV) of concrete asphalt for bituminous materials to be used as a surface course shall be at least that stated in Table 12 below.

The risk rating of the site is defined as either Potentially High Risk, including:

- Traffic signals, pedestrian crossings, railway level crossings - including 50m approaches
- Roundabouts and their exits - including 50m approaches
- Bends <100m in radius where the speed limit >40 mph (65 km/h) - including 50m approaches
- Downhill gradients >10% for more than 50m (single or dual carriageway)
- Uphill gradients >10% for more than 50m (single carriageway only)

or Average or Low Risk for all other situations on single and dual carriageways, including:

- Generally straight sections of carriageway
- Approaches to and across major/minor road junctions
- Bends of 100m radius or greater, at any speed limit
- Downhill/uphill sections of 10% gradient or less

Table 11: Grading of grit for surface application to SMA	
BS test sieve	% passing
6.3mm	100
5.0mm	95 - 100
3.3mm	66 - 90
1.18mm	0 - 20
600µm	0 - 8
75µm	0 - 1.5

Table 12: PSV requirements for surface course materials		
Road type	PSV for Potentially High Risk	PSV for Average or Low Risk
Distributor Road	68	60
Major Access Road	65	55
Minor Access Road	60	50
Cycleways	55	50
Footways	55	50

Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

Commercial estates

Surface course material shall be as above, except that 50pen grade bitumen with natural latex modification (0.2 – 0.3% by mass of the total mix) shall be used or an alternative modified binder may be submitted to the Engineer for approval.

Where frequent turning movements by heavy goods vehicles is likely, a Premium Bituminous Design Mix shall be required at the Engineer's discretion. Guidance on an appropriate material can be obtained by contacting Devon County Council's Materials Laboratory.

Section 8: Road Pavements - Concrete and Cement Bound Materials

8.1: Concrete Carriageway

Concrete carriageway construction shall comply with the provisions of the Department of Transport's Specification for Highway Works and requires written agreement of the Engineer.

Section 9: Kerbs, Footways, and Paved Areas

9.1: Precast Concrete Kerbs, Channels, Edgings and Quadrants

Precast concrete kerbs, channels, edgings, and quadrants that are to be handled by specialist machinery or handling devices shall be hydraulically pressed and shall comply with the requirements of BS EN 1340.

Tapered kerbs and quadrants and some of the less popular sizes of radius kerbs may not be manufactured in pressed form and in these cases only, hammer compacted products will be accepted, provided that they too comply with the requirements of BS EN 1340.

Such machine handled kerbs shall also comply with Paragraph 9.2.

9.2: Natural or Simulated Stone Kerbs

Natural stone kerbs

Stone kerbs shall be of granite, sandstone, or other approved stone, and shall be clean and of regular shape, sound and free from cracks, weathering, or faults. They shall be laid in a manner similar to precast concrete kerbs.

Reconstituted stone kerbs

Reconstituted stone kerbs may be used in Residential Estates subject to the approval of the Engineer. The County Kerb produced by Redland, the Conservation Kerb produced by Marshalls, and the Countryside Kerb CSK2 and CSK3 produced by Charcon are typical examples of these products. Radii, quadrants and dropping kerbs are to be used where necessary.

9.3: Laying Kerbs

Kerb and edging bases shall be constructed in concrete Grade ST2 to BS 8500-2 AND BS EN 206-1 to paragraph 14.1.3 properly compacted by tamping. For lightweight kerbs see below.

Kerbs may be laid direct on to the wet concrete base or on a mortar bed 10mm to 40mm thick laid on previously constructed base. The concrete should not be used if more than two hours have elapsed since the batch was mixed.

Edging shall be laid in a minimum 125 mm base of homogeneous concrete and must be bedded in the wet concrete.

After laying, the line of the kerbs is to be approved by the Engineer, and then shall be backed and/or haunched with concrete Grade ST2 to BS 8500-2 AND BS EN 206-1.

Precast concrete kerbs shall be laid butt jointed, without the use of mortar infill.

9.4: Footways and Paved Areas - General

All drainage work, statutory undertakers' mains and services, and street lighting cabling that runs along the footways or footpaths must be installed and properly backfilled and compacted before footway or footpath construction commences.

Preparation of formation

The formation shall be prepared by removing all vegetation growth, water, mud, slurry and unsound or unstable material and the surface brought to formation level by the addition of acceptable granular material and rolled with a smooth wheel roller weighing not less than 2.5 tonnes or by an equivalent vibrating plate or roller. The level of the approved formation shall be within plus or minus 20mm of levels shown on the approved drawings.

Foundation

The foundation material shall be granular sub-base material to SHW clause 803 spread evenly and without drying out or segregation to the required profile in one layer of 125mm compacted thickness.

Compaction shall be achieved by rolling with a smooth wheel roller weighing at least 2.5 tonnes or by an equivalent vibrating roller until no further compaction can be achieved.

The level of the foundation material shall be within plus 10mm or minus 30mm of the levels shown on the approved drawings.

Application of weed killer

The application of weed killer is required prior to footway construction and prior to final surfacing works. The chemical weed killer is intended as a weed growth preventative and shall be Dichlobenil. It shall not be applied during or before weather conditions that would render their use ineffective or result in the contamination of surrounding areas.

The chemical is to be applied by an approved method by the Engineer using purpose-built plant or applicators. The Contractor shall ensure that a good treatment technique is adopted, and that contamination of surrounding areas, plantings, grass, and watercourses is avoided.

The Contractor shall only undertake chemical weed-killing using operatives who are certified as being competent by an authorised organisation or body for the purposes of Conditions 6 and 7 of the consent in use of pesticides given by Ministers on the 6th of October 1986 in exercise of the power in the Control of Pesticides Regulations 1986. Operators Certificate of Competence must be available for inspection at the request of the Engineer.

The use of chemical weedkiller shall be strictly in accordance with the manufacturer's recommendations, recommendations issued by DEFRA, The Control of Pesticides Regulations 1986, and any amendments thereof. Chemical weedkillers shall be of an approved type licensed for the appropriate use by the DEFRA and be non-corrosive, of low toxicity to humans, animals, fish and bees, and non-flammable.

The Contractor's attention is drawn to the requirement to state the type, product trade name and active ingredients of the weedkiller(s) they propose to use for the Engineer's approval. The Contractor shall also submit full details and specifications of the product, including Health and Safety Data sheets. The Contractor shall state whether "full" or "provisional" approval has been given to the product under the Control of Pesticides Regulations. All the above is to be submitted to the Engineer at least three days before the weedkiller is to be used.

The use of chemical weedkillers containing any of the following shall not be permitted:

- 2 – 4 – 5T
- Aldrin
- Substances from the triazine group
- Any other nationally banned substance

Surface course

On Residential Estates, the surface course shall be 0/6mm SMA. The grade of bitumen used for surface course shall be 100/150 grade (125pen). On Commercial Estates, the surface course shall be SMA of 6mm nominal size. The grade of bitumen used for surface course shall be 70/100 grade (85pen).

The material shall be spread and compacted to the required profile and to a finished layer thickness of no less than 20mm, by means of a vibratory roller delivering the appropriate compactive effort (recommended to be at least a 3-tonne deadweight roller).

The finished surface shall be within ± 6 mm from the surface level (as shown on the approved drawings) and flush with adjacent kerbs, covers, etc.

Limestone surface course will not be acceptable. No area of segregated material will be permitted.

The air voids limits for the compacted layer are given in Table 7.

Tack/bond coat

Tack coat is required where existing surfaces are to be overlaid, irrespective of how newly laid. Older and visually contaminated surfaces will require thorough cleaning (e.g., water jetting) prior to the application of tack/bond coat. Bond coat is required beneath all SMA surfaces laid on carriageways.

9.5: Footways and Paved Areas – Precast Concrete Paving Slabs, Paviours, or Setts

General requirements

All materials used in the footways shall be capable of maintaining a minimum in-service slip resistance of 40SRV (45 on gradients of 10% or greater) when measured using a standard slider and pendulum-type skid resistance meter on a sample of the paving that has been subject to an approved accelerated polishing regime.

Precast concrete paving slabs

Precast concrete paving slabs shall be hydraulically pressed and shall comply with the requirements of BS EN 1339:2003. The slabs shall be a minimum of 60mm thick and shall be a maximum size of 400mm x 400mm square or 450mm x 300mm rectangular. They shall be laid on an all over bed of 35mm uncompacted thickness of sand complying with Table 10a. Limestone coarse aggregate or fines shall not be used unless evidence of satisfactory in-service slip resistance can be provided. Joints shall be butt-jointed and sealed with dry sand brushed in.

Concrete paving blocks

Concrete paving blocks for footways shall be in accordance with Paragraphs 9.7 and 9.8, except that the blocks shall not be less than 65mm thickness.

Bricks or clay paviours

Clay and calcium silicate pavers shall conform to BS7533-3. Paviours shall be rectangular in shape and not less than 50mm thickness and shall be laid in accordance the above Standard. The thickness of sand bedding material to be used when clay and calcium silicate pavers are the surface course shall be in accordance with BS 7533 and shall be not less than 50mm.

The Engineer will require Polished Paver Values (PPVs) for any clay paver before approval for use is given.

9.6: Steps and Ramps

Steps

Steps shall be constructed of either precast or in-situ concrete Grade C30P or of approved natural stone. All materials used in their construction shall be capable of maintaining a minimum in-service slip resistance of no less than 45SRV when measured using a standard slider and pendulum-type skid resistance meter. For in-situ concrete, the formwork shall provide adequate support to the wet concrete to prevent deformation. A252 mesh reinforcement shall be placed parallel to the ground and positioned to have 40mm of cover.

