

Technical Standard - Roads

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List of acronyms

CDM	Construction (Design and Management)
CoCP	Code of Construction Practice
CPTED	Crime Prevention Through Environmental Design
CTRL	Channel Tunnel Rail Link (also see HS1)
DAS	Deliverable approach statement
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
EIR	Environmental Information Request
FOI	Freedom of Information
GLA	Greater London Authority
HS1	High Speed 1 (also see CTRL)
Kph	Kilometres per hour
LLAU	Limits of Land to be Acquired or Used
LoD	Limit of Deviation
LU	London Underground
LWM	London West Midlands
NR	Network Rail
OCS	Overhead catenary system
PAR	Project Appraisal Report
PSC	Professional Services Consultant

SSD Stopping Sight Distance
TfL Transport for London
TLRN Transport for London Road Network
TRO Traffic Regulation Order

References

Title	Reference
<i>HS2 Technical Standards</i>	
Technical Standard – Highway and access drainage	HS2-HS2-DR-STD-000-000002
Technical Standard – Public rights of way	HS2-HS2-HW-STD-000-000002
Technical Standard – Errant vehicle protection	HS2-HS2-HW-STD-000-000005
Technical Standard – Earthworks	HS2-HS2-GT-STD-000-000001
Technical Standard – Earthworks design (landscape integration)	HS2-HS2-EV-STD-000-000021
Technical Standard – Fencing	HS2-HS2-CV-STD-000-000002
Technical Standard – Overbridges (post-hybrid Bill only)	HS2-HS2-BR-STD-000-000003
Technical Standard – Viaducts (post-hybrid Bill only)	HS2-HS2-BR-STD-000-000001
Technical Standard – Underbridges (post-hybrid Bill only)	HS2-HS2-BR-STD-000-000002
<i>HS2 Deliverable Approach Statements (applicable to hybrid Bill design only)</i>	
Deliverable approach statement – Overbridges	HS2-HS2-BR-DAS-000-000001
Deliverable approach statement – Viaducts and underbridges	HS2-HS2-BR-DAS-000-000002
<i>HS2 Phase One Information Papers</i>	
Environmental Minimum Requirements (EMR)	gov.uk
Environmental statement	gov.uk
Scope and methodology report	gov.uk
<i>HS2 Phase One Information Papers</i>	
D11 – Maintaining access to residential and commercial property during construction	gov.uk
E5 – Roads and Public Rights of Way	gov.uk
E13 – Management of traffic during construction	gov.uk
E14 – highways and traffic during construction – legislative provision	gov.uk

Title	Reference
E28 – Future highway maintenance responsibilities	gov.uk
Standard detail drawings	
Highway standard detail drawings	HS2-CSI-HW-STD-000-XXXXXX-FD, where XXXXXX represents all drawing numbers
Other HS2 documents	
Guidance Document – Landscape Design Approach	HS2-HS2-EV-GDE-000-000002
Project dictionary	HS2-HS2-PM-GDE-000-000002
Legislation	
Highways Act 1980	legislation.gov.uk
Road Traffic Regulation Act 1984	legislation.gov.uk
Road Vehicles (Construction and Use) Regulations 1986	legislation.gov.uk
Road Traffic Act 1988	legislation.gov.uk
Equality Act 2010	legislation.gov.uk
Town and Country Planning Act 1990	legislation.gov.uk
New Roads and Street Works Act 1991	legislation.gov.uk
Transport and Works Act 1992	legislation.gov.uk
Traffic Signs Regulations and General Directions 2002	legislation.gov.uk
Road Vehicles (Authorisation of Special Types) (General) Order 2003	legislation.gov.uk
Traffic Management Act 2004	legislation.gov.uk
DMRB	
Design Manual for Roads and Bridges (DMRB) Standards and Advice Notes	gov.uk/standards-for-highways-online-resources
British and European Standards	
BS EN 1317 'Road restraint systems'	BSI
BS EN 12767 'Passive safety of support structures for road equipment. Requirements, classification and test methods'	BSI
DfT Local Transport Notes	
LTN 1/95 'The assessment of pedestrian crossings'	gov.uk
LTN 2/95 'The design of pedestrian crossings'	gov.uk
LTN 2/08 'Cycle Infrastructure Design'	gov.uk

Title	Reference
<i>DfT Traffic Advisory Leaflets</i>	
TAL 6/05 'Traditional Direction Signs'	gov.uk
<i>Manual for Streets</i>	
Manual for Streets	gov.uk
Manual for Streets 2	Chartered Institute of Highways and Transportation
<i>Other guidance documents</i>	
Inclusive mobility – A guide to best practice on access to pedestrian and transport infrastructure 2005	gov.uk
London Cycle Design Standards, 2014	tfl.gov.uk
<i>British Horse Society advice</i>	
'Advice on Specifications and Standards recommended for equestrian routes in England and Wales', by the British Horse Society	bhs.org.uk

Project terminology

The project terminology used within this document can be found in the HS2 project dictionary (HS2-HS2-PM-GDE-000-000002).

Conventions

Mandatory clauses

The following convention is used to indicate mandatory clauses.

Mandatory clauses are differentiated from the main text of this document by use of a 'black box'. They contain the word 'shall' to indicate their status as a requirement.

Departures

Any intention to not comply with a mandatory clause is considered to be a departure from this Technical Standard.

It is recommended that the designer discusses any proposed departures with HS2's Technical Directorate at an early stage.

Guidance

The following convention is used to indicate guidance.

NOTE – Guidance is differentiated from the paragraph to which it relates by use of italic type and use of the words 'should' or 'may'.

1 Executive summary

- 1.1.1 This technical standard provides the technical requirements and associated guidance for the design of any works to roads potentially affected by the HS2 project.
- 1.1.2 Adoption of this technical standard will help ensure a consistent approach to road issues across all areas.
- 1.1.3 This technical standard is intended for use during all phases of design, from hybrid Bill design to detailed design.

2 Introduction

2.1 Background

- 2.1.1 For the purposes of this document, the term 'road' refers to any public highway not classed as a public right of way.

2.2 Legislation

HS2 hybrid Bills

- 2.2.1 The HS2 hybrid Bills give powers to a 'Nominated Undertaker' to stop-up, realign and divert existing roads and create new roads where these are within the Parliamentary limits. Refer to Information Paper E14 'Highways and traffic during construction – legislative provision' for further details.
- 2.2.2 New, realigned and diverted roads are shown in the Parliamentary plans as a 'work' and have a Limit of Deviation (LoD) associated with them.

Highways Act

- 2.2.3 The main statute covering the creation, adoption, use, maintenance, diversion, and stopping up of roads is the Highways Act 1980. However, these powers and duties are largely disapplied and replaced by substitute provisions in the case of a hybrid Bill.

Road Traffic Regulation Act

- 2.2.4 Most of the legal powers to place a temporary or permanent restriction on a road are contained in, or derive from, the Road Traffic Regulation Act 1984.

NOTE – Parts of the Road Traffic Regulation Act also apply to certain private roads which the public have access; not only busy networks such as landside roads at airports, access roads inside port facilities and around major shopping centres but also within industrial estates and even car parks.

- 2.2.5 Examples of such restrictions are a Traffic Regulation Order (TRO) which imposes a permanent weight limit or a Temporary Traffic Regulation Order (TTRO) which closes a road to vehicular traffic for a specified period to enable works to be carried out. Speed limits and parking restrictions can also be imposed by either type of order.

Other Acts of Parliament

- 2.2.6 Temporary or permanent alterations to the road network can also result from specific provisions in legislation such as the Transport and Works Act 1992 or Town and Country Planning Act 1990.
- 2.2.7 Roadworks are governed by legislation such as the New Roads and Street Works Act 1991 and the Traffic Management Act 2004.
- 2.2.8 Reasonable adjustments required for disabled people / people with mobility impairments are covered by the Equality Act 2010.

Secondary legislation

- 2.2.9 Specific provisions may also be made under statutory instruments such as the Traffic Signs Regulations and General Directions 2002.

NOTE – An update to the Traffic Signs Regulations and General Directions is expected in 2015.

2.3 Highway authorities

- 2.3.1 Under English law, there are three main types of highway authority, as follows:
- **Highways England**, a government owned company (formerly known as the Highways Agency until March 2015), responsible for motorways and all-purpose trunk roads
 - **Transport for London (TfL)**, part of the Greater London Authority (GLA), responsible for the Transport for London Road Network (TLRN)
 - **Local highway authorities** – being the county council, unitary authority, London Borough or metropolitan borough for the area – responsible for all other roads
- 2.3.2 There can only be one highway authority for any particular length of highway. However there are cases where some functions of the highway authority have been delegated to a contractor (such as the M25 motorway DBFO). Clarification may be required to establish who performs the various functions of the highway authority in such circumstances.
- 2.3.3 Refer to the 'Consents and approvals strategy – permanent highway works' (HS2-HS2-HW-STR-000-000001) for details of the various consents and approvals required from each highway authority.

2.4 Types of road

- 2.4.1 There are seven main types of road, as follows:
- **Motorway** – A 'special road' for certain classes of motorised vehicles only, maintained by Highways England
 - **All-purpose trunk road** – A strategic 'A' road for long-distance traffic, maintained by Highways England

- **Primary route** – A network of other 'A' roads, important at a regional level and maintained by local highway authorities
- **Principal road** – Other 'A' roads, important at a sub-regional level and maintained by local highway authorities
- **Secondary road** – 'B' roads, important at a district level and maintained by local highway authorities
- **Classified road** – Roads of local importance only, maintained by local highway authorities
- **Unclassified road** – Other roads, ranging from urban streets to country lanes (including unsurfaced 'green lanes' in remote areas), maintained by local highway authorities

NOTE – Classified roads have a 'C' number, but this is for internal use by the local highway authority and is not shown on traffic signs. Similarly, unclassified roads may be given a 'D', 'E' or 'U' number for the highway authority's internal reference purposes only.

2.4.2	Reference shall not be made to 'C', 'D', 'E' or 'U' road numbers in design documents or drawings.
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Designation

- 2.4.3 The Department for Transport has been responsible for designating road types down to secondary level since the 1920s. However, as of April 2012, local highway authorities now have powers to amend the primary route network and re-designate 'A' and 'B' roads in their areas subject to the agreement of any adjacent highway authorities (including Highways England) that may be affected.

Road numbering

- 2.4.4 The Department for Transport retains responsibility for allocating numbers for 'A' and 'B' roads (as well as motorways) in order to avoid the risk of duplication.

Road naming

- 2.4.5 Although there has been no legal requirement for a road to be named, almost every part of the historic road network has had a colloquial name which was subsequently taken up by the local highway authority. Similarly, all but a few of the most modern roads have either been officially named or has a name in common use such as 'Xyz Bypass' or 'Abc Ring Road'.
- 2.4.6 However, under long-standing public health legislation, local authorities (i.e. district / borough / city councils and unitary authorities) have official responsibility for naming roads for address purposes. Local authorities (as opposed to local highway authorities) are also responsible to erecting and maintaining street name plates.

NOTE – The local authority's official road name and the local highway authority's name may differ.

