



HS2 Technical Specification



HS2 Technical Specification

- Technical standards and specifications
- Applications of standards to HS2 route design
- Construction logistics development

Specific local detail will be covered during the line of route consultation process next year



Technical standards and specifications



Our Approach

- Recognise various models of high speed rail operation and established proven technologies
- HS2 Ltd has sought to tailor an approach fit for now and also in the future
 - Longer distance city to city journeys
 - High speed lines used only by high speed trains
 - Initially some trains run on to classic network
 - Over time increasing segregation
 - Well-integrated with other transport networks



Key features

- Route alignment designed for up to 250 mph ultimately
- Initial technologies and trains designed for up to 225 mph
- Adoption of proven European standards, technology and practice
- Capacity for 400m long (as Eurostar) European-sized trains carrying up to 1,100 people
- Initial capacity 14 trains per hour
- Ultimate capacity up to 18 trains per hour with largely segregated running and expected technology advances
- Sustainable development principles adopted



Linespeed

Achieving and maintaining high linespeeds enables journey time reduction

Comparison of line speeds of some European high speed routes

Britain (HS1) line speed = 187 mph

France (TGV Est) line speed = 200 mph

Spain (Madrid - Barcelona) line speed = 220 mph

France / Italy New Trains Specification = 250 mph

HS2 Day One line speed = 225 mph

HS2 Potential ultimate line speed = 250 mph

In service

Proposed



Technical Standards 1

- Many of the standards used to develop our specification are defined within the Technical Specifications for Interoperability (TSIs). Interoperability is the ability of different systems to work together irrespective of national borders
- These have been developed from all the existing European experience of high speed
- As a result we can specify standard high speed rail technologies with proven safety, reliability and performance levels
- The international supply community continues to develop and improve these systems and provides a competitive supply market
- The UK supply industry can market products it develops in the world-wide high speed rail market
- The potential for services to operate internationally is maximised
- High Speed 1, whilst pre-dating the TSIs, was built to the French standards on which they were substantially based and conforms in principal respects
- The TSIs, brought into force by EU legislation, have been adopted by UK Government



Technical Standards 2

The principal effects for HS2 design at this stage are:

- Train size (hence structure gauge, platform and clearances