The steps shall normally be 1.8 metres wide. Landings shall be of the same width as the steps and have minimum length of 2m. A flight of steps shall consist of not more than 12 risers of 150mm, and where there are 4 or more risers a handrail shall be provided. Where the width exceeds 2 metres a central bollard and handrail shall be erected. The treads should have a going of 300mm and have 6mm head fall, shall have a non-slip finish to the surface and the nosings shall have arrises of 10mm radius. The minimum throat dimension (i.e., the minimum thickness of the slab) shall be 150mm.

Walls flanking the steps, bollards, free standing handrails, and handrails attached to walls are to conform to a design approved by the Engineer.

Adequate drainage and lighting shall be provided to steps, ramps, landings, and approach paths.

9.7: Pavements in Carriageway – Overall Requirements

All materials used in the carriageway shall be capable of maintaining a minimum in-service skid resistance of 40 SRV (45 on gradients of 10% or greater) when measured using a standard slider and pendulum-type skid resistance meter. The Engineer may specify a higher level of skid resistance where a particular risk rating requires it.

Paving blocks are to be laid in accordance with the Code of Practice for Laying Precast Concrete Block Pavements, published jointly by the Cement and Concrete Association, the County Surveyors Society, and the Interlocking Paving Association (Interpave). The blocks are to be laid to a 45-degree herringbone pattern and have sufficient edge restraint to be provided to prevent outward migration of the blocks.

In cases where purpose-made edge blocks cannot be used, soldier courses laid at edges (including those adjoining manholes, gullies, etc.) are to be in accordance with the above Code of Practice and as illustrated in Appendix 4A. Blocks shall be cut so that no individual block shall be less than half of a block in length.

To satisfy this requirement, the last two courses adjacent to the edge of the carriageway or other obstruction shall be adjusted, as necessary. For example, if the gap is $\frac{1}{4}$ block in length, cut two blocks. Alternatively, some manufacturers produce a block that is one and a half times the size of a normal block, which can assist in forming such edges.

Pavements will have nibs which run the full height of the block/brick.

Table 13a: Grading of bedding sand for pavements	
Sieve (mm)	Percentage passing
6.3	100
5	90 - 100
2.36	75 - 100
1.18	55 - 90
0.600	35 - 75
0.300	8 - 35
0.150	0 - 10
0.075	0 - 0.5

Table 13b: Thickness of bedding sand		
Blocks laid on:	Max thickness (mm)	Min thickness (mm)
Asphalt concrete DBM binder course	25	25
Sub-base	25	55

Paving blocks shall be bedded on sand in accordance with the following grading thicknesses as shown in Tables 13a and 13b below. The material shall be naturally occurring silica sand, free of deleterious salts. Suitable sources of approved sand can be obtained from the Engineer.

All joints shall be sealed with a proprietary joint sealing material approved by the Engineer. Care shall be taken to ensure that the sealant does not contaminate the surface of the blocks/bricks so as to cause discoloration or reduction in skid resistance.

Fin drains

Fin drains shall be incorporated to the approval of the Engineer to ensure drainage of the sand bed at all low channels, etc. where water could pond in the sand, and the surface of the sub-base or bituminous under-layer shall be graded to ensure that no local ponding will occur.

9.8: Paviours in Carriageway – Clay Paviours and Engineering Bricks

Clay paviours shall be laid only where and when approved by the Engineer. Where permitted, clay paviours shall be capable of achieving a minimum in-service Skid Resistance Value (SRV) of 45 after 2 years trafficking or, on gradients of 10% or steeper, a minimum in-service SRV of 50 after 2 years trafficking. The Engineer may specify a higher level of skid resistance where a particular risk rating requires it. The paviours shall be not less than 65mm thick and shall be laid in accordance with the provisions of the appropriate part of BS 7533. The Engineer will require Polished Paver Values (PPVs) for any clay paver before approval for use is given.

Engineering bricks

Prior to work commencing, the type of brick to be used shall be approved by the Engineer in writing. Bricks used for this purpose should not contain frogs or holes. Engineering bricks shall be class A or B of BS3921 and shall be laid on edge and in a similar manner to concrete block paving.

9.9: Vehicle Crossings of Footway or Verge

Where paving blocks are to be laid directly on to Type 1 sub-base, the surface shall be blinded using a dry limestone “3mm to dust” and vibrated using a plate compactor to produce a void-free surface. Additional blinding and vibratory compaction may be required dependent upon the nature of the subbase surface so as to achieve complete filling of any surface voids.

Construction thicknesses for light and heavy-duty crossings are shown below in Table 14.

Where it is likely that vehicular crossings will be used by commercial vehicles of over 1.5 tonnes unladen weight, the crossing shall be constructed to the same specification as the carriageway and in the case of concrete to the specification for Commercial roads (see below).

Table 14: Vehicular crossing of footways and verges	
Residential roads	
Bituminous crossing	Minimum of 30mm of 6mm SMA* Binder penetration grade 85pen (May-September) & 125pen (October-April) Aggregate minimum PSV 50. 60mm thick 0/20mm DBM binder course* Binder grade 125 pen 150mm thick Type 1 sub-base**
Block pavers	80mm thick block pavers # 25mm sand # 150mm thick Type 1 sub-base**
Concrete	100mm pavement quality air entrained concrete of grade C30/37 Waterproof membrane 100mm thick Type 1 sub-base**
Commercial roads	
Concrete	235mm pavement quality air-entrained concrete of grade C30/37 A193 mesh reinforcement to B54483 in top and bottom of slab Waterproof membrane 265 thick Type 1 sub-base**

Section 10: Traffic Signs

10.1: Traffic Signs

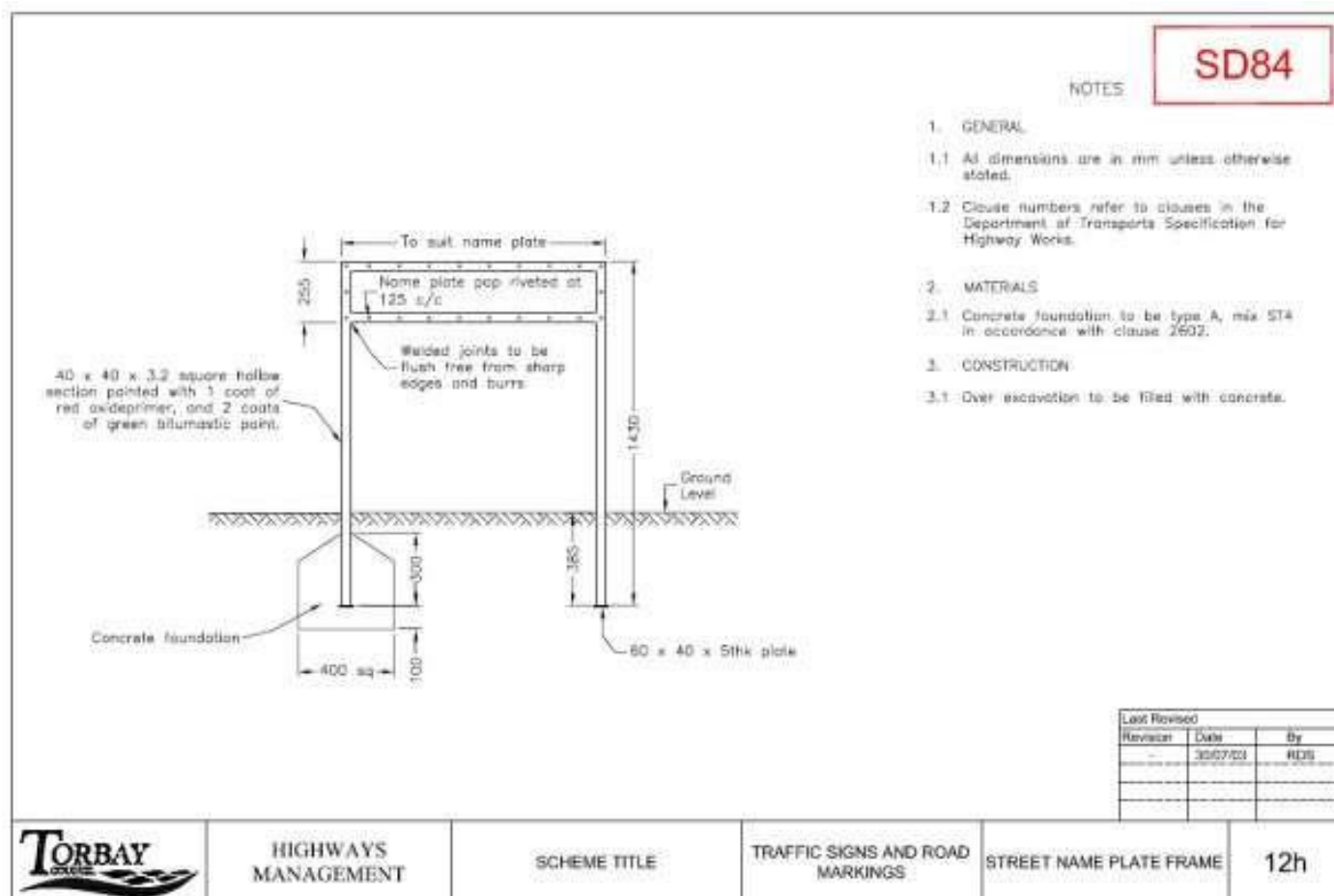
Traffic signs are to be provided where directed by the Engineer and shall conform with the Specification for Highway Works Series 1200. Any electrical connections shall be made at the same time as those for street lighting.