Abnormal load routes

- 2.4.7 The vehicular movement of certain types of indivisible load longer, wider, higher or heavier than permitted by the Road Vehicles (Construction and Use) Regulations 1986 is covered by the Road Vehicles (Authorisation of Special Types) (General) Order 2003. However, other types of indivisible load have to be individually authorised by a Vehicle Special Order under the Road Traffic Act 1988.
- 2.4.8 A number of pre-defined wide and high load routes exist where the highway authorities have confirmed their suitability to carry oversized vehicle / load combinations up to specific maximum dimensions. Similarly, various pre-defined heavy load routes exist where highway authorities and bridge owners (e.g. Network Rail) have confirmed their suitability to carry heavier axle loads or overall vehicle / load weights than normally permitted.
- 2.4.9 Where a new, realigned or diverted road forms part of an abnormal load route, the road shall not restrict the passage of oversized vehicles up to the route's approved dimensions / load-carrying capacity.

NOTE – Highways England publishes advisory high and heavy load 'grids' on its website, and local highway authorities may also have lists or maps of other abnormal load routes in their areas.

2.5 Records

List of Streets

- 2.5.1 Historically, the local highway authority has been required to maintain a 'List of Streets' which itemises those roads within its area which are maintained at public expense.

NOTE – The List of Streets may include routes (including pedestrian and/or cycle paths) which are not public highways but which are maintained at public expense.

NOTE – Very rarely, a public highway may be encountered where a court has decided that it need not be maintained at public expense (and thus may not be included in the List of Streets).

Street Gazetteers

- 2.5.2 In most cases, the local highway authority will have developed their List of Streets by creating a full gazetteer of their roads; original in paper form but more recently using a Geographic Information System (GIS) or similar technology.
- 2.5.3 However, local highway authorities are now obliged to maintain a Local Street Gazetteer (LSG) which in turn forms part of the National Street Gazetteer (NSG), maintained by GeoPlace (a public sector limited liability partnership between the Local Government Association and Ordnance Survey).
- 2.5.4 The National Street Gazetteer contains a range of street network and related information including:

- Street name and location details
- Road length
- Junctions
- Road centre lines
- Street geometry
- Additional Street Data (ASD)
- Additional Street Data includes:
 - Details of ownership
 - Reinstatement categories
 - Details of protected streets
 - Special designations such as:
 - Traffic sensitive streets
 - Streets with special engineering difficulties
- Level crossing safety zones
- Environmentally sensitive areas
- Streets with special surfaces
- Streets with priority lanes
- Streets with special construction needs
- Height, weight and width restrictions
- Direction restrictions

NOTE – Direct use of the National Street Gazetteers is normally restricted to organisations with a statutory duty to coordinate street works activities or dig in the road, but Highways England and local highway authorities can be approached for the same information held in their Local Street Gazetteers.

Land & Property Gazetteers

- 2.5.5 Each local authority is also obliged to maintain a Local Land & Property Gazetteer (LLPG), based on their street naming / address database, which forms part of the National Land & Property Gazetteer (NLPG), also maintained by GeoPlace.

NOTE – Access to the National Land & Property Gazetteer is available via the Ordnance Survey website, but local authorities can also be approached directly about access to their Local Land & Property Gazetteers.

NOTE – Road names used for mailing and geographic addresses in the Local and National Land & Property Gazetteers may differ from street names given in the Local and National Street Gazetteers.

2.6 Maintenance

General

- 2.6.1 Road maintenance can be carried out by a number of different arrangements, including:
- Direct labour (increasingly rare)
 - Term maintenance contracts

- Combined management and operations contracts
- DBFO contracts and other forms of concession
- Agency or partnership agreements with other councils

NOTE – Whatever arrangement is used, the highway authority retains overall responsibility for the condition of the road.

- 2.6.2 The HS2 hybrid Bills include various provisions for the future maintenance of new, realigned or diverted roads.

NOTE: Refer to Information Papers E14 'Highways and traffic during construction – legislative provisions' and E28 'Future highway maintenance responsibilities' for further details.

Design for maintenance

- | | |
|-------|--|
| 2.6.3 | All roads shall be designed to help ensure maintenance activities can be conducted safely. |
|-------|--|

NOTE – Refer to Interim Advice Note 69 for further details on designing for maintenance.

2.7 Stakeholders

Local planning authorities

- 2.7.1 For works not authorised by the HS2 Bill, local planning authorities (i.e. district / borough / city councils, metropolitan boroughs, London Boroughs and unitary authorities) are responsible for agreeing layouts and design standards for new or altered roads.

- 2.7.2 The hybrid Bill gives the equivalent of outline planning permission for the scheme, and consents and approvals associated with the plans and specifications for the highway need to be sought from the highway authority.

NOTE: While consents from local planning authorities are not required for the roads themselves, 'structures' supporting roads (such as bridges or embankments) are subject to approval.

Parish councils

- 2.7.3 Local planning authorities usually consult parish councils about all planning applications in their area, including those which affect the road network. However, the extent to which highway authorities engage with parish councils varies widely.

NOTE – Although parish councils are not directly responsible for consents or approvals, many are likely to take an active part in the hybrid Bill process regarding proposed changes to the road network in their area.

Drainage organisations

- 2.7.4 Organisations with land drainage and flood prevention responsibilities – including the Environment Agency, Canal and River Trust, Internal Drainage Boards and Lead Local Flood Authorities – will have an interest in any proposals affecting the watercourses for which they are responsible. For highway works, this would include any culverting or changes to highway drainage discharge arrangements.

NOTE – Although the hybrid Bill gives the Nominated Undertaker the power to alter the course of (or otherwise interfere with) all types of watercourse, consent is required to undertake any works which could affect the level, flow or quality of water (including from new or amended highway drainage systems) from the appropriate drainage body (as defined under the Protective provisions of the hybrid Bill).

Statutory undertakers

- 2.7.5 A significant proportion of the utilities apparatus owned by the statutory undertakers for water, gas, electricity, telecommunications, sewers, etc. is located under the carriageways, footways and verges of roads. While the various statutory undertakers have powers (to a greater or lesser extent) to construct and maintain apparatus under or over private land, in many cases they opt to construct and maintain apparatus along or across roads for ease of access and to avoid having to enter into arrangements with landowners such as wayleaves or easements.

NOTE – Although the hybrid Bill gives the Nominated Undertaker the specific power to alter high-voltage overhead lines and a general power to alter the course of (or otherwise interfere with) all types of utilities apparatus, it also includes protective provisions covering each of the statutory undertakers.

- 2.7.6 Any proposal to realign and/or stop up a road is likely to affect one or (in most cases) several statutory undertakers, and the question will inevitably arise as to whether the existing apparatus will be retained on the former alignment or diverted to run along the new route (and thus through any new structures that may be provided).

NOTE – Apart from possible changes to high-voltage overhead lines, many such issues may not be addressed until the detailed design stage. However, statutory undertakers are likely to take a great interest in any stopping-up proposals because of the potential implications of anything that may alter access their apparatus.

NOTE – Particular attention will need to be paid to works affecting existing gravity sewers as it may well be impracticable for these to be diverted to follow the road realignments under or over HS2.

Bus and coach operators

- 2.7.7 Bus and coach operators will have a direct interest in any routes affected by temporary or permanent diversion and/or stopping up proposals, as well as the location of new or relocated bus stops.

NOTE – In addition to establishing what timetabled public services use potentially affected roads, care will need to be taken to identify other public transport usage such school transport routes (some of which may be operated by taxis rather than buses).

Tourist facility operators

- 2.7.8 Tourist facility operators may pay highway authorities to erect and maintain brown 'Tourist Signs' to direct visitors to their attractions. As a result, there are likely to be interested in any proposals that may affect their signed routes (and, more widely, any changes to the road network that make access routes – whether signed or not – more or less appealing to potential visitors).

NOTE – Potentially affected routes to tourist attractions may extend a considerable distance away from the HS2 Line of Route.

Sustrans

- 2.7.9 Sustrans is a registered charity that manages the National Cycle Network, which comprises a mixture of 'greenways' and on-carriageway cycling on quiet roads. They are likely to be interested in changes to the National Cycle Network including impacts during construction. Refer to the Sustrans website (sustrans.org.uk) for details on the National Cycle Network, including future planned routes.

Road transport industry bodies

- 2.7.10 Industry bodies such as the Freight Transport Association and Road Haulage Association are likely to take an interest in any changes to the main road network (including motorways and all-purpose trunk roads, primary routes and other principal roads).

Local amenity groups

- 2.7.11 Where they exist, local amenity groups are likely to take an interest in many aspects of HS2 (including local roads).

3 Environmental considerations

3.1 Environmental Statement

- 3.1.1 Environmental impacts, including the impacts on traffic and transport, are assessed prior to and during the hybrid Bill stage and are reported by means of an Environmental Statement. Examples of temporary and permanent effects include:

- impacts on journey times to road users (including pedestrians, cyclists and equestrians)
- impacts on bus frequency and occupancy
- severance to communities
- visual impact of highway earthworks and structures

- 3.1.2 Following Royal Assent, the project is obliged to comply with the Environmental Minimum Requirements (EMRs), which amongst other things state that the project cannot introduce any significant effects beyond those already addressed in the Environmental Statement. Design development for all aspects, including for roads, needs to ensure that no new significant effects are introduced. ¹

3.2 Transport Assessment

- 3.2.1 Potential impacts on all forms of transport (including roads) are reported in detail in the Transport Assessment supporting the Environmental Statement.

NOTE – All types of traffic are considered in the Transport Assessment, including non-motorised users such as pedestrians, cyclists and equestrians using roads as well as public rights of way.

NOTE – The Transport Assessment also considers issues such as bus frequency when quantifying the potential impact of temporary and permanent alterations to the road network.

3.3 Integration with the landscape

- 3.3.1 Roads, as with all aspects of the project, should be sensitive to the unique patterns, subtleties and diverse character of the surrounding landscape. Refer to 'Guidance Document – Landscape Design Approach' (HS2-HS2-EV-GDE-000-000002) for requirements and guidance relating to landscape integration.

4 Potential treatment options

4.1 General

NOTE – Although this section is primarily relevant prior to and during the hybrid Bill process, it is applicable for significant changes to road layouts following Royal Assent (e.g. changes requiring a Transport and Works Act 1992 order)

- 4.1.1 Refer to Information Paper E5 'Roads and Public Rights of Way' for the general approach to be taken for road design.
- 4.1.2 There is no hierarchy of preference between the treatment options listed below – each location needs to be considered on a case-by-case basis.

NOTE – Third-party interests, such as landowner access and statutory undertakers' (public utilities) apparatus, may be a decisive factor in the choice of treatment option in some locations – refer to Section 5.5 for further details.

¹ Refer to the Scope and Methodology Report in the Phase One Environmental Statement for the definition of a significant effect.

4.2 On-line crossings

- 4.2.1 In some cases, the most straightforward option for dealing with a road to be crossed by HS2 is to provide an on-line crossing, three typical examples of which are discussed below.

NOTE – The various considerations below apply to both skew and squared-up crossings.

HS2 in deep cutting

- 4.2.2 There are many examples of where the HS2 route is located in deep cutting for environmental reasons, and on-line overbridge crossings will often provide a convenient solution in these situations. The potential advantages and disadvantages of this solution are summarised in Table 1. A typical on-line overbridge with a temporary realignment is shown in

- 4.2.3 Figure 1.