10.2: Street Nameplates

Street nameplates shall be of a design and material approved by Torbay Council. Nameplates shall be provided by the Developer and erected before any premises in the street are occupied. The nameplates shall be fixed to the satisfaction of Torbay Council and the Engineer.

Where appropriate, the street nameplate shall incorporate a "No Through Road" sign.

Figure 10.2.1: Typical street nameplate detail



10.3: Road Markings

Road markings shall be provided where directed by the Engineer, and Deep Cream (to BSEN 1436) lines 50mm wide where an on-street parking order has been imposed. The markings shall be of Thermoplastic or Acrylic material and shall be certified as capable of meeting the performance criteria outlined below. Certificates to this effect will be considered as acceptable if produced by a UKAS-accredited laboratory with those tests in their schedule.

All road marking shall be carried out by a contractor certificated to the National Highways Sector Scheme No. 7.

All white road marking shall meet the following requirements from BSEN 1436. The minimum period for maintaining these levels is 24 months from the time of application or notification of the Engineer whichever is the greater. Measurement shall be in accordance with BSEN 1436.

Deep Cream marking shall have a minimum skid resistance of S1, in accordance with BSEN 1436.

Section 11: Materials

11.1: Concrete

General requirements

Ready-mixed concrete shall be supplied by a company certificated for the design and supply of the relevant mixes, e.g., the Quality Scheme for Ready-Mixed Concrete (QSRMC). Delivery tickets and mix design information will be made available to the Engineer upon request.

Concrete grade C30P

Concrete grade C30P shall be an ordinary prescribed mix complying with BS 8500-2 and BS EN 206-1. The nominal maximum size of aggregate shall be 20mm and the mix shall have medium workability. In accordance with Table 1 of BS 8500-2 and BS EN 206-1, the mix shall contain 460kg of dry aggregate per 100kg of cement.

Concrete grade C20P and ST4

Concrete grade C20P and ST4 shall be an ordinary prescribed mix complying with BS 8500-2 and BS EN 206-1. The nominal maximum size of aggregate shall be 20mm and the mix shall have medium workability. In accordance with Table 1 of BS 8500-2 AND BS EN 206-1, the mix shall contain 600kg of dry aggregate per 100kg of cement.

ST2

Concrete grade ST2 shall be an ordinary prescribed mix complying with BS 8500-2 and BS EN 206-1. The nominal maximum size of aggregate shall be 20mm and the mix shall have medium workability. In accordance with Table 1 of BS 8500-2 and BS EN 206-1, the mix shall contain 900kg of dry aggregate per 100kg of cement.

Water for concrete

Water for concrete shall be obtained from a mains supply or otherwise comply with EN 1008. No additional water shall be added to ready-mix concrete after the initial plant batching.

Aggregates

Unless otherwise specified or agreed with the Engineer, aggregates shall comply with EN 12620 Aggregates for concrete or EN 13055-1 Light-weight aggregates for concrete.

Admixtures and cements containing additives

Unless agreed with the Engineer, neither admixtures nor cements containing additives shall be used.

Ready-mixed concrete

Ready-mixed concrete shall comply with the requirements of BS 8500-2 and BS EN 206-1.

Curing of concrete

Immediately after compaction (and for 7 days thereafter), concrete shall be protected against harmful effects of weather, including rain, rapid temperature changes, frost, and drying out. The methods of protection used shall be subject to the approval of the Engineer. The method of curing used shall minimise the loss of moisture for the concrete. On concrete surfaces that are to be waterproofed, curing membranes shall not be used. Details for all curing methods to be used shall be subject to the approval of the Engineer.

Cold weather working

Concreting shall not be continued when a descending air temperature in the shade falls below 3°C, nor shall it be resumed until an ascending air temperature in the shade reaches 3°C.

11.2: Reinforcement

General

Steel reinforcement shall be stored in clean conditions. It shall be clean and free from loose rust and loose mill scale at the time of fixing in position and subsequent concreting. Only reinforcement supplied by a manufacturer/fabricator registered with the CARES quality scheme shall be used.

Bending of reinforcement

Reinforcement shall be bent to the dimensions given in the Bar Schedules. All reinforcement shall be bent at temperatures in the range of 5°C to 100°C.

Placing of reinforcement

Reinforcement shall be placed and maintained in the position shown in the Contract. Unless otherwise permitted by the Engineer, all bar intersections shall be tied together, and the ends of the tying wires shall be turned into the main body of the concrete. 1.2mm diameter stainless steel wire shall be used for in-situ members that have exposed soffits. 1.6mm diameter soft annealed iron wire shall be used elsewhere.

Cover block

Concrete cover blocks to ensure that the reinforcement is correctly positioned shall be as small as possible consistent with their purpose, of a shape acceptable to the Engineer, and designed so that they will not overturn when the concrete is placed. They shall be made of concrete with 10mm maximum aggregate size. Tying wire shall be cast in the block for the purpose of tying them to the reinforcement.

11.3: Brickwork

Bricks

Bricks shall be of a type approved by the Engineer for the purpose for which they are required and shall comply with the particular requirements of BSEN 772. Bricks for the construction of utility access holes, inspection chambers, catchpits, public utility boxes etc. shall be clay engineering bricks conforming the requirements of BSEN 771 for Class B bricks, unless otherwise approved by the Engineer.

Mortar

Cement mortar used shall be composed of 3 parts sand to 1 part cement and all joints shall be flushed up solid. Sand for mortar shall be a natural sand or crushed natural stone or a combination of both, as specified in BS1200.

11.4: Miscellaneous Materials

Reconstructed stone

Reconstructed stone shall conform to the requirements of BSEN 771-5.

Timber preservation

All timber shall comply with the 300 Series of the SHW. Copies of all treatment certificates shall be forwarded to the Engineer. Preservative treated timber will only be accepted from sources certificated as complying with National Quality Assurance Sector Scheme 4: "The Natural and Conferred Durability of Timber."

Appendices

Appendix 4a: Standard Construction Details

The following standard drawings are included, being the most commonly needed details in highway construction. Other details can be obtained from the Department of Transport's publication 'Highway Construction Details', or specific details from Torbay Council at the request of the Developer.

4a-1	Precast concrete manhole – depth to soffit 1.35m to 3.0m
4a-2	Precast concrete manhole – depth to soffit 3.0m to 6.0m
4a-3	Brick manhole – depth to soffit not exceeding 1.0m, pipe diameter not exceeding 450mm
4a-4	Brick manhole – depth to soffit not exceeding 1.0m, pipe diameter 450mm to 900mm
4a-5	Typical vertical backdrop detail
4a-6	Subsoil drain and french drain gully
4a-7	Block paving details
4a-8	Block paving details (showing fin drain)

Appendix 4b: Location of Services in Straight Routes on Estates

Notes:

1. The layout of mains is in accordance with the Recommended Positioning of Utilities Mains and Plant for New Works (1986) published by the National Joint Utilities Group.
2. The dimensions shown represent the preferred arrangement in straight routes on residential and commercial estates. Variations may be necessary at curves and changes of gradient.
3. The space allocated is considered to be the absolute minimum and in certain circumstances, e.g., where both high voltage and low voltage cables are laid, the low voltage cable will be laid in the alternative position and additional width may be required.
4. Where buildings are to be connected to gas mains, a minimum instance of 2.0m is required between the building and the centre line of the main.
5. The prior approval of each of the utilities with plant present is required before the dimensions shown are varied to suit wider footways or verges which may be present in some estate layouts.

Appendix 4c-1: Recommended Trees

Trees		Location suitability	Design factors					Soil suitability							
Botanical name	English name	Local distributor R1, C1 R2, R31, R32, C2 Private drive R33 shared surface	Slope	Mass or screen	Group	Specimen	Rapid growth	Height (m)	Deciduous	Evergreen	Coastal margin	Most soils	Clay soils	Chalk soils	Light acid soils
Acer campestre	Field maple	•	•	•	•			14	•			•	•	•	
Acer plationdes	Norway maple	• •	•		•	•	•	20	•			•	•	•	
Acer pseudoplatanus	Sycamore	•	•			•	•	25	•	•		•	•	•	•
Acer rubrum	Red maple	• •	•			•	•	20	•			•	•	•	
Aesculus indica	Horse chestnut	•	•		•	•	•	25	•			•	•	•	•
Ailanthus altissima	Tree of heaven	• •	•			•	•	22	•			•	•	•	
Alnus cordata	Italian alder	• • •	•	•	•		•	16	•	•		•	•	•	
Alnus incana	Grey alder	• • •	•		•		•	13	•	•		•	•	•	•
Arbutus unedo	Strawberry tree	• • • •	•	•	•	•		10		•	•	•	•	•	
Betula pendula	Common silver birch	• • • • •	•	•	•		•	15	•			•	•		•
Betula pubescens	White birch	• • • • •	•	•	•		•	13	•			•	•		•
Carpinus betulus	Common hornbeam	• • •	•	•		•		16	•			•	•	•	
Castanea sativa	Sweet chestnut	•	•		•	•	•	25	•	•			•		•
Cotoneaster frigidus	Himalayan tree cotoneaster	• • • • •	•	•	•	•	•	6	•	•		•	•	•	
Crataegus crus-gallii	Cockspur thorn	• • • • •	•	•	•	•	•	6	•	•		•	•	•	
Crataegus prunifolia	Broad-leafed cockspur thorn	• • • • •	•	•	•			5	•	•		•	•	•	
Fagus sylvatica	Common beech	•	•	•	•	•		27	•			•	•	•	
Fraxinus excelsior	Common ash	• •		•	•		•	30	•	•		•	•	•	
Fraxinus ornus	Manna ash	• •	•		•	•	•	22	•			•	•	•	
Gleditsia triacanthos	Honey locust	• • • • •	•		•	•	•	24	•			•	•	•	•
Ilex aquifolium	Common holly	• • • • •	•	•	•	•	•	12		•		•	•	•	
Juglans nigra	Black walnut	•	•			•		20	•			•	•	•	
Koelreuteria paniculata	Pride of India	• • • • •				•		12	•				•	•	
Larix decidula	European larch	• • • • •	•	•	•		•	25	•			•	•		•
Larix kaempferi	Japanese larch	• • • • •	•	•	•		•	25	•			•	•		•
Ligustrum lucidum	Chinese privet	• • • • •	•			•	•	14		•	•	•	•	•	

Trees		Location suitability	Design factors					Soil suitability							
Botanical name	English name	Local distributor R1, C1 R2, R31, R32, C2 R33 shared surface	Slope	Mass or screen	Group	Specimen	Rapid growth	Height (m)	Deciduous	Evergreen	Coastal margin	Most soils	Clay soils	Chalk soils	Light acid soils
Liriodendron tulipifera	Tulip tree	• •	•			•		28	•			•	•	•	
Malus hupehenis	Hupeh crab	• • • •		•	•			7	•		•	•	•	•	
Malus sylvestris	Crab apple	• • • •		•	•			8	•			•	•		•
Morus nigra	Black mulberry	• •	•			•		7	•			•	•	•	
Pinus nigra var maritima	Corsican pine	• •			•		•	25		•	•	•		•	•
Pinus radiata	Monterrey pine	• •	•				•	27		•	•	•			•
Pinus sylvestris	Scots pine	• •	•	•	•		•	25		•	•	•		•	•
Platanus x hispanica	London plane	• •	•			•	•	30	•		•	•		•	
Prunus avium	Wild cherry	• •			•	•	•	20	•			•	•	•	
Prunus padus	Bird cherry	• •			•			15	•			•	•	•	
Pterocarya fraxinifolia	Caucasian wing-nut	• •	•			•	•	22	•			•			
Quercus carris	Turkey oak	• •			•	•		30	•		•	•	•	•	•
Quercus ilex	Holm oak	• •	•			•		30		•	•	•	•	•	•
Quercus palustris	Pin oak	• •	•	•	•	•		20	•			•			
Quercus petraea	Sessile oak	• •	•			•		30	•		•	•			•
Quercus robur	English oak	• •	•		•	•		30	•		•	•	•	•	
Quercus ruba	Red oak	• •	•			•	•	25	•			•	•	•	
Robinia pseudoacacia	False acacia	• • • •	•		•	•	•	22	•		•	•	•	•	•
Salix alba in var	White willow	• •	•	•	•		•	20	•		•	•	•	•	
Salix pentandra	Bay willow	• •	•				•	22	•		•	•	•		
Sorbus aria	Whitebeam	• • • •	•	•	•	•		6	•		•	•	•	•	
Sorbus aucuparia	Rowan	• • • •	•	•	•			7	•		•	•	•	•	•
Sorbus terminalis	Wild service tree	• • • •	•			•	•	10	•			•	•	•	•
Taxus baccata	English yew	• •	•	•	•	•		10		•		•	•	•	•
Tilia cordata	Small-leaved lime	• •	•			•	•	23	•			•	•	•	•
Tilia euchlora	Caucasian lime	• •			•	•	•	18	•			•	•	•	
Tilia petiolaris	Silver pendent lime	• •	•			•	•	28	•			•	•	•	
Tilia platyphyllos 'Rubra'	Red-twigged lime	• •	•			•	•	30	•			•	•	•	

Appendix 4c-2: Recommended Shrubs

Shrubs	Design factors													Soil suitability				
Botanical name	Visual screen	Barrier hedge	Forman hedge	Informal hedge	Ground cover	Climbers	Coastal margin	Vandal tolerant	Dominance	Height	Spacing	Maintenance	Deciduous	Evergreen	Most soils	Clay soils	Chalk soils	Shade tolerant
Acer ginnala	•								•	4.0	4.0		•		•			
Amelanchier lamarckii	•								•	4.0	3.0		•		•	•		•
Aralia alata										3.0	3.0				•	•		•
Aucuba japonica	•		•							2.0	1.5			•	•	•		•
Berberis candidula		•		•	•			•		1.0	0.5			•	•	•		
Berberis darwinii	•	•		•	•			•		2.5	2.5			•	•	•		
Berberis julianae	•	•		•				•		2.5	1.0			•	•	•		
Berberis panlanensia	•	•		•				•		1.5	3.0			•	•	•		
Berberis × stenophylla	•	•		•				•		2.5	2.0			•	•	•		
Berberis thunbergii		•		•				•		2.0	2.0		•		•	•		
Berberis wilsoniae		•						•		1.0	1.0		•		•	•		
Betula nana					•					1.0	0.5		•		•	•		•
Buddleia davidii	•			•				•		0.5	2.5	•	•		•	•		
Buxus sempervirens	•	•	•							2.5	4.0	•		•	•	•		
Calluna in var					•					0.5	0.4			•		•		
Carpinus betulus	•		•							2.5	0.3		•	•	•	•		•
Chaenomeles japonica		•		•				•		1.5	1.5		•		•	•		
Choisya ternata		•		•			•			2.0	1.5			•	•	•		
Cornus alba		•						•		2.0	2.0	•	•		•	•		
Cornus sanguinaea		•						•		2.0	2.0		•		•			
Cornus stolonifera		•						•		2.0	2.0		•		•	•		
Corylus avellana	•									3.0	0.4	•	•		•	•		•
Corylus maxima	•									3.0	3.0		•		•	•		
Cotinus coggyria	•			•				•		2.5	2.5		•			•		
Cotoneaster horizontalis					•			•		0.5	1.5		•		•	•		•
Cotoneaster lacteus		•		•			•			4.0	2.0			•	•	•		•
Cotoneaster simonsii		•		•			•			3.5	2.0		•		•	•		•

Shrubs	Design factors														Soil suitability			
Botanical name	Visual screen	Barrier hedge	Forman hedge	Informal hedge	Ground cover	Climbers	Coastal margin	Vandal tolerant	Dominance	Height	Spacing	Maintenance	Deciduous	Evergreen	Most soils	Clay soils	Chalk soils	Shade tolerant
Cotoneaster ‘Skogholm’					•		•			0.5	1.0			•	•	•	•	•
Crataegus monogyna/oxycantha	•	•	•	•			•			3.0	0.3	•	•		•	•	•	•
Eleagnus x ebbingei	•	•		•			•	•		2.0	3.0			•	•	•	•	•
Eleagnus pungens		•		•			•			1.5	2.5			•	•	•		
Erica var					•					0.5	0.4			•		•		
Escallonia macrantha		•		•			•	•		2.0	2.5		•	•	•	•	•	
Euonymus alatus		•								2.0	2.5		•		•	•	•	•
Euonymus fortunei radicans					•		•	•		0.3	0.4			•	•	•	•	
Euonymus japonicus	•	•	•	•			•			2.5	1.0				•	•	•	•
Fagus sylvatica	•		•							2.5	0.3	•	•		•	•	•	•
Garrya ellipita		•		•			•			1.5	1.0			•	•	•		•
Genista hispanica		•			•		•			0.5	1.0			•	•	•	•	•
Hebe brachysiphon					•		•	•		1.0	0.5				•	•	•	•
Hebe cupressoides					•		•	•		0.5	0.5				•	•	•	
Hebe pinguifolia ‘Pagei’					•		•	•		0.5	0.5				•	•	•	
Hedera canariensis					•	•					1.0				•	•		
Hedera colchia					•			•			0.5				•	•		•
Hedera helix ‘Hibernica’					•			•			0.5				•	•	•	•
Hippophae rhamnoides	•	•		•			•	•	•	4.0	2.5		•		•	•		
Hydrangea ‘Bluewave’							•			1.0	1.0	•	•		•	•		•
Hydrangea petiolaris						•				1.0	1.0			•	•	•		•
Hydrangea paniculata							•			1.0	3.0	•	•		•	•		•
Hydrangea ‘Whitewave’							•			1.0	1.0	•	•		•	•		•
Hypericum calycinum					•		•	•		0.5	0.5			•	•	•	•	•
Hypericum ‘Hidcote’					•		•	•		0.5	0.5			•	•	•	•	•
Ilex aquifolium	•	•	•	•			•	•	•	3.0	0.6	•		•	•	•	•	•
Laurus nobilis	•		•				•	•	•	3.0	0.4	•		•	•	•	•	•