Table 1: On-line overbridge – HS2 in deep cutting

Potential advantages	Potential disadvantages
- No severance or lengthening of journeys for users in the permanent situation - Smaller area of environmental impact than an off-line diversion built to permanent standards - Limited visual impact in many cases due to maintenance of permanent alignment continuity	- Some severance and lengthening of journeys for users in the temporary situation (depending on offset from original alignment) - Additional land required temporarily - Potential need to divert public utilities twice

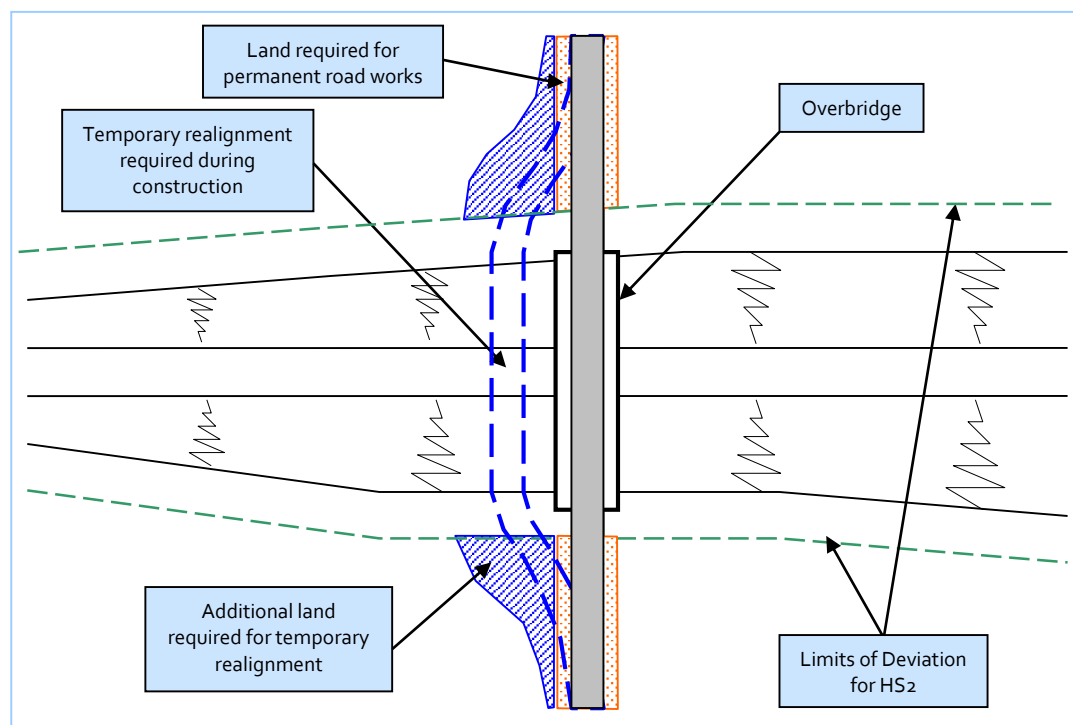


Figure 1: On-line overbridge with temporary realignment

HS2 close to existing ground level

- 4.2.4 Some lengths of HS2 are located close to existing ground level, and this can make provision of an on-line overbridge or underbridge crossing a less convenient solution in these situations. The potential advantages and disadvantages of this solution are summarised in Table 2.

Table 2: On-line overbridge or underbridge – HS2 close to existing ground level

Potential advantages	Potential disadvantages
• Very limited severance or lengthening of journeys for users in the permanent situation	• Steep approaches can introduce some severance for non-motorised users • Some visual impact due to changed vertical alignment in the permanent situation (particularly for an overbridge) • Potentially difficult tie-ins during construction • Underbridge may require pumped drainage and/or lighting
<i>Also refer to other general advantages / disadvantages for on-line overbridges (Table 1) and underbridges (Table 3), as appropriate</i>	

HS2 on high embankment

- 4.2.5 Some lengths of the HS2 route are located on high embankment, and on-line underbridge crossings with temporary realignments will often provide a convenient solution in these situations. The potential advantages and disadvantages of this solution are summarised in Table 3.

Table 3: On-line underbridge – HS2 on high embankment

Potential advantages	Potential disadvantages
• No severance or lengthening of journeys for users in the permanent situation • Smaller area of environmental impact than an off-line diversion built to permanent standards • Limited visual impact in many cases due to maintenance of alignment continuity (except during construction)	• Some severance and lengthening of journeys for users in the temporary situation (depending on offset from original alignment) • Additional land required temporarily • Potential need to divert public utilities twice • Lighting may be required

4.3 Off-line crossings

- 4.3.1 Another common option to consider when dealing with a road to be crossed by HS2 is to provide an off-line crossing, three typical examples of which are discussed below.

NOTE – The various considerations below generally apply to both skew and squared-up crossings (although potential impacts are usually minimised the closer the new crossing follows the original alignment).

HS2 in deep cutting

- 4.3.2 Off-line overbridge crossings may also provide a convenient solution in some situations where the post-consultation HS2 route is located in deep cutting. The potential advantages and disadvantages of this solution are summarised in Table 4. A typical on-line overbridge with temporary diversion is shown in Figure 2.

Table 4: Off-line overbridge – HS2 in deep cutting

Potential advantages	Potential disadvantages
- No severance or lengthening of journeys for users in the temporary situation - Only need to divert public utilities once	- Some severance and lengthening of journeys for users in the permanent situation (depending on offset from original alignment) - Requires a permanent realignment, with some visual impact due to changed horizontal alignment - Additional land required permanently

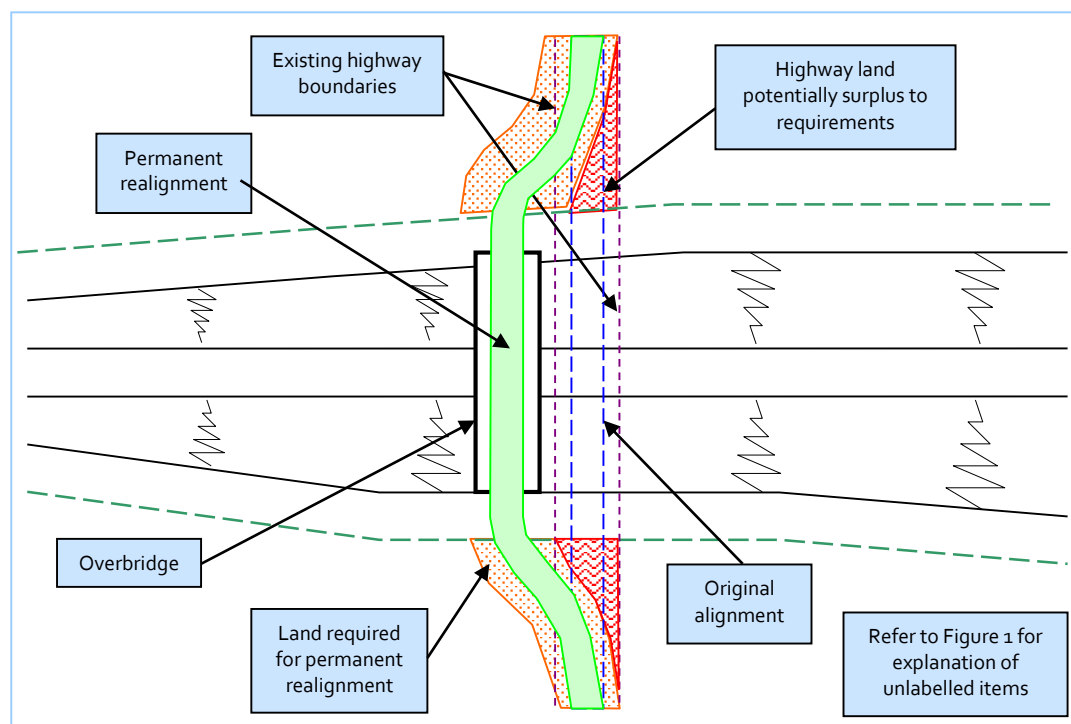


Figure 2: Off-line overbridge with permanent realignment

HS2 close to existing ground level

- 4.3.3 Off-line overbridge or underbridge crossings may also prove more convenient than an on-line solution in some situations where the post-consultation HS2 route is located close to existing ground level. The potential advantages and disadvantages of this solution are summarised in Table 5.

Table 5: Off-line overbridge or underbridge crossing – HS2 close to existing ground level

Potential advantages	Potential disadvantages
No severance or lengthening of journeys for users in the temporary situation	- Some severance and lengthening of journeys for users in the permanent situation (depending on offset from original alignment) - Steep approaches can introduce some severance for non-motorised users - Requires a permanent realignment, with some visual impact due to changed horizontal alignment (especially for an overbridge) - Additional land required permanently - Potentially difficult tie-ins during construction - Underbridge may require pumped drainage and/or lighting

Also refer to other general advantages / disadvantages for off-line overbridges (Table 4) and underbridges (Table 6), as appropriate

HS2 on high embankment

- 4.3.4 Off-line underbridge crossings may also provide a convenient solution in some situations where the post-consultation HS2 route is located on high embankment. The potential advantages and disadvantages of this solution are summarised in Table 6.

Table 6: Off-line underbridge crossing – HS2 on high embankment

Potential advantages	Potential disadvantages
- No severance or lengthening of journeys for users in the temporary situation - Only need to divert public utilities once	- Some severance and lengthening of journeys for users in the permanent situation (depending on offset from original alignment) - Requires a permanent realignment, with some visual impact due to changed horizontal alignment - Additional land required permanently - Lighting may be required

4.4 Combined crossings

- 4.4.1 In some situations, it may be appropriate to provide a combined HS2 crossing for two roads in close proximity, two typical examples of which are discussed below.

Centred

- 4.4.2 A centred off-line crossing may be provided at a suitable location between the points where the original routes of the roads intersect the HS2 route. The potential advantages and disadvantages of this solution are summarised in Table 7.

Table 7: Combined crossing – centred

Potential advantages	Potential disadvantages
- Minimised overall severance - Can often be constructed without a temporary diversion or closure for either route - Reduced cost – single structure required	- Requires two permanent diversions - Some lengthening of journeys for both sets of users, depending on separation between routes
Degree of visual impact will depend on actual location	
<i>Also refer to other general advantages / disadvantages for overbridges (Tables 1 and 4) and underbridges (Tables 3 and 6), as appropriate</i>	

Offset

4.4.3 An on-line crossing may be provided for one of the roads with diversions being required on each side of HS2 for the other road. The potential advantages and disadvantages of this solution are summarised in Table 8.

NOTE – It will usually be appropriate to provide the on-line crossing for the busier route and diversions for the other, but local circumstances may dictate that a different approach needs to be taken.

Table 8: Combined crossing – offset

Potential advantages	Potential disadvantages
- No severance for one route - No lengthened journeys for one set of users - Can be constructed without a temporary realignment for one route - Reduced cost – single structure required	- Requires a permanent diversion for one route - Some lengthening of journeys for one set of users, depending on separation between routes - Temporary diversion required during construction for one route
Degree of visual impact will depend on actual location	
<i>Also refer to other general advantages / disadvantages for on-line overbridges (Table 1) and underbridges (Table 3), as appropriate</i>	

NOTE – Similar considerations will apply if a local off-line crossing is provided for the busier route, but reference will need to be made instead to the other general advantages / disadvantages for off-line overbridges (Table 4) and underbridges (Table 6), as appropriate.

4.5 Avoiding need for separate crossing

4.5.1 In some situations, it may be appropriate to divert a road to avoid the need for a separate crossing (e.g. a local realignment to run underneath a viaduct or up and over a 'green tunnel' portal). The potential advantages and disadvantages of this solution are summarised in Table 9.

Table 9: Avoiding need for separate crossing

Potential advantages	Potential disadvantages
• No structure cost • Can be constructed without a temporary realignment or closure	• Requires a permanent realignment • Degree of severance depends on separation between existing and new alignments • Lengthening of journeys for users, depending on separation between existing and new alignments
• Degree of visual impact will depend on actual location	

4.6 Temporary stopping-up

4.6.1 Many of the examples above discuss temporary realignments or diversions during construction, which is generally preferred so that connectivity can be maintained. However in some instances, site-specific constraints (such as the close proximity of ecological habitat or residential buildings) may mean that temporarily stopping-up the road during construction is a more appropriate solution.

4.7 Permanent stopping-up

4.7.1 In certain circumstances, it may be appropriate to permanently stop-up an existing road altogether. One example might be where other existing roads would enable another nearby crossing to be used without the need to provide any new lengths of road on the diversion route. The potential advantages and disadvantages of this solution are summarised in Table 10.

Table 10: Closure

Potential advantages	Potential disadvantages
• No structure cost • No visual impact • No temporary diversion required	• Requires a permanent stopping up • Degree of severance depends on separation between stopped-up and alternative route • Lengthening of journeys for users, depending on separation between closed and alternative route • Alternative route may not be suitable for non-motorised users

5 Design considerations

5.1 Impacts on non-motorised users

General

5.1.1 Refer to Technical Standard – Public Rights of Way (HS2-HS2-HW-STD-000-000002) for requirements, advice and guidance for non-motorised users remote from the road.

- 5.1.2 Apart from motorways and a few other special locations (such as certain tunnels) where they are prohibited by an order made under the Road Traffic Regulation Act, pedestrians, cyclists and equestrians are entitled to use any road.

NOTE – Because few walking, cycling and riding routes are wholly located on public rights of way, any changes to the local road network may also impact – either directly or indirectly – on users of footpaths, bridleways and byways.

Pedestrians

- 5.1.3 Issues to consider for pedestrians include:

- Will there be a footway on one or both sides of the route?
- If not, will it be safe for pedestrians to walk along the carriageway (bearing in mind that grassed verges – which in any case may be overgrown – are not designed as walking routes and taking account of factors such as carriageway width, traffic levels and speed, visibility around bends, etc.)?
- How will the proposals impact on people with mobility impairments?

NOTE – Inappropriate design of footways, crossings and street furniture can introduce significant barriers to travel for people with mobility impairments. Refer to the DfT guidance 'Inclusive mobility – a guide to best practice on access to pedestrian and transport infrastructure' for details of good practice for designing for people with mobility impairments.

Cyclists

- 5.1.4 Issues to consider for cyclists include:

- Will there be dedicated provision for cyclists (e.g. cycle lanes, combined footway/cycleways or other off-carriageway cycle routes)?
- If not, will it be safe for cyclists to use the carriageway (taking account of factors such as carriageway width, traffic levels and speed, visibility around bends, etc.)?
- Will the gradient of the route be suitable for cyclists?

NOTE – The former Cycling England, an independent body funded by the Department for Transport to promote cycling in England, provided detailed design guidance for maximum gradient. This, together with other useful guidance, is available from the Chartered Institute of Logistics and Transport (CILT) and Sustrans websites.

NOTE – TfL's London Cycle Design Standards is a comprehensive document with useful guidance that could also be applicable outside London.

Equestrians

- 5.1.5 Issues to consider for equestrians include:

- Will it be safe for horses to be ridden or led on the carriageway (taking account of factors such as carriageway width, traffic levels and speed, visibility around bends, etc.)?
- Will the gradient and surfacing of the route be suitable for horses?

NOTE – The document 'Advice on Specifications and Standards recommended for equestrian routes in England and Wales' by the British Horse Society states that "for general purposes, a gradient of 1 in 12 is the ideal maximum for ridden use." However, whilst this is steeper than the desirable (6%) and absolute (8%) maximum gradient for roads given in Design Manual for Roads and Bridges (DMRB) standard TD 9, horses are known to experience difficulties on certain types of newly-laid road surfaces at flatter gradients than this.

Road closures, realignments and diversions

5.1.6 When considering possible temporary and permanent road realignments, diversions and closures, full consideration should be given to the needs of pedestrians, cyclists and equestrians using the existing routes.

5.1.7 In particular, it should be noted that:

- The impact of any route lengthening for cyclists and equestrians is likely to be more significant than for motorists.
- The impact of any route lengthening for pedestrians is likely to be much more significant than for motorists.

5.1.8 In addition to extended distance, the nature and suitability for non-motorised users must also be taken into account when designing any changes to the road network.

NOTE – Even where it is appropriate to divert motorised vehicles on a temporary or permanent basis, it may be necessary to consider retention of on-line provision for pedestrians (and, in some cases, cyclists and equestrians as well).

5.2 Crime Prevention Through Environmental Design (CPTED)

5.2.1 Crime Prevention Through Environmental Design (CPTED, also known as Designing Out Crime) is a multi-disciplinary approach to deterring criminal activities through environmental design. This is based on research into criminal behaviour which shows that the decision to offend or not to offend is often related to the risk of being caught. Many aspects of CPTED relate to perceived risks and perceived safety, which are difficult to quantify.

5.2.2 From the perspective of designing roads, CPTED is mainly relevant to non-motorised users as vehicles provide motorists a degree of safety and security from crime. The following list is a selection of CPTED issues that should be considered from the perspective of non-motorised users in urban areas or on the urban fringe, however the

designer should consider all relevant CPTED issues based on industry good-practice and guidance:

- Will the route feel 'safe'?
- Does the route encourage 'legitimate' use or 'illegitimate' use, such as anti-social behaviour?
- Will users of the route feel 'threatened'?
- How well can users see what is ahead or behind, so that threatening behaviour can be identified? Are there places where an attacker could hide (for example, behind a wall, in bushes or in a dark place)?
- If a person felt threatened, are there likely to be people nearby who could see or hear that person in distress? 'Passive surveillance' by other people could be provided by adjacent residences or businesses, or other road users (including motorists).

5.3 Temporary impacts during construction

General

5.3.1 The following Information Papers are relevant to temporary impacts on highways during construction:

- D11 – Maintaining access to residential and commercial property during construction; and
- E13 – Management of traffic during construction.

5.3.2 Refer also to the 'Route-wide transport management plan' (HS2-HS2-CL-PLN-000-000003) for requirements and guidance relating to temporary works affecting highways.

5.3.3 If roads outside the Parliamentary limits are required to be temporarily realigned or diverted beyond the existing highway boundaries, an order made under the Transport and Works Act 1992 may be required.

Temporary traffic regulation orders

5.3.4 The hybrid Bill allows for highways to be 'temporarily stopped up' – i.e. to temporarily close a highway to vehicular and pedestrian traffic in a similar way to a temporary traffic regulation order made by a highway authority under the Road Traffic Regulation Act 1984. Refer to Information Paper E14 'Highways and traffic during construction – legislative provision' for further details.

5.3.5 The hybrid Bill does not give the power to implement other restrictions that a temporary traffic regulation order enables, such as reducing speed limits, banning turning movements or suspending parking bays. Where these restrictions are required, a traffic regulation order should be sought from the highway authority.

5.4 Provision for future changes to the highway network

- 5.4.1 New, realigned or diverted roads shall only be designed where required to mitigate the impacts of the scheme. It is not within the scope of HS2 to provide 'betterment' to the existing highway network.
- 5.4.2 When designing road mitigation, the highway network shall be considered as the existing network plus any committed schemes.

5.4.3 Where highway authorities or third parties have planned future developments or aspirations that will impact on the road network and are not yet committed, consideration should be given to ensuring the design does not preclude their plans from occurring. However any provision over and above what is necessary to mitigate the scheme would require site-specific approval, taking account of matters such as cost, fundraising arrangements and programme.

5.4.4 *NOTE – Where in doubt as to whether a development is 'committed' or not, please consult with HS2's Technical Directorate.*

5.5 Land ownership

Private access rights

5.5.1 In the event that a road is stopped-up, any existing private accesses off the closed length must be carefully considered from an early stage.

5.5.2 Apart from modern routes where land has been acquired by compulsory purchase or voluntary agreement, the rebuttable legal ('*ad medium filum viae*') presumption covering the vast majority of roads is that the adjacent landowners each retain ownership of the sub-soil to the centre of the highway. In the event that a road is permanently stopped up, ownership of each half of the former road surface will revert to the adjacent landowner.

5.5.3 If one of the adjacent landowners needs to maintain access over all or part of the stopped-up length, then it may be necessary to re-acquire new private access rights over some or all of the other party's land if the remaining half-width is insufficient. In the event that both of the adjacent landowners need to maintain access, this will apply to both sides of the former road if the remaining half-widths are insufficient to provide separate accesses or in the event that a combined access is required for some other reason.

5.5.4 Similarly, under the 'Crichel Down' rules, land acquired compulsorily, under threat of compulsion or under statutory blight usually has to be offered back to former owners (or their successors) in the first instance. This may mean this it is necessary to re-acquire new private access rights over all or part of the former road if a third party currently relies on public rights along all or part of the road to be stopped up.

NOTE – Detailed information on the 'Crichel Down' rules is given in Office of the Deputy Prime Minister Circular 06/04 and Communities and Local Government Circular 04/10.

- 5.5.5 Alternatively, in either case, it may be preferable in some instances to secure new private rights over a different route for any affected owners of land or other property previously accessed along all or part of the stopped-up length road.

NOTE – The same would apply to any new access necessary for the future operation / maintenance of HS2 where it is intended that this would follow the alignment of a road to be stopped up, except where HS2 also needs to acquire the adjoining land on both sides of the former road for some other purpose (in which case the half-widths would revert to it instead).

- 5.5.6 Consideration should be given to the interests of all parties potentially affected by any proposed stopping up, even if they are located outside the hybrid Bill limits.