Shrubs	Design factors													Soil suitability				
Botanical name	Visual screen	Barrier hedge	Forman hedge	Informal hedge	Ground cover	Climbers	Coastal margin	Vandal tolerant	Dominance	Height	Spacing	Maintenance	Deciduous	Evergreen	Most soils	Clay soils	Chalk soils	Shade tolerant
Lavatera olbia							•			1.0	0.5			•	•	•	•	
Lavendula spica ‘Hidcote’					•		•			0.5	0.3			•	•			
Lonicera nitida		•	•				•	•		2.0	0.5	•		•	•	•	•	•
Lonicera pileata					•		•	•		0.5	0.5			•	•	•	•	•
Mahonia aquifolium		•		•				•		1.5	1.0			•	•	•	•	•
Mahonia ‘Charity’		•		•				•		1.5	1.0			•	•	•	•	•
Parthenocissus quinquefolia						•				4.0			•		•	•	•	
Parthenocissus tricuspidata						•				4.0			•	•	•	•	•	
Polygonum baldschuanicum						•				5.0			•		•	•	•	
Potentilla arbuscula					•		•			1.0	1.0		•		•	•	•	
Potentilla fruticose in var		•					•			1.0	1.0	•	•		•	•	•	
Prunus cerasifera	•	•	•	•					•	2.5	0.3	•	•		•	•	•	
Prunus laurocerasus	•		•	•					•	3.5	0.5	•		•	•	•	•	•
Prunis lusitanica	•	•		•				•	•	3.0	1.0	•		•	•	•	•	•
Prunus spinosa	•	•		•			•	•		2.5	0.3	•	•		•	•	•	•
Pyracantha ‘Orange Glow’				•			•	•		2.5	0.5	•	•		•	•	•	
Pyracantha rogersiana		•		•			•	•		2.5	0.5	•	•		•	•	•	
Rhamnus cathartica	•								•	3.0	2.5		•		•		•	
Rhododendron ponticum	•		•	•					•	4.0	1.0	•		•		•		•
Rhus typhina									•	4.0	2.5		•		•	•	•	
Rosa canina							•	•		1.5	1.0		•		•	•	•	
Rosa pimpinellifolia							•			1.5	1.0		•		•	•	•	
Rosa rubrifolia							•	•		1.5	1.0		•		•	•	•	
Rosa rugosa							•			1.5	1.0		•		•	•	•	
Rosmarinus officinalis							•			1.5	1.0			•	•	•	•	
Rubus cockburnialis		•					•	•		2.0	1.0		•		•	•	•	

Shrubs	Design factors													Soil suitability				
Botanical name	Visual screen	Barrier hedge	Forman hedge	Informal hedge	Ground cover	Climbers	Coastal margin	Vandal tolerant	Dominance	Height	Spacing	Maintenance	Deciduous	Evergreen	Most soils	Clay soils	Chalk soils	Shade tolerant
Rubus tricolor					•		•	•		0.5	1.0		•		•	•	•	
Salix caprea	•						•	•	•	4.0	2.0		•		•	•	•	•
Salix daphnoides	•						•	•	•	5.0	3.0		•		•	•	•	
Salix purpurea	•						•	•	•	4.0	2.0	•	•		•	•	•	
Salix viminalis	•						•	•	•	5.0	3.0		•		•	•	•	
Sambucus nigra							•	•	•	4.0	2.0		•		•	•	•	•
Sambucus racemosa							•	•		2.5	1.5		•		•	•	•	•
Senecio greyii					•		•			1.0	1.0			•	•	•	•	
Spirea x arguta		•		•			•	•		1.5	1.5		•		•	•	•	
Spirea x bumalda				•			•	•		0.5	0.5		•		•	•	•	
Symphoricarpus x chenaultii ‘Hancock’					•			•		0.3	0.5		•		•	•	•	•
Viburnum davidii				•			•			0.5	1.0			•	•	•		
Viburnum lantana	•			•				•		2.0	1.0		•		•	•	•	
Viburnum opulus	•			•						2.0	1.0		•		•	•	•	•
Viburnum rhytidophyllum							•			3.5	2.0			•	•	•		
Viburnum tinus	•	•		•			•	•		2.0	1.0		•		•	•	•	•
Vinca major/minor					•		•	•		0.3	0.5			•	•	•	•	•
Villis cognetti						•					4.0		•		•	•	•	•

Appendix 4d: Carriageway Construction Design Principles

D.2.1

Carriageway design is based on the principles in the Highways Agency's Design Manual for Roads and Bridges, Volume 7: Pavement Design and Maintenance.

- Road pavement: the total depth of construction of all layers supported by the sub-grade. It distributes the traffic loads over the sub-grade and protects it from the weather.
- Sub-grade: the in-situ ground surface or top of fill, which, together with the sub-base, forms the foundation for the pavement.
- Formation: the surface of the sub-grade or capping layer prepared to receive the pavement.
- Sub-base: a second part of the foundation of the road, which also serves as a frost protective layer of material placed directly on the formation.

- Base (roadbase): the principal load-carrying layer of material which distributes the applied traffic loading, and which supports the surfacing in a flexible pavement
- Surfacing: the top load-carrying and water-proofing layer(s) of a flexible pavement which enables a good ride quality to be achieved; it comprises of the following:
 - a) Surface course – the layer which carries the traffic and gives appropriate levels of safety, e.g., resistance to skidding.
 - b) Binder course – the layer immediately beneath the surface course.

D.2.2

Design is based on two main factors:

- The quality of the sub-grade, expressed in terms of the California Bearing Ratio (CBR) etc.
- The total number of commercial vehicles (i.e., exceeding 1500kg unladen weight) expected to run on it throughout its design life, expressed in million standard axles (msa).

For convenience, acceptable construction thicknesses are set out in a table in Section 5.

D.2.3

To ascertain the sub-grade conditions, the Developer shall request that the County Materials Laboratory carry out a site investigation. An assessment should also be made of the frost susceptibility of the sub-grade. No material within 350mm of the road surface should be frost susceptible.

D.2.4

If a preliminary investigation is made during the design process, the assessment of the CBR value etc. is also to be confirmed at the time of excavation.

D.2.5

The water table is to be prevented from rising to within 600mm of the formation level by either using sub-soil drainage or raising the formation by embankment whenever practicable. If neither is practicable, the appropriate construction thicknesses shown in brackets in Table 5 under Section 5.1 must be used.

D.2.6

In summary, the design process is as follows:

1. Establish the mechanical, physical, and chemical properties of the sub-grade, including hydraulic properties where appropriate.
2. Obtain the thicknesses of sub-base, base, and surfacing appropriate to the type of road from relevant guidance, including Tables 3 and 4 in Section 5.1.
3. If the sub-grade is frost susceptible, check that at least 350mm of pavement thickness is provided by increasing the sub-base thickness, as necessary.
4. Determine the appropriate PSV of the aggregate for the surface course or the performance capabilities of the paving bricks or blocks where appropriate.

Appendix 4e: List of Documents Referred to in the Guide to the Specification

- Highways Agency Manual of Contract Documents for Highway Works Volume 1, Specification for Highway Works 1998 with any subsequent amendments

- BRE Reports 365 & 436
- Control of Pollution Act 1974
- Chapter 8 of the Traffic Sign Manual Traffic Safety Measures for Roadworks, published May 1991.
- The Construction (General Provisions) Regulations 1961
- Guidance Note GS7 (Revised 1989) issued by the Health and Safety Executive
- The New Roads and Street Works Act 1991
- British Standard Specifications (BS)
- European Specifications (EN)
- Simplified Tables of External Loads on Buried Pipelines
- Code of Practice for Laying Precast Concrete Block Pavements, published jointly by the Cement and Concrete Association, the County Surveyors Society, and the Interlocking Paving Association (Interpave).
- Recommended Positioning of Utilities Mains and Plant for New Works (1986)
- Highways Agency Design Manual for Roads and Bridges, Volume 7 “Pavement Design and Maintenance”.

When publications referred to in this document are revised or replaced, the current editions or replacement documents shall apply, unless otherwise agreed with the Engineer.

Developers’ attention is drawn to all current legislation relative to construction sites. Nothing stated in this document shall be taken to relieve Developers or their agents of responsibility in this respect.

Highway Adoption Procedures

Section 1: Introduction

This part of the Design Guide describes how a developer can advance their proposals in order to achieve an adoptable road. (An adoptable road is one which by its function, condition, layout, and specification is suitable for the Council to adopt and maintain at public expense.) It sets out the purpose and status of this Guide, the planning framework within which proposals are considered, what roads are eligible for adoption, and how such adoption is achieved. All developers are strongly advised to complete a Section 38 Agreement for the adoption of estate roads before work commences on them.

Section 2: Purpose and Status of the Guide

2.1: Purpose of the guide

This Design Guide is a policy document approved by Torbay Council. It replaces the previous documents entitled “Residential Estates Design Guide - Highways and Footpaths” and “Residential Estates - Specification” published in April 1989. It details the hierarchy, layout and specification for highways that would be eligible in principle for adoption and sets out the procedures that should be followed to achieve a highway adoption Agreement.

A highway consists of all vehicular and pedestrian thoroughfares that are available for public use; it may thus include roads, footpaths, footways, cycleways, alleyways, courtyards, and their related verges, visibility splays and service margins.

The purpose of the document is to set out the principles and philosophies to be considered in the design of estate highway layouts and to provide advice on appropriate dimensions. It sets out the Council's requirement for compliance with legislation regarding Health and Safety Environment Protection and Mobility impaired users. Developers and estate designers are encouraged to interpret this advice so as to achieve a pleasant environment and to provide safe and adequate pedestrian, vehicle, and cycle access to the residential or commercial premises.

This Guide takes into account the advice from circulars and technical memoranda provided and aims to reflect the Government's planning policy PP53 and its companion guides Manual for Streets 1 and 2.

Throughout the guide, various links will appear to direct the user to sites containing relevant information and further reading these are shown in blue.

Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

2.2: Role of the Council

Torbay Council is the Local Highway Authority for all the publicly maintained highways in Torbay and, as such, is responsible for the adoption of these new highways in Torbay.

2.3: Why estate roads should be adopted

The principal pedestrian, cycle and vehicular access routes to residential and commercial premises should be eligible for adoption to safeguard their future maintenance, drainage, and lighting. The current legislation as contained in the Highways Act 1980 enables new streets to be adopted by an Agreement between the developer and the Local Highway Authority; this procedure means that the Advance Payments Code does not apply. (How this code is applied is covered in Section 7 below.)

Section 3: The Planning Framework

3.1: The consultation process

Planning applications for new estate development are determined by Torbay Council's Planning Authority.

3.2: Pre-application discussion

Developers and their agents are encouraged to meet the representatives of the Planning Authority and the Highway Authority to discuss their proposed estate layout in advance of the submission of a planning application.

3.3: The plan-led system

Determination by the Planning Authority of any planning application is governed by the Development Plans; namely, the Torbay Structure Plan and the relevant Local plan. Additionally, there may well be a Development Brief, which sets out how the development is to be integrated into the surrounding area.

3.4: The Structure Plan

The Structure Plan is prepared by Torbay Council and is a written statement of broad policy for up to 15 years ahead. It sets out policies and proposals for major land uses that include residential and industrial land, and for highways and their relationship to development.

The Structure Plan also defines the Road Network, which consists of a Major and Minor Road Network. The Major Road Network comprises the National Routes and Primary and Secondary County Routes, while the Minor Road Network comprises Local Distributor, Collector, and all other roads. The design of the junctions of residential roads with existing roads is dependent on a number of factors, including their classification in the Road Network, traffic flows and existing road width.

3.5: Local Plans

The Local Planning Authority is responsible for preparing Local Plans for this area. The Local Plan makes detailed proposals for the future pattern of development by interpreting the general proposals of the Structure Plan. Structure Plans are statutory documents and are of prime importance in the determination of any planning application or appeal.

3.6: Design Briefs

Developers are urged to establish at an early stage from these Plans and other local policies whether there are any constraints on access to the site or specific requirements for roads, footpaths, and cycleways. For instance, developments in Conservation Areas will need special consideration in order not to prejudice their singular character.

It is recommended that a Design Brief is prepared for residential estates larger than 50 dwellings and for commercial developments of more than 1.2 hectares (3 acres). This Brief may be prepared by the Planning Authority, in consultation with the Highway Authority, and where appropriate with the Developer.

The preparation of the Design Brief could include these factors:

- Site characteristics and features
- Connections with existing highways
- Pedestrian and cyclist desire lines
- Relationship to off-site facilities
- Penetration by public transport
- Existing private street APC liability
- Any proposed highway schemes
- Any existing new street orders, building lines
- Access visibility
- Access and site gradients, e.g., whether a road alignment is feasible
- Surface water disposal

- Off-site highway works
- Highway stopping up or diversion orders
- General highway characteristics in the locality (speed restriction zones, etc)

3.7: Conserving the environmental

Much of Torbay's landscape is of exceptional quality; It makes the Bay attractive to both visitors and residents; The development should contribute to the quality of the environment rather than detract from it. The design of new housing and commercial estates in such environmentally sensitive areas should respect and complement the character and scale of the landscape or townscape that provides the setting for the site.

The layout of the street and the use of materials in constructing it are an important and integral element of design and are just as significant as choice of materials in the buildings or their elevation in detail in contributing to the sense of local distinctiveness.

3.8: Section 38 Agreements

As soon as the Planning Authority has granted full planning permission and approved all the reserved matters regarding an estate road layout, it is recommended that the developer makes an application to the Authority for a Section 38 Agreement so that the estate roads and footpaths will be adopted. (The details of the prospective highways that are agreed with the Local Planning Authority and Local Highway Authority should be consistent with those necessary for the Section 38 Agreement. Therefore, Section 38 Agreement discussions should commence at this stage). It should be noted that there are several steps after the granting of any necessary planning permission.

Section 4: Highways Eligible for Adoption

Definitions in this guide:

- Engineer: The Service Manager for Street Scene and Place, or their representative
- Carriageway: part of the highway which is intended for use by vehicles
- Footway: part of the estate highways which is intended for use by pedestrians, and which generally is parallel with the carriageway and only separated by a kerb or verge
- Footpath: a pedestrian route located away from carriageways
- Verge: a grassed or ground cover planted part of the highway that is provided for highway visibility, vehicle overhand, and statutory undertakers' mains and apparatus routes
- Cycleway: a route particularly identified for cycles; may be part of a carriageway, adjacent to a footway or footpath, or otherwise separate. Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

4.1: Roads and footways that are eligible for adoption

The roads and footways that are eligible for adoption are those that:

- Serve more than a single commercial property or more than five individual dwellings
- Provide a principal means of access for pedestrians, vehicles, and cycles
- Are laid out in accordance with the principles of this Design Guide
- Conform to the current construction specification of the Council

At the detailed planning approval stage, those areas that could be adopted should be identified and agreed with the Engineer.

Please note that LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

4.2: Verges and landscaped areas

The Highway Authority will expect all visibility areas to be offered for adoption. Other verges and planted areas are eligible for adoption if:

- The verges are adjacent to Local Distributor Roads
- The verges are adjacent to Residential Access Roads or Ways and which are provided in the place of footways as a vehicle overhang margin or to accommodate the statutory undertakers' mains and apparatus and other services
- Landscaped areas are within the highway envelope, e.g., at traffic calming features
- Landscaped areas are slightly in excess of what is required for visibility, etc., in order to achieve a more satisfactory layout

Small areas of privately maintained ground sandwiched between publicly maintained areas are unacceptable.

An agreed commuted sum for maintenance may be required for any soft landscaping within the adopted highway, following which the Council will make arrangements for the long-term maintenance of any landscaped areas.

4.3: Footpaths and cycleways

Footpaths and cycleways will be adopted if they are the primary means of access to a group of five or more dwellings or a number of commercial units, or if they provide desirable and/or essential links within the estates.

Note: LTN 1/20 guidance takes precedence over our guide in relation to the design of cycle infrastructure.

4.4: Parking areas

Normally, car parking areas outside the highway envelope, specifically allocated to individual dwellings or to which access is gained separately from the carriageway (e.g., garage courts), will not be adopted. Furthermore, communal areas of parking, for instance in Housing Courts, are to be outside the highway envelope and will not be adopted.

4.5: Embankments and retaining walls

Structures (such as embankments and retaining walls) that support the highway, whether it be carriageway, footpath, footway, or verge, may be adopted by the Council.

Structures that support land above the highway will not be adopted; however, calculations and details of these will normally be required to ensure that there is no possibility of an adverse effect on the highway.

They will also be subject to inspection, and therefore the estimate of the construction cost of the wall will be included in the calculation of the inspection fee. To insure against the developer being in default of the Agreement and the Highway Authority having to complete the works including the construction of retaining walls above or below the carriageway, the estimated cost of these retaining walls will be included in the Bond calculated by the Engineer.

4.6: Lighting

Lighting of streets and footpaths will be adopted.

4.7: Street naming and numbering

Street names and numbering are the responsibility of the Council and there is a charge for each dwelling and each new road. Details should be agreed with the Council, and the developer should provide street nameplates in accordance with that Authority's specification.

4.8: Highway Safety Audits

Any scheme for the provision of new highways outside a residential or commercial estate, or the alteration of existing highways, is to be subject to a Highway Safety Audit, both during the design process and when the works are completed. The Developer is responsible for any alterations as a result.

4.9: Drainage

The Highway Authority will normally be responsible only for those drains carrying surface water from the highway. If roof water or water from any other source is introduced, the drain will then become a surface water sewer to be adopted and maintained by South West Water. In such circumstances the developer must enter into a separate agreement with South West Water for its adoption. Only the gullies and their connections will be adopted by the Highway Authority where a surface water sewer carries anything other than highway water. (The Council will complete a Section 38 Agreement only when a Section 104 of the Water Industry Act 1991 or similar agreement has already been made with the Water Authority). Furthermore, outfalls require the consent of the Environment Agency and South West Water, for which a fee may be payable.

4.10: Statutory undertakers and other services

Before the new highway is adopted by the Council, all service pipes or cables etc. must be approved and adopted by the appropriate statutory authority. Developers may be required to provide written evidence of acceptance by these authorities before the works can be approved before the commencement of the maintenance period.

Section 5: Statutory Provision for the Adoption of Streets

5.1: The Highways Act 1980

The Highways Act 1980 requires that a Highway Authority should protect the owners of residential and commercial premises from the ultimate liability of private street works charges; the two provisions within the Act that are relevant are:

- the Advance Payments Code under Sections 219 - 225
- a Highway Adoption Agreement under Section 38

5.2: The Advance Payments Code

The Advance Payments Code (APC) of the Highways Act 1980 has been adopted by the Council as Highway Authority. Consequently, once building regulation approval is obtained and building works commence, a developer is obliged to deposit or secure to the satisfaction of the Council a sum of money representing the estimated future liability for street works charges within the proposed development.

At the discretion of Torbay Council, it may utilise the above provisions.

A schedule of exemptions is detailed in Section 219 of the Act; one of the exemptions is the completion of a Section 38 Agreement for the ultimate adoption of the street.

Section 6: Section 38 Agreements – Detailed Requirements

A Section 38 Agreement is a voluntary Agreement between the Highway Authority and the owner of the street for its ultimate adoption and is the normal method of ensuring that works are carried out to an adoptable standard. The Council has adopted the Model Agreement produced by the Association of Metropolitan Authorities in 1988 on behalf of the Local Authority Associations and the House Builders Federation.