Construction sites

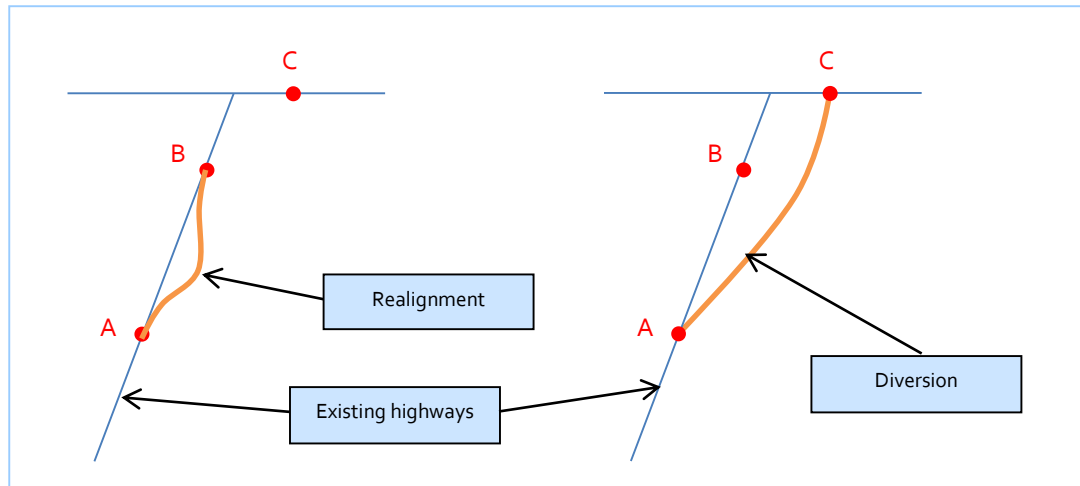
- 5.5.7 Consideration should be given at an early stage to the need for construction sites required for any overbridges, underbridges or other structures associated with road works.

5.6 HS2 nomenclature

- 5.6.1 The following terms should be used when referring to highway alterations:

- **Realignment** – where a new alignment is to be provided between points 'A' and 'B' on the same route (refer to Figure 3)
- **Diversion** – where the existing route between points 'A' and 'B' is to be replaced by a new route from point 'A' to a different point 'C', no longer passing through point 'B' (refer to Figure 3)
- **Reinstatement** – where a route is to be re-provided more-or-less on the same alignment, e.g. over a green tunnel
- **Closure** – where all or part of a route is to be stopped up without replacement

Figure 3: Realignment versus diversion



6 Design Basis

6.1 General

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|-------|---|
| 6.1.1 | The design basis for new, realigned or diverted roads shall be one of the four described in Sections 6.2 to 6.5 below. |
| 6.1.2 | Only one design basis shall be applicable to any road (or length of road). |
| 6.1.3 | The appropriate design basis for each road or length of road shall be agreed with the relevant highway authority as part of the consent / approval process. |
| 6.1.4 | Appendix A 'Design standards common for all design bases' shall apply to <i>all</i> design bases, in addition to the requirements in Sections 6.2 to 6.5. |

6.2 Design basis – 'As existing'

Applicability

- 6.2.1 The design basis 'As existing' adopts a like-for-like approach to design. This design basis is potentially applicable to roads of any type in the following situations:
- Overbridges above deep HS2 cuttings on existing road alignments where no approach earthworks are required;
 - Underbridges below high HS2 embankments on existing road alignments where no approach earthworks are required;
 - Reinstatements of existing roads over HS2 green tunnels; and
 - Short lengths of road diversions not directly associated with HS2 structures.

Requirements

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| 6.2.2 | Unless otherwise specified in Appendix A, roads designed to the design basis 'As existing' shall match the standards of the adjacent road. |
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6.3 Design basis – 'DMRB'

Applicability

- 6.3.1 The design basis 'DMRB' (Design Manual for Roads and Bridges) is applicable for the design of all motorway and all-purpose trunk roads, unless an 'As Existing' design basis is agreed with Highways England for small-scale works at a particular site.
- 6.3.2 Some local highway authority 'A' roads built to modern standards may also adopt the 'DMRB' design basis. However, local circumstances may mean that the 'HS2 rural road design criteria' or the 'HS2 urban street design criteria' may be more appropriate.

Requirements

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| 6.3.3 | Unless otherwise specified in Appendix A, roads designed to the design basis 'DMRB' shall be in accordance with all applicable DMRB standards. |
|-------|--|

6.4 Design basis – 'HS2 urban street design criteria'

Background

- 6.4.1 The design basis 'HS2 urban street design criteria' is based on the guidance documents Manual for Streets and Manual for Streets 2.
- 6.4.2 Manual for Streets focuses on lightly-trafficked residential streets. Manual for Streets 2 builds on the principles in Manual for Streets to provide guidance for busier urban streets and non-trunk roads.

Applicability

- 6.4.3 The design basis 'HS2 urban street design criteria' is generally applicable to all roads within built-up areas that are not trunk roads or motorways.

Requirements

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| 6.4.4 | Unless otherwise specified in Appendix A, roads designed to the design basis 'HS2 urban street design criteria' shall be in accordance with Appendix B. |
|-------|---|

6.5 Design basis – 'HS2 rural road design criteria'

Background

- 6.5.1 The design basis 'HS2 rural road design criteria' was created for works on rural roads, to address the perceived gap between the design bases 'DMRB' and 'HS2 urban street design criteria'.

- 6.5.2 The design basis 'DMRB' is only directly applicable to motorways and all-purpose trunk roads, although most local highway authorities adopt DMRB standards and advice notes (either wholly or in part) for their major rural roads.
- 6.5.3 Likewise whilst the design basis 'HS2 urban street design criteria' contains principles for low-speed roads that could also be applied to minor rural roads, care needs to be taken as Manual for Streets and Manual for Streets 2 were primarily aimed at those designing for the estate road environment or busier urban streets.
- 6.5.4 The design basis 'HS2 rural road design criteria' is based on experience from the Channel Tunnel Rail Link (High Speed One) project and industry good practice. It is intended to provide a safe, consistent and proportionate approach to the design of rural roads that respond to the unique landscape character of the local area.

Applicability

- 6.5.5 The design basis 'HS2 rural road design criteria' is generally applicable to all rural roads that are not trunk roads or motorways.

Requirements

- 6.5.6 Unless otherwise specified in Appendix A, roads designed to the design basis 'HS2 rural road design criteria' shall be in accordance with Appendix C.

7 Local highway authority standards or guidance

- 7.1.1 Local highway authorities often have design standards or guidance, which are used by developers when planning new local distributor roads and housing / industrial estate road networks. However, these can also be suitable for use when designing alterations to many existing urban streets.
- 7.1.2 In addition to the design basis for each road or length of road, the adoption of local standards or guidance may be agreed with the highway authority on a case-by-case basis.

- 7.1.3 Any agreed local standards or guidance for a particular road or length of road shall be clearly stated when referring to the design basis in the design documentation.

Appendix A – Design standards common for all design bases

A.1 Highway structures

Highway underbridges and overbridges

- A.1.1 Refer to the following documents for requirements and guidance relating to underbridges:
- Hybrid Bill design – 'Deliverable Approach Statement – Viaducts and underbridges' (HS2-HS2-BR-DAS-000-000002)
 - Post-hybrid Bill design – 'Technical Standard – Underbridges' (HS2-HS2-BR-STD-000-000002)
- A.1.2 Refer to the following documents for requirements and guidance relating to overbridges:
- Hybrid Bill design – 'Deliverable Approach Statement – Overbridges' (HS2-HS2-BR-DAS-000-000001)
 - Post-hybrid Bill design – 'Technical Standard – Overbridges' (HS2-HS2-BR-STD-000-000003)

Road restraint systems

- A.1.3 Refer to the 'Technical Standard – Errant vehicle protection' (HS2-HS2-HW-STD-000-000005) for requirements where there is a risk of vehicle incursion onto the HS2 railway lines by errant vehicles.

Other aspects

- | | |
|-------|--|
| A.1.4 | Unless otherwise specified in Appendix B and C, requirements for other applicable aspects associated with highway structures shall be in accordance with the relevant standards of Volumes 1 to 3 of the DMRB. |
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A.2 Geotechnics and drainage

Earthworks

- A.2.1 Refer to Technical Standard – Earthworks (HS2-HS2-GT-STD-000-000001) and Technical Standard – Earthworks design (landscape integration) (HS2-HS2-EV-STD-000-000021) for requirements and guidance for highway earthworks.

Drainage

- A.2.2 Refer to Technical Standard – Highway and access drainage (HS2-HS2-DR-STD-000-000002) for requirements and guidance for highway drainage.

A.3 Assessment and preparation of road schemes

Design year

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| A.3.1 | The design year for the purposes of traffic modelling shall be taken as 15 years after the expected date of the new, realigned or diverted road being brought into use. |
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Junction modelling

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| A.3.2 | Junction modelling (using software such as PICADY, ARCADY LInsig or Tran-Ed as appropriate) shall be conducted to determine the size and arrangement of junctions. |
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Road safety audits

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| A.3.3 | Road safety audits shall be carried out for all permanent road layout alterations in accordance with DMRB standard HD 19. |
| A.3.4 | Similarly, temporary road layout alterations shall be subject to a road safety review with a scope proportionate to the nature and expected duration of the works. |

NOTE –DMRB standard HD 19 gives examples of 'exceptional temporary traffic management schemes', which might justify a road safety review of a similar scope and standard as a road safety audit.

Non-motorised user audits

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| A.3.5 | Non-motorised user audits shall also be conducted in accordance with DMRB standard HD 42 in order to help ensure pedestrian, cyclist and equestrian safety. |
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- A.3.6 A separate context report is not required for non-motorised user audits where this aspect is sufficiently addressed in the Transport Assessment associated with the Environmental Statement.

Other aspects

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| A.3.7 | Requirements for other applicable aspects of the assessment and preparation of road schemes shall be in accordance with the relevant standards of Volumes 5 of the DMRB. |
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A.4 Road Geometry

Temporary alignment

- A.4.1 The geometric layout of temporary alignments shall be as for permanent works, subject to any reduced requirements where a lower design speed is appropriate or a mandatory temporary speed limit is to be applied.

Boundary treatments

- A.4.2 Apart from on motorways, roads are not required to have features such as fences, hedges or walls on the highway boundaries. However, in practice, most roads have boundary features on both sides but these are the responsibility of the adjacent landowner rather than the highway authority.

NOTE – Most new or replacement highway boundary features on roads affected by HS2 will thus be accommodation works agreed with the relevant landowners, but it will always be beneficial for these to be of a type and appearance consistent with the character of those found on adjacent roads of a similar type.

- A.4.3 Refer to Technical Standard – Fencing (HS2-HS2-CV-STD-000-000002) for details of the fencing requirements between roads and HS2.

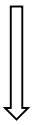
Bus stops

- A.4.4 Bus stops shall be designed in accordance with the relevant highway authority standards, or where there are none, the bus operator standards.

Cost considerations for structures

- A.4.5 Overbridges and underbridges that are on a skew are generally more expensive than square structures. In the absence of other constraints, the road alignment should help facilitate cheaper structures by passing over or under HS2 as close to perpendicular as possible.
- A.4.6 Overbridges that have changes in vertical or horizontal alignment, or changes in crossfall / superelevation are generally more expensive and complex to build (though it depends on the type of structure used). In the absence of other constraints, the structures should be as straight-forward as possible. Refer to Table A.1 for details on factors that increase complexity.

Table A.1: Degree of complexity for underbridges and overbridges

Degree of complexity	Horizontal alignment	Vertical alignment	Crossfall / superelevation
 Increasing complexity	Straight	Straight	Constant crossfall / superelevation
	Constant radius	Constant radius	
	Tangent point on structure	Tangent point on structure	Change in crossfall / superelevation on structure

Headroom

A.4.7	Headroom at HS2 underbridges and viaducts shall be 5.7 metres plus any allowances for vertical sag curvature and deflection over the paved width and 'structure free zone', unless the road is a High Load Route where 6.45 metres (plus sag curvature and deflection) shall be provided in accordance with DMRB standard TD27.
A.4.8	Headroom to other structures shall be designed in accordance with DMRB standard TD 27.

NOTE – The highway authority should be consulted to check whether a road forms part of a High Load Route.

Junctions

A.4.9	Junctions and accesses shall be situated sufficiently far back from bridge abutments to allow for any necessary errant vehicle protection (typically 45 metre minimum).
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Kerbs

- A.4.10 Refer to standard detail drawings HS2-CI-HW-DDE-000-001102-FD to HS2-CI-HW-DDE-000-001114-FD for details on kerbs.
- A.4.11 Stone or conservation kerbs should only be used to re-provide existing kerbs on a 'like-for-like' basis or where necessary in order to meet landscape design objectives.

NOTE – Particular consideration should be given to health and safety aspects associated with any manual handling of the installation and renewal of pre-cast or stone kerbs.

Other aspects

- A.4.12 Refer to 'Appendix B – HS2 urban street design criteria' and 'Appendix C – HS2 rural road design criteria for other aspects relating to road geometry, as relevant.

A.5 Pavement Design and Maintenance

Footways and cycleways

- A.5.1 Standard detail drawings HS2-CI-HW-DDE-000-001117-FD and HS2-CI-HW-DDE-000-001118-FD show typical types of footway construction.
- A.5.2 The type of footway selected should be consistent other footway types in the locality. Local highway authorities often have preferences for footway finishing, which varies by location and level of use. For example, a 6mm asphalt surface course may be suitable for outer-suburban areas, while 600 x 900 pre-cast concrete or stone flags may be more appropriate for high streets.
- A.5.3 Cycleways should generally not be surfaced with flag or block paving due to the reduced level of comfort associated with these.

Footway crossings

- A.5.4 The design of footway crossings, including ramps and tactile paving should follow the DfT guidance 'Inclusive mobility – A guide to best practice on access to pedestrian and transport infrastructure 2005'.
- A.5.5 Tactile paving at uncontrolled crossings should typically 'buff' colour, though any colour that contrasts with the surroundings is permitted (except red which is reserved for controlled crossings). Colours other than 'buff' may be desirable for landscape and aesthetic reasons.

NOTE – Where a tactile paving colour at uncontrolled crossings other than 'buff' is proposed, the highway authority should be consulted to ensure their acceptance.

Traffic islands and medians

- A.5.6 Standard detail drawings HS2-CSI-HW-DDE-000-001115-FD and HS2-CSI-HW-DDE-000-001116-FD show typical types of traffic islands and medians.

NOTE – Consideration should be given to avoiding Types 2A and 2B to avoid a black-strip of asphalt being provided between tactile paving for aesthetic reasons.

Other aspects

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|-------|--|
| A.5.7 | Unless otherwise specified in Appendix B and C, other applicable aspects associated with pavement design and maintenance shall be in accordance with the relevant standards of Volume 7 of the DMRB. |
|-------|--|

A.6 Traffic Signs and Lighting

Traffic Signs and Road Markings

- A.6.1 The design of traffic signs and road markings should be in accordance with the Traffic Signs Manual.

NOTE – The proposed use of any traffic signs that are not prescribed in the Traffic Signs Regulations and General Directions (TSRGD) requires specific authorisation.

- A.6.2 There may be the need for visibility splays in front of certain signs (typically advance direction signs on busier roads) that are significant enough to require extra landtake, and potential sites where this may be required must be identified at an early stage.

- A.6.3 Directional signs should be designed in accordance with a directional sign strategy for a given area. The strategy should agree on standard destination names with the highway authorities, provide consistent naming for HS2 destinations such as stations and depots as well as provide details of any signing to HS2 assets for emergency purposes (as required).

NOTE – Directional signs are not just targeted at motorists – agreeing common destinations for pedestrian and cyclist directional signs should also be included in the directional sign strategy.

- A.6.4 Additionally, there may be other directional signs where input from the highway authority or other stakeholders is required. These may include promoted routes for non-motorised users, National Cycle Network and tourist destinations.
- A.6.5 Existing features such as bespoke cast-iron signs, wooden fingerpost signs and other historic street furniture can be highly valued by communities, enhancing the sense of local distinctiveness and heritage. Therefore, if affected by HS2 works, historic signage should be retained or relocated wherever feasible².

NOTE – Refer to Technical Standard – Public rights of way for details of public rights of way signs at junctions with roads.

Lighting

NOTE – There may be instances where a road is altered or stopped-up and existing lighting needs to be removed.

Other aspects

- A.6.6 Unless otherwise specified in Appendix B and C, other applicable aspects associated with traffic signals and control equipment, traffic signs and road markings, lighting, traffic management at roadworks and pedestrian crossings shall be in accordance with the relevant standards of Volume 8 of the DMRB.

A.7 Traffic control and communications

- A.7.1 Traffic control and communications associated with the road shall be designed in accordance with the standards contained within Volume 9 of the DMRB.

A.8 Environmental design

- A.8.1 In addition to adoption of appropriate boundary treatments (see Clause A.4.2), it may be appropriate in certain circumstances for landscape areas to be provided (or re-provided) within the highway boundaries.
- A.8.2 All landscape areas require on-going maintenance and careful consideration should be given to the provision of additional landscape areas within highway land, whilst still meeting the landscape integration objectives.

² Further advice is given in TAL 6/05.

Appendix B – HS2 urban street design criteria

B.1 Guiding principles

- B.1.1 Appendix B 'HS2 urban street design criteria' should be read in conjunction with the requirements contained within Appendix A 'design standards common for all design bases'.
- B.1.2 The design basis 'HS2 urban street design criteria' is based on the guidance documents Manual for Streets and Manual for Streets 2. These documents form the basis of the design of urban streets, and generally only those parts of the document that are made mandatory are specifically mentioned in this appendix.
- B.1.3 In addition to those principles contained in Manual for Streets and Manual for Streets 2, the following principles are highlighted as relevant to this design basis:
 - i. Streets should not just focus on accommodating the movement of motor vehicles – a high priority needs to be placed on meeting the needs of pedestrians, cyclists and public transport users.
 - ii. Recognise the sense of 'place' and streetscape that streets have, through local distinctiveness and sensitively in design. All works – both temporary and permanent – affecting an urban street should aim to retain the existing character and distinctiveness of the route wherever feasible.
 - iii. Potential adverse impacts of HS2 on the existing urban street network should be 'designed out' where reasonably practicable to do so.
 - iv. Where adverse impacts on urban streets are unavoidable, appropriate and proportionate mitigation measures should be incorporated into the design.
 - v. All works should be designed to minimise, as far as is reasonably practicable, future maintenance requirements.

B.2 General

- B.2.1 All urban streets should The design basis 'HS2 urban street design criteria' is based on the guidance documents Manual for Streets and Manual for Streets 2, and the principles contained in those documents apply to this design basis.

B.3 Highway structures

Road restraint system

B.3.1	Road restraint systems shall be provided in accordance with TD 19 on routes with AADT flows above 5000 and a speed limit of 50 mph or more.
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- B.3.2 On routes with AADT flows below 5000 and/or a speed limit of less than 50 mph, road restraint systems shall only be provided where deemed necessary following a risk assessment undertaken in accordance with the 'Provision of Road Restraint Systems on Local Authority Roads' guidance.
- B.3.3 Pedestrian guard rail shall only be provided where there is a clear demonstrable need, consistent with the guidance in Section 12.4 of Manual for Streets 2.

B.4 Geotechnics and drainage

- B.4.1 No requirements beyond those specified in Appendix A.

B.5 Assessment and preparation of road schemes

- B.5.1 No requirements beyond those specified in Appendix A.

B.6 Road geometry

Design Speed

- B.6.1 For existing rural roads with an 85th percentile speed greater than 40 mph, the design speed shall be selected using DMRB standard TD 9.

- B.6.2 For lower-speed roads, the design speed shall be selected using Table B.1 where 85th-percentile speed data is available.

Table B.1: Selection of design speed for lower-speed rural roads

85 th percentile speed (mph)	Design speed (kph)
34-40	60
28-34	50
22-28	40
16-22	30

NOTE – Lower speeds are not recommended for design purposes.

- B.6.3 In the event that 85th-percentile speed data is either unavailable or not applicable (e.g. for lengths of new road), engineering judgement shall be used to propose a suitable design speed for the submission for consent / approval under the hybrid Bill.

Horizontal curvature

- B.6.4 For urban streets with a design speed greater than 60 kph, horizontal radii shall be in accordance with DMRB standard TD 9.
- B.6.5 For urban streets with a design speed of 60 kph or less, horizontal radii shall be greater than or equal to the values given in Table B.2.

Table B.2: Minimum horizontal radius for lower-speed urban streets³

Design speed (kph)	Minimum radius (m)
60	64
50	44
40	28
30	16

NOTE – Lower speeds are not recommended for design purposes.

Widening at curves

- B.6.6 The need for widening at curves shall be assessed on a case-by-case basis using vehicle tracking software.

NOTE – Curve widening may not be appropriate for streets where the carriageway width is restricted, as this may encourage higher speeds (particularly for windy streets).

Crossfall / superelevation

- B.6.7 For urban streets with a design speed of 50 kph or more, crossfall, superelevation and any associated transitions shall be in accordance with DMRB standard TD 9.

- B.6.8 For urban streets with a design speed less than 50 kph, superelevation should be kept to a minimum due to the frequency of accesses and junctions.

³ Source: Section 8.3 of Manual for Streets 2.

Vertical curvature

- B.6.9 For urban streets with a design speed of 50 kph or more, K values for vertical curvature shall be in accordance with DMRB standard TD 9.
- B.6.10 For urban streets with a design speed less than 50 kph, K values for vertical curvature shall be greater than or equal to the values given in Table B.3.

Table B.3: Minimum K values for low-speed rural roads⁴

Design speed (kph)	Minimum crest K value (m)	Minimum sag K value (m)
40	4.0	4.0
30	2.5	3.0

NOTE – Lower speeds are not recommended for design purposes.

Gradient

- B.6.11 Where cyclist usage is significant, the gradient for urban streets should not exceed 3%⁵. Where pedestrian usage is significant, the gradient should not exceed 5%⁶. Where neither of these are significant, the gradient should not exceed 6%⁷.

- B.6.12 The maximum gradient for urban streets with significant cyclist usage shall not exceed 5% (100 metres maximum) or 7% (30 metres maximum)⁸.
- B.6.13 The maximum gradient for urban streets without significant cyclist usage shall be 8%⁹.

NOTE – When determining whether pedestrian or cyclist usage is 'significant', consideration should be given to existing usage as well as potential future usage and be done on a case-by-case basis. For example, an existing road that will provide a connection to a HS2 station may have 'significant' cyclist usage in the future, even if the existing road has few cyclists.

⁴ Source: Values adopted on Channel Tunnel Rail Link (High Speed 1).

⁵ Source: Section 8.7 of LTN 2/08 for roads where use by cyclists is significant.

⁶ Source: Section 8.4, Manual for Streets 2.

⁷ Source: TD 9.

⁸ Source: Section 8.7 of LTN 2/08 for roads where use by cyclists is significant.

⁹ Source: TD 9.

B.6.14 The minimum constant gradient for urban streets shall be 0.5%.