All developers are strongly advised to complete a Section 38 agreement for the adoption of new streets before any work commences on them.

6.1: Bond

A Bond to cover the cost of the works necessary to achieve an adopted highway and the associated administration costs for each Section 38 Agreement, as estimated by the Engineer, must be provided by a member of the British Insurance Association or one of the Joint Stock Clearing Banks. The purpose of the Bond is to ensure that the Highway Authority can complete the highway works if the Developer defaults for any reason.

6.2: Inspection Fee

An Inspection Fee is also payable (see also Appendix 3d below, paragraph 2.3). The following is the fee structure for highway agreement works. Note that the stated percentages relate to the authority's estimated construction costs of the schemes in question.

- Section 38 fees up to £25,000 to be £1,500 fixed fee
- Section 38 fees £25,000 to £50,000 to be 10%
- Section 38 fees £50,000 to £150,000 to be 8%
- Section 38 fees over £150,000 to be 6%
- Section 278 fees up to £25,000 to be £1,500 fixed fee
- Section 278 fees £25,000 to £50,000 to be 10%
- Section 278 fees £50,000 to £150,000 to be 8%
- Section 278 fees over £150,000 to be 6%

Any Public Realm works and Town Centre improvements will carry an additional 1% on the above percentages, due to the increased officer time dealing with the design and consultations.

6.3: Why discussions with the Highway Authority are essential

Developers proposing to enter into a Section 38 Agreement should make early contact with the appropriate area office of the Highway Authority for the following reasons:

- Early discussion with the Highway Authority can avoid unnecessary and abortive design work.
- If the Developer has begun work on site and a Section 38 Agreement is still being pursued but has not been completed, then the APC deposit must be paid in the interim period (APC deposits will be repaid to Developers upon the signing of a Section 38 Agreement); the Highway Authority will not discuss Section 38 matters unless and until such APC sums have been deposited.
- Early completion of the Section 38 Agreement will avoid difficulty with the eventual adoption of the works due to absence of inspection.

In advance of the initial discussion with the Highway Authority, the developer may well wish to consider the Design Brief for the development, and those factors outlined in section 1.3 for smaller sites and those not having a design brief.

6.4: Commuted sums

Commuted sums for the future maintenance of landscaping may be required by the Highway Authority, as outlined in Paragraph 4.2 above.

6.5: Appendices

There are some useful appendices at the end of this part of the Design Guide, as follows:

- Appendix 3C: A check list that may prove helpful in ensuring a layout includes sufficient detail
- Appendix 3D: Information on documentation required for a Section 38 Agreement
- Appendix 3E: Information on procedures for inspection and adoption of the works

Section 7: Construction of New Streets Without a Section 38 Agreements

If a developer constructs a private street, that is, a street not maintainable at public expense, the Advance Payments Code contained in the Highways Act 1980 applies (clauses 219 to 225). This Code protects future frontagers of any

street constructed by a developer that is not maintainable at public expense. Firstly, it requires that before new buildings are erected in private streets (i.e., a road or street not maintainable at public expense) the sum likely to be needed for street works shall be paid to the local authority, or security given for it.

Secondly, it provides that when development has reached a certain stage frontagers are able to require the carrying out of street works and the adoption of the street.

Therefore, where a development involves the construction of new estate roads it is common for developers to enter into a Section 38 Agreement with the Highway Authority under which the developer constructs the street to the satisfaction of the authority. Where such an agreement is entered into the Advance Payments Code has no application.

However, if the developer is unable or unwilling to enter into a Section 38 Agreement, the provisions of the Advance Payments Code will be fully applied, thus normally requiring the payment of a deposit to the Council representing the liability estimated by the Engineer for street works charges on each property in the development.

As a consequence, the new roads will not be inspected by the Engineer during the construction period; if subsequently the developer decides that they wish the new roads to be adopted, they must then enter into a Section 38 Agreement, with agreed drawings, and they will be required to:

prove the quality of the works to the satisfaction of the Engineer; (in order to do this, it will normally be necessary to complete a series of inspections, boreholes, drainage tests and camera survey as required by the Engineer, at the developer's cost) ii) the developer will then be required to undertake any necessary remedial or reconstruction works.

Only after this can the maintenance period commence (the minimum length of which would be twelve months).

Even under the above circumstances where the new street or road is not offered for adoption, it will still be necessary for a developer to agree with the Engineer the works required to the existing highway in order to complete the connection to the existing road network and mains services.

The developer is not permitted to proceed with any works within, or that affect the highway, until these verge crossings and road opening procedures have been completed, together with any necessary notices to the Statutory Undertakers.

Section 8: Highway Alteration, Stopping Up, and Diversion Agreements

8.1: Off-site highway works

Off-site highway works may be necessary to achieve a satisfactory development e.g., alterations to an existing road, or the resurfacing of adjacent roads or footpaths. Contributions may be required for off-site works where damage may be caused to the existing highway network as a result of construction traffic. In such cases, a separate legal agreement with Torbay Council as Local Highway Authority is required before any of these works commence, as it is an offence to carry out works in a public highway without legal authority.

8.2: Diversion, stopping up, etc.

If the development involves the diversion or stopping up of an existing public highway, footpath, bridleway, or County Road, then an Order under the Town and Country Planning Act 1990 has to be obtained from the Department of Transport before the part of the development that is dependent upon the diversion or stopping up of the existing highway is commenced.

8.3: Road opening and verge/footway crossings

The Agreements for the highway works will normally provide consent for opening of the existing highways or crossings within a verge or footway. Reinstatements are to be carried out in accordance with the procedures outlined in the New Roads and Street Works Act 1991.

8.4: Private sewers or drains

Private sewers or drains in the proposed or existing highway may well require a licence.

8.5: Restrictions on works on the highway

On certain identified traffic sensitive routes (normally the principal traffic routes), there are embargo periods during which works that affect the highway will not be permitted. Details of these periods and the affected routes can be obtained from Torquay Town Hall or from Torbay Council's website.

Section 9: Sustainable Development

9.1: Summary

The latest Government guidance places sustainability in development, transport, and drainage at the core of design practice. Provision for the car shall take second place compared to peoples' and communities' needs for a pleasant and safe living environment. The Council through its joint Local Transport Plan with Devon County Council 2011 to 2026 is committed to developing an integrated, sustainable transport system for Torbay, as a means to reduce traffic congestion, pollution and promote healthier forms of travel.

An Integrated Passenger Transport Strategy has been specifically developed in Torbay. This strategy aims to meet all journey needs, including work, education, health, and leisure within Torbay.

Public Transport should adequately support all developments and where none exists, contributions may be sought from developers for its provision.

Permeability is the key to successful sustainable transport and essentially means the ease with which pedestrians and cyclists can move through the built environment and take the shortest and most pleasant routes to their destination.

It must be ensured that adjacent roads have similar levels of access for all users with safe footways and cycleways, crossing points, low traffic speeds and easily reached quality bus stops allowing permeability for non-motorised traffic through the development. In designing cycle facilities, initial consideration should be given to making links with the strategic network of routes defined by the Council. It is considered appropriate for cyclists to share a network of streets where the 85%ile speed of vehicles does not exceed 20mph and/or where there will be less than 100 dwelling units.

Local Transport Note 1/20 provides guidance and good practice for the design of cycle infrastructure in support of the Cycling and Walking Investment Strategy.

The scope of this document is limited to design matters. Further reading on related matters, helpful tools and advice on procedural issues is included in the Appendices.

LTN 1/20 replaces previous guidance on cycle infrastructure design provided by LTN 2/08, and accordingly, LTN 2/08 is withdrawn.

LTN 1/20 also replaces LTN 1/12: Shared Use Routes for Pedestrians and Cyclists, and accordingly, LTN 1/12 is now withdrawn.

Most development proposals will trigger the need for extra facilities for the needs of the development (e.g., public transport links, pedestrian crossings etc) or to mitigate the impact of development upon existing community facilities. These facilities, either developer funded and/or provided shall be secured by agreement under Section 106 of the Town and Country Planning Act 1990.

Torbay Council will pursue Sustainable Drainage Systems (SUDS) as required and in compliance with the Floods and Water Act.

Appendix 3a: Checklist for Detailed Design

This list is intended to enable developers to check that all aspects of the design have been including and/or are adequate for submission to the Highway Authority.

Please note that this list is not necessarily comprehensive; the Developer should ensure for themselves that all requirements of the Design Guide are met.

Carriageway	
In Plan	In Section
<input type="checkbox"/> Width	<input type="checkbox"/> Vertical alignment
<input type="checkbox"/> Crossfall/camber	<input type="checkbox"/> Horizontal alignment
<input type="checkbox"/> Junction layout	<input type="checkbox"/> Construction
<input type="checkbox"/> Junction radius	<input type="checkbox"/> Kerb detail
<input type="checkbox"/> Junction visibility	<input type="checkbox"/> Ramp detail
<input type="checkbox"/> Forward visibility	<input type="checkbox"/> Speed restriction detail
<input type="checkbox"/> Speed restrictions	
<input type="checkbox"/> Spacing	
<input type="checkbox"/> Gullies	

Footpath	
In Plan	In Section
<input type="checkbox"/> Width	<input type="checkbox"/> Gradient
<input type="checkbox"/> Alignment	<input type="checkbox"/> Crossfall
<input type="checkbox"/> Route	<input type="checkbox"/> Construction
<input type="checkbox"/> Vehicle crossings	<input type="checkbox"/> Edging
<input type="checkbox"/> Motorcycle barriers	<input type="checkbox"/> Vehicle crossing construction
<input type="checkbox"/> Bollards	<input type="checkbox"/> Barrier detail
<input type="checkbox"/> Service routes	<input type="checkbox"/> Bollard detail
<input type="checkbox"/> Gullies	<input type="checkbox"/> Cutting slope
	<input type="checkbox"/> Embankment slope
	<input type="checkbox"/> Retaining wall

Maintenance/service margins	
In Plan	In Section
<input type="checkbox"/> Width	<input type="checkbox"/> Gradient
<input type="checkbox"/> Pedestrian crossings	<input type="checkbox"/> Crossfall
<input type="checkbox"/> Vehicle crossings	<input type="checkbox"/> Construction
<input type="checkbox"/> Service routes	<input type="checkbox"/> Edging
<input type="checkbox"/> Boundary demarcation	<input type="checkbox"/> Vehicle crossing construction
	<input type="checkbox"/> Pedestrian barrier detail

Footways	
In Plan	In Section
<input type="checkbox"/> Width	<input type="checkbox"/> Gradient
<input type="checkbox"/> Alignment	<input type="checkbox"/> Crossfall
<input type="checkbox"/> Pedestrian crossings	<input type="checkbox"/> Construction
<input type="checkbox"/> Pedestrian barriers	<input type="checkbox"/> Edging
<input type="checkbox"/> Vehicle crossings	<input type="checkbox"/> Vehicle crossing construction
<input type="checkbox"/> Bollards	<input type="checkbox"/> Bollard detail
<input type="checkbox"/> Service routes	<input type="checkbox"/> Barrier detail
<input type="checkbox"/> Gullies	<input type="checkbox"/> Cutting slope
	<input type="checkbox"/> Embankment slope
	<input type="checkbox"/> Retaining wall

Visibility splays
In Section
<input type="checkbox"/> Height
<input type="checkbox"/> Means of retention (rear of splay)

Drainage	
In Plan	In Section
<input type="checkbox"/> SW outfall	<input type="checkbox"/> SW utility access holes
<input type="checkbox"/> SW route	<input type="checkbox"/> SW outfall
<input type="checkbox"/> SW utility access holes	<input type="checkbox"/> SW pipe specification
<input type="checkbox"/> Gully connections	<input type="checkbox"/> FW utility access holes
<input type="checkbox"/> FW route	<input type="checkbox"/> Trench bedding/backfill
<input type="checkbox"/> FW utility access holes	<input type="checkbox"/> Depth of cover

Highway boundary	
In Plan	In Section
<input type="checkbox"/> Retaining walls	<input type="checkbox"/> Cutting slopes
<input type="checkbox"/> Boundary fence/wall	<input type="checkbox"/> Embankment slopes
<input type="checkbox"/> Embankments	<input type="checkbox"/> Retaining walls
<input type="checkbox"/> Cuttings	<input type="checkbox"/> Wall/fence/bank details
<input type="checkbox"/> Highway overhang	

Off-street facilities	
In Plan	In Section
<input type="checkbox"/> Proximity of parking spaces	<input type="checkbox"/> Drive construction
<input type="checkbox"/> Alignment	<input type="checkbox"/> Parking space gradient
<input type="checkbox"/> Garage set-back	<input type="checkbox"/> Parking space construction
<input type="checkbox"/> Drainage	<input type="checkbox"/> Drainage details
<input type="checkbox"/> Vehicle turning	
<input type="checkbox"/> Access pedestrian visibility	
<input type="checkbox"/> Access vehicle visibility	

Supporting information
<input type="checkbox"/> Drainage calculations
<input type="checkbox"/> CBR report
<input type="checkbox"/> Drainage
<input type="checkbox"/> Vehicle curve calculations
<input type="checkbox"/> Drainage outfall consent – wayleave from landowner
<input type="checkbox"/> Drainage outfall consent – from NRA

Appendix 3b: Documentation Required for Section 38 Agreements

3b-1: Preliminary submission

To avoid abortive work, the Developer is advised to submit (informally in the first place) three sets of the plans and associated engineering details. These will be returned with a list of any details of recommended modifications. When all material matters have been agreed, the street lighting requirements of the Engineer will be forwarded to the Developer.

Well before the required agreement date, details of and calculations for all structures should be submitted. The Developer is solely responsible for the accuracy of the submitted calculations.

3b-2: Final submission

The final submission for a Section 38 Agreement should include:

- PDF Copies 1/200 or 1/500 scale plans (as appropriate to the size of scheme and detail to be shown), and sections showing complete details of the estate road layouts. These are to be based on an accurate site survey, including highway drains, and foul and surface water sewers.
The plans should indicate:
 - a) the hard surfaced area to be adopted by the Highway Authority coloured pale brown where constructed in concrete block paving, coloured grey where constructed of bituminous materials, and verges and landscaping areas that the Highway Authority have agreed to adopt coloured green
 - b) the boundary of the land owned by the developer and the subject of the Agreement edged in red
 - c) the proposed highway drainage including any off-site drainage to be adopted, coloured blue
 - d) the manner in which surface water is disposed of offsite; this should include line and levels of a sewer subject to a Section 104 or similar Agreement the developer has made with South West Water or its agents.
 - e) the agreed position of street lighting columns, indicated by a red circle.
 - f) the proposed line of statutory undertakers' apparatus
 - g) the horizontal alignment of the road including curve radii, road width, setting out details i.e., radius centres, tangent points, etc.
- PDF copies of drawing showing the engineering details:
 - a) a longitudinal section on the centre line of each road showing existing ground levels and proposed centre line and channel levels at a maximum of 20m intervals related wherever possible to Ordnance Datum or otherwise to an identified datum; the section should also show distance in figures from the point of origin, gradients of the proposed road, length and radius of vertical curves and invert levels of utility access holes; proposed pipe sizes and gradients between manholes. Suitable scales are 1/500 horizontal and 1/100 vertical.
 - b) cross-sections should be provided where necessary at appropriate intervals to a natural scale of 1/100 showing existing and proposed levels; these should show crossfalls of carriageways and footways and cutting and embankment levels and slopes, together with any retaining walls adjacent to the proposed highway; whether or not they are part of the adopted highway; kerb and pavement construction details should be shown on a typical cross-section
- Structural, drainage, and road curve calculations should also be submitted.

Other information required:

- Name and registered address of the Developer

- Name and address of bondsperson, who should be either a member of the British Insurance Association or a member of the Joint Stock Clearing Banks
- Name and address of solicitor
- Proposed phasing of development
- Proposed date of commencement of works
- Target date for the first residential occupation
- Target date for the completion of works
- Details of any easements for off-site drainage works with evidence of permission to discharge.

Following receipt of the completed details, the Engineer will provide their estimate of the cost of the works (based on recently submitted tender prices) which will be the Bond figure required for the Agreement. The Inspection Fee will also be calculated, based on the Engineer's estimate of the cost of the works using the approved criteria.

- Section 38 fees up to £25,000 to be £1,500 fixed fee.
- Section 38 fees £25,000 to £50,000 to be 10%
- Section 38 fees £50,000 to £150,000 to be 8%
- Section 38 fees over £150,000 to be 6%
- Section 278 fees up to £25,000 to be £1,500 fixed fee.
- Section 278 fees £25,000 to £50,000 to be 10%
- Section 278 fees £50,000 to £150,000 to be 8%
- Section 278 Works over £150,000 to be 6%

Any Public Realm works and Town Centre improvements will carry an additional 1% on the above percentages, due to the increased officer time dealing with the design and consultations.

An Invoice for this amount will be supplied to the developer and/or their agent. Site inspections cannot normally start until the Agreement has been signed and bonded, and the Inspection Fee paid.

Appendix 3c: Site Inspection of Works for Section 38 Agreements

Developers are required to notify the Highway Authority of the commencement of any work on the proposed roads and footpaths so that inspection can be arranged. In addition, before any works within the existing highway are undertaken, approval must be obtained from the Engineer, and notice given to any affected statutory undertaker. Developers should note that work undertaken without a Section 38 Agreement will not be inspected and will NOT be adopted until all the works have been proven at the developer's expense. Such works may also be subject to an extended maintenance period, together with a security bond and separate inspection fee.

The developer shall afford the Engineer's representative all facilities necessary for the inspection of each of the stages of construction as set out in the Section 38 Agreement.

The works at each stage will be inspected by the Engineer provided that adequate notice is given in accordance with the Agreement and any supplementary advice given to the developer (normally 2 working days)

Should any revisions to the Agreement drawings be requested by the developer, these should always be referred to the relevant Area Development Control Officer

The developer will be required, on satisfactory completion, to maintain all works submitted for adoption for a period of at least twelve months (the Maintenance Period). Subject to their carrying out any remedial works during and at the end of the maintenance period, to the satisfaction of the Engineer, the street will become a highway maintainable at public expense. Responsibility for street lighting will be assumed by Torbay Council on satisfactory completion of the Works.

Before the Works are finally adopted as a publicly maintained highway, the developer must provide written evidence that any sewer that is laid within the highway has been adopted by the Drainage Authority. Similar evidence will also be required for any other Statutory Undertakers, plant, pipes, cables, and equipment.

The Highway Authority's Section 38 Agreement is based on the Model Agreement produced by the Association of Metropolitan Authorities and the House Builders Federation.

This document can be made available in other languages and formats. For more information, please contact highways@torbay.gov.uk.