Stopping Sight Distance (SSD)

B.6.15 For urban streets with a design speed greater than 50 kph, minimum stopping sight distance values shall be in accordance with DMRB standard TD 9.

B.6.16 For urban roads with a design speed of 50 kph or less, minimum stopping sight distance shall be greater than or equal to the values given in Table B.4.

Table B.4: Minimum stopping sight distance for low-speed rural roads¹⁰

Design speed (kph)	Minimum SSD (m)
50	50
40	36
30	24

NOTE – Lower speeds are not recommended for design purposes.

Visibility splays at private accesses and junctions

B.6.17 For urban streets with a design speed greater than 50 kph, visibility splays shall be in accordance with DMRB standards TD 41 for private accesses and TD42 for road junctions.

B.6.18 For urban streets with a design speed of 50 kph or less, visibility splays should be in accordance with DMRB standard TD 41 or TD 42, as appropriate, except that a maximum 'X' distance of 2.4 metres¹¹ should be provided and the 'Y' distance should equal the minimum SSD distance given in Table B.3.

Junctions

B.6.19 Refer to Section 7 of Manual for Streets and Section 9 of Manual for Streets 2 for further details.

Other aspects

B.6.20 Requirements for other applicable aspects of road geometry shall be in accordance with the relevant standards of Volumes 6 of the DMRB.

B.7 Pavement design and maintenance

Design life

B.7.1 The design life of urban street pavements shall be 20 years.

¹⁰ Source: Sections 7.5 and 7.6 of Manual for Streets and Section 10 of Manual for Streets 2, using values of 1.5 seconds for reaction time, deceleration rate of 3.68 m/s² (0.375g) and bonnet length of 2.4 metres.

¹¹ Source: Section 10.5.6 of Manual for Streets 2

NOTE – Urban streets often have statutory utilities crossing them or running underneath the carriageway. While in theory a design life of greater than 20 years could be provided, in practice the design life of the pavement is often reduced by reinstatement works by statutory utility authorities.

B.8 Traffic signs and lighting

General

- B.8.1 In recent years many local highway authorities have had programmes to 'de-clutter' streets, which have focused on removing unnecessary traffic signs, road markings and street furniture.
- B.8.2 Issues to consider for road markings include:
- Does it add or detract from the streetscape?
 - Does it add to 'clutter'?
- B.8.3 In addition to the issues listed above for road marking, the following issues also apply to traffic signs and street furniture:
- Does it impede the passage of people with reduced mobility?
 - Will it be prone to graffiti or vandalism, and therefore have a maintenance burden associated with it?
 - Is it necessary – i.e. will it be used?
 - Can it be combined with other elements to reduce clutter (e.g. placing signs on lamp posts as opposed to having a separate post)?
 - Does it meet the design, visual integration and socio-economic objectives described in the Guidance Document - Landscape Design Approach (HS2-HS2-EV-GDE-000-000002)?

Traffic signs and road marking

- B.8.4 Refer to Section 9 of Manual for Streets and Section 13 of Manual for Streets 2 for details.

Lighting

- B.8.5 In recent years, there has been a move in many parts of the country to minimise energy costs and 'light pollution' effects by reducing existing lighting in various ways. These include:
- Taking a proportion of columns out of service;
 - Switching off or dimming lighting for a period in the middle of the night and early morning; and/or
 - Decommissioning systems entirely.
- B.8.6 Existing lighting systems affected by HS2 works to urban streets should normally be replaced on a 'like-for-like' basis, subject to any planned reductions to those systems.

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| B.8.7 | New lighting systems shall not be installed on urban streets affected by HS2 works unless an assessment demonstrates that it would be economically justified. |
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NOTE – Aspects of DMRB advice note TA 49 – modified as necessary where applied to non-trunk roads – can be used as a basis for assessment, but a full Project Appraisal Report (PAR) is unlikely to be appropriate for smaller urban streets.

NOTE – Refer to Section 10.3 of Manual for Streets or Section 12.6 of Manual for Streets 2 for guidance on street lighting in urban streets.

B.9 Traffic control and communications

- B.9.1 No requirements beyond those specified in Appendix A.

B.10 Environmental design

- B.10.1 No requirements beyond those specified in Appendix A.

Appendix C – HS2 rural road design criteria

C.1 Introduction

- C.1.1 Appendix C 'HS2 rural road design criteria' should be read in conjunction with the requirements contained within Appendix A 'design standards common for all design bases'.
- C.1.2 Rural roads, and in particular low-speed rural roads, are often highly valued by local communities. Many rural roads have evolved over several hundreds of years and its design and visual characteristics (such as alignment, cross-section and visibility) reflect a time before the modern use of the motor vehicle. Terms such as 'quaint', 'scenic', 'enclosed', 'charming' and 'inviting' are often used to describe them, which differs from the 'traditional' highway engineering focus of capacity and engineering standards. The ultimate success of rural road design is one that responds to the unique patterns, subtleties and diverse character of the local landscape while also meeting the engineering requirements listed in this appendix.

C.2 Guiding principles

- i) All works – both temporary and permanent – affecting rural roads should provide route continuity for non-motorised users (NMUs) as well as vehicular traffic.
- ii) Potential adverse impacts of HS2 on the existing rural road network should be 'designed out' where reasonably practicable to do so.
- iii) Where adverse impacts on rural roads are unavoidable, appropriate and proportionate mitigation measures should be incorporated into the design.
- iv) All works – both temporary and permanent – affecting a rural road should aim to retain the existing character and distinctiveness of the route wherever feasible.
- v) Therefore, as a general rule, the starting point for design should be the existing engineering parameters when a rural road is diverted or reinstated.
- vi) For new routes, the requirements should be based on other similar rural roads in the area.
- vii) All works should be designed to minimise, as far as is reasonably practicable, future maintenance requirements.

C.3 Highway structures

Road restraint systems

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| C.3.1 | In order to retain the rural character of roads in the countryside, passively-safe street furniture (including lighting poles and traffic sign supports) compliant with BS EN 12767 shall be used wherever reasonably practicable in order to avoid unnecessary lengths of road restraint systems. |
| C.3.2 | Road restraint systems shall be provided in accordance with TD 19 on routes with AADT flows above 5000 and a speed limit of 50 mph or more. |
| C.3.3 | In other locations on routes with AADT flows below 5000 and/or a speed limit of less than 50 mph, road restraint systems shall only be provided where deemed necessary following a risk assessment undertaken in accordance with the 'Provision of Road Restraint Systems on Local Authority Roads' guidance. |
| C.3.4 | A standard set-back of 1.2 metres shall be adopted for road restraint systems used on rural roads, except where wider verges are necessary to provide the required stopping sight distance or where hardstrips are provided for continuity (in which case the set-back may be reduced to 0.6 metres). |

NOTE: In visually-sensitive locations, wooden-faced safety fences compliant with BS EN 1317 may be an appropriate solution, though at time of writing there is no compliant product capable of connecting a wooden-faced safety fence with a bridge parapet.

C.4 Geotechnics and drainage

Earthworks

- C.4.1 No requirements beyond those specified in Appendix A.

Drainage

- C.4.2 Refer to Technical Standard – Highway Drainage (HS2-HS2-DR-STD-000-000002) for specific requirements and guidance for highway drainage for rural roads.

C.5 Assessment and preparation of road schemes

- C.5.1 No requirements beyond those specified in Appendix A.

C.6 Road geometry

Carriageway width - general

- C.6.1 Application of guiding principle v) means that widths for new rural roads should generally match those found on adjacent routes of a similar type, subject to the limits given below. The appropriate width for individual roads should be considered on a case-by-case basis.

Carriageway width – two-lane roads

- C.6.2 Realigned or diverted rural roads should generally match the existing, subject to a minimum of 5.5 metres (the minimum for two cars to pass in safety at low speed). This minimum width shall be increased to 6.0 metres for lengths with occasional use by buses or heavy goods vehicles and 6.8 metres for roads where buses or heavy goods vehicles are likely to pass each other on a regular basis.

- C.6.3 The need for any increased lane width at bends should be determined on a case-by-case basis using vehicle tracking design tools.

- C.6.4 The maximum carriageway width for two-lane roads shall be 7.3 metres (plus any widening on bends that may be required).

- C.6.5 Hardstrips should not be provided on two-lane rural roads unless required for continuity.

Carriageway width - single-track roads

- C.6.6 For safety reasons, the normal width of single-track roads shall be 3.5 metres (above which the risk of uncertainty increases about whether two vehicles can pass each other over a length without passing places).

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| C.6.7 | Inter-visible passing places must be provided on single-track roads at a maximum spacing of 200 metres. |
| C.6.8 | The combined width of single-track road plus passing bay shall be 5.5 metres over a length of 5 metres (or 15 metres where likely to be used by buses or heavy goods vehicles). 5 metre long tapers shall be provided at each end. |
| C.6.9 | The carriageway width across overbridges and through underbridges on single-track roads shall be 5.5 metres, using road markings to give a centred 3.5 metre running lane to discourage a sudden increase in traffic speed or unsafe overtaking manoeuvres. Inter-visible passing places shall be provided at each end of the structure. |

Verges

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| C.6.10 | The minimum width of verges shall be 1.5 metres, or 2.5 metres where a road restraint system is involved. |
| C.6.11 | The verge width provided for the road shall continue across all overbridges and underbridges. |

C.6.12 Verge widths for rural road realignments and diversions should generally match the existing, subject to the minimum above.

C.6.13 New rural road verge widths should generally match those found on adjacent roads of a similar type, subject to the minimum above.

NOTE – Greater verge widths may be required for visibility reasons or to accommodate highway drainage systems, footways/paths for non-motorised users and/or statutory undertakers' apparatus.

Provision for non-motorised users

C.6.14 In order to prevent 'creeping suburbanisation' of the countryside, paved footways should normally be considered on rural roads only where necessary to retain existing paved pedestrian route continuity.

C.6.15	Footways on a rural road shall be either 1.5m wide, or where it replaces an existing footway greater than 1.5m wide, it shall be the same width as the existing footway.
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C.6.16 On 'quiet lanes' where traffic speeds are inherently low due to physical constraints, it will usually be appropriate for pedestrians, cyclists and equestrians to walk/ride along the carriageway on an informal shared-use basis (especially where remote from built-up areas).

- C.6.17 However, on higher speed roads with regular pedestrian, cyclist or equestrian use, it may be preferable to provide a wider verge on one or both sides of the road with a parallel 'path' (or paths, as appropriate to the level of demand) comprising an unbound surface separated from the carriageway by a grass verge.

NOTE – The distinction between a 'footway' and a 'path' is that the former is paved while the latter has an unbound surface.

- C.6.18 Where provided, separate paths for non-motorised users should have a desirable minimum width of 2.0 metres if intended for pedestrians only or 3.0 metres when shared with cyclists and/or equestrians.

- C.6.19 The absolute minimum width for paths shall be 1.3m for pedestrians only, or 2.0 metres where shared with cyclists and/or equestrians.

- C.6.20 The grass verge between edge of carriageway and path should have a desirable minimum width of 1.5 metres or (1.8 metres if path is to be used by equestrians).

- C.6.21 The absolute minimum width of grass verge between edge of carriageway and path shall be 0.5 metres.

- C.6.22 A further grass verge shall be provided between and path and boundary feature, with a minimum width of 0.5 metres. However, as an alternative, the minimum width of the path shall be increased by 0.25 metres to allow for 'kerb shyness' for boundary feature heights up to 1.2 metres (or by 0.5 metres if the boundary feature is higher).

Design speed

- C.6.23 The selection of an appropriate design speed is critical in designing rural roads that retain the 'feel' of other rural roads in the locality. Each design speed has engineering standards associated with it (such as alignment and cross-fall), and the selection of a greater speed than necessary may result in a rural road appearing 'over-engineered' and not in-keeping with its surroundings.

- C.6.24 For existing rural roads with an 85th percentile speed greater than 40 mph, the design speed shall be selected using DMRB standard TD 9.

- C.6.25 For lower-speed roads, the design speed shall be selected using Table C.1 where 85th-percentile speed data is available.

Table C.1: Selection of design speed for lower-speed rural roads

85 th percentile speed (mph)	Design speed (kph)
34-40	60

28-34	50
22-28	40
16-22	30

NOTE – Lower speeds are not recommended for design purposes.

- C.6.26 In the event that 85th-percentile speed data is either unavailable or not applicable (e.g. for lengths of new road), engineering judgement should be used to propose a suitable design speed for the submission of plans and specifications under Schedule 4 of the hybrid Bill.

Horizontal curvature

- C.6.27 For rural roads with a design speed greater than 60 kph, horizontal radii shall be in accordance with DMRB standard TD 9.
- C.6.28 For rural roads with a design speed of 60 kph or less, horizontal radii shall be greater than or equal to the values given in Table C.2.

Table C.2: Minimum horizontal radius for lower-speed rural roads¹²

Design speed (kph)	Minimum radius (m)
60	64
50	44
40	28
30	16

NOTE – Lower speeds are not recommended for design purposes.

Widening at curves

- C.6.29 For rural roads with a design speed of 70 kph or more, curve widening shall be designed in accordance with DMRB standard TD 9.
- C.6.30 For rural roads with a design speed of less than 50kph (including single-lane rural roads), the need for widening at curves shall be assessed on a case-by-case basis using vehicle tracking software.

Crossfall / superelevation

- C.6.31 For rural roads with a design speed of 50 kph or more, crossfall / superelevation shall be in accordance with DMRB standard TD 9.

¹² Source: [Section 8.3 of Manual for Streets 2](#).

C.6.32 For rural roads with a design speed less than 50 kph, crossfall / superelevation shall be provided in accordance with Table C.3.

Table C.3: Crossfall / superelevation for low-speed rural roads

Road type	Crowned cross-section	Cambered cross-section
Two-lane	2.5% down from centreline	2.5% up / down from centreline (non-adverse bends)
Single-track	Not applicable	

NOTE – Superelevation above 2.5% should not be necessary with low traffic speeds.

Transitions

C.6.33 In addition to providing a smooth horizontal alignment without abrupt changes in direction, changes of width and crossfall / superelevation are usually applied over transition lengths in order to provide a satisfactory visual appearance and to help avoid drainage problems such as ponding.

C.6.34 For rural roads with a design speed of 50 kph or more, transitions shall be provided in accordance with TD 9.

C.6.35 For rural roads with a design speed less than 50 kph, transitions of an appropriate length shall be provided where the horizontal alignment results in a change from crowned to cambered cross-section or at changes of camber from one direction to the other.

Tie-ins

C.6.36 Changes of width, radius and crossfall / superelevation at rural road tie-ins shall be achieved over a transition of appropriate length.

Vertical curvature

C.6.37 For rural roads with a design speed of 50 kph or more, K values for vertical curvature shall be in accordance with DMRB standard TD 9.

C.6.38 For rural roads with a design speed less than 50 kph, K values for vertical curvature shall be greater than or equal to the values given in Table C.4.

Table C.4: Minimum K values for low-speed urban streets¹³

Design speed (kph)	Minimum crest K value (m)	Minimum sag K value (m)
40	4.0	4.0

¹³ Source: Values adopted on Channel Tunnel Rail Link (High Speed 1).

30	2.5	3.0
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NOTE – Lower speeds are not recommended for design purposes.

Gradient

C.6.39 Where cyclist usage is significant, the gradient of rural roads should not exceed 3%¹⁴. Where pedestrian usage is significant, the gradient should not exceed 5%¹⁵. Where neither of these are significant, the gradient should not exceed 6%¹⁶.

C.6.40 The absolute maximum gradient for rural roads with significant cyclist usage shall not exceed 5% (100 metres maximum) or 7% (30 metres maximum)¹⁷.

C.6.41 The absolute maximum gradient for rural roads without significant cyclist usage shall be 8%¹⁸.

NOTE – When determining whether pedestrian or cyclist usage is 'significant', consideration should be given to existing usage as well as potential future usage and be done on a case-by-case basis. For example, an existing road that will provide a connection to a HS2 station may have 'significant' cyclist usage in the future, even if the existing road has few cyclists.

C.6.42 The minimum constant gradient for rural roads shall be 0.5% (except where an 'over the edge' approach is adopted to dissipate carriageway runoff).

Stopping Sight Distance (SSD)

C.6.43 For rural roads with a design speed greater than 50 kph, minimum stopping sight distance values shall be in accordance with DMRB standard TD 9.

C.6.44 For rural roads with a design speed of 50 kph or less, minimum stopping sight distance shall be greater than or equal to the values given in Table C.5.

Table C.5: Minimum stopping sight distance for low-speed rural roads¹⁹

Design speed (kph)	Minimum SSD (m)
50	50
40	36
30	24

¹⁴ Source: Section 8.7 of LTN 2/08 for roads where use by cyclists is significant.

¹⁵ Source: Section 8.4, Manual for Streets 2.

¹⁶ Source: TD 9.

¹⁷ Source: Section 8.7 of LTN 2/08 for roads where use by cyclists is significant.

¹⁸ Source: TD 9.

¹⁹ Source: Sections 7.5 and 7.6 of Manual for Streets and Section 10 of Manual for Streets 2, using values of 1.5 seconds for reaction time, deceleration rate of 3.68 m/s² (0.375g) and bonnet length of 2.4 metres.

NOTE – Lower speeds are not recommended for design purposes.

Visibility splays at private accesses and junctions

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| C.6.45 | For rural roads with a design speed greater than 50 kph, visibility splays shall be in accordance with DMRB standards TD 41 for private accesses and TD42 for road junctions. |
| C.6.46 | For rural roads with a design speed of 50 kph or less, visibility splays should be in accordance with DMRB standard TD 41 or TD 42, as appropriate, except that a maximum 'X' distance of 2.4 metres ²⁰ should be provided and the 'Y' distance should equal the minimum SSD distance given in Table C.5. |

Junctions

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| C.6.47 | For rural roads with a design speed greater than 50 kph, major-minor junction layouts shall be designed in accordance with DMRB standard TD 42. |
| C.6.48 | For rural roads with a design speed of 50 kph or less, major-minor junction layouts shall normally be designed in accordance with DMRB standard TD 41 Layout 6, except where no long vehicles are predicted Layout 3 shall be used. |

- C.6.49 Major/minor priority junctions and vehicular accesses should be as near to 90° as possible.
- C.6.50 DMRB standard TD 41 Layout 1 should be used for field accesses; Layout 2 for accesses from single dwellings; and Layout 3 or 6, as appropriate, for other types of private access.
- C.6.51 Refer also to standard detail drawing HS2-CSI-HW-DDE-000-001122-FD for details on accesses, including set-back of fencing and length of paved aprons (where required).

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| C.6.52 | However, in all cases, layouts shall be modified on a case-by-case basis using vehicle tracking design tools if necessary to accommodate larger vehicles. |
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Kerbs

- C.6.53 In order to retain the rural character of roads in the countryside, kerbs should not normally be provided on rural roads except in the following circumstances:
- To maintain continuity with adjacent kerbed lengths
 - Where new footways are being provided
 - Where positive drainage requiring kerbing is installed

²⁰ Source: [Section 10.5.6 of Manual for Streets 2](#)

- C.6.54 Standard detail drawing HS2-CSI-HW-DDE-000-001102 and HS2-CSI-HW-DDE-000-001107 provides details of using two layers of imported turf to act as a 'green' kerb. This should only be used in agreement with the highway authority; otherwise over-the-edge drainage is normally appropriate.

- C.6.55 Kerbs shall be the 45°-splay type except along footways where half-batter kerbing shall be used.

Street furniture

- C.6.56 In order to maintain the character of rural roads, other street furniture – such as bus stops and shelters, litter bins and pedestrian railings – shall only be provided on a like-for-like basis (re-using the existing materials, where appropriate).
- C.6.57 The design and visual appearance of street furniture shall respond to the local landscape character.

Other aspects

- C.6.58 Requirements for other applicable aspects of road geometry shall be in accordance with the relevant standards of Volumes 6 of the DMRB.

C.7 Pavement design and maintenance

General

- C.7.1 The design life of road pavement for rural roads shall be 40 years.

- C.7.2 Refer to Clause C.6.15 about widths of footways in rural roads.

C.8 Traffic signs and lighting

Traffic signs and road markings

- C.8.1 In order to retain the rural character of roads in the countryside, the design should aim to eliminate (where possible), and at least minimise, the need for large numbers of traffic signs and extensive road markings. For example, by adopting similar layout parameters to those found on adjacent roads of a similar type, warning signs for features that are the norm in the vicinity should not be necessary and inappropriate 'sign clutter' can be avoided.

NOTE – Although road markings can themselves be considered a suburbanising feature (especially on smaller lanes), in some situations their use can reduce or eliminate the need for signage which may be more visually intrusive.

- C.8.2 Standard Drawing HS2-CSI-HW-DDE-000-000712-FD shows passing bay arrangement for single-lane rural roads and includes a note referring to the sign TSRGD Diagram 822. In keeping with the principles described above, this sign should only be used sparingly, in locations where passing places are not expected to be obvious to motorists.

Lighting

- C.8.3 Apart from on some busier 'A' roads and other roads in and around larger communities, few rural roads have existing lighting systems.
- C.8.4 In recent years, there has been also been a move in many parts of the country to minimise energy costs and 'light pollution' effects by reducing existing lighting in various ways. These include:
- Taking a proportion of columns out of service;
 - Switching off lighting for a period in the middle of the night and early morning; and/or
 - Decommissioning systems entirely.
- C.8.5 Existing lighting systems affected by HS2 works to rural roads should only be replaced on a 'like-for-like' basis, subject to any planned reductions to those systems.

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| C.8.6 | New lighting systems shall not be installed on rural roads affected by HS2 works unless an assessment demonstrates that it would be economically justified. |
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NOTE – Aspects of DMRB advice note TA 49 – modified as necessary where applied to non-trunk roads – can be used as a basis for assessment, but a full Project Appraisal Report (PAR) is unlikely to be appropriate for minor roads in most rural locations.

- C.8.7 The design should also seek to avoid the need for traffic signs on rural roads to be illuminated (except where this is required by the Traffic Signs Regulations and General Directions).

C.9 Traffic control and communications

- C.9.1 No requirements beyond those specified in Appendix A.

C.10 Environmental design

- C.10.1 No requirements beyond those specified in Appendix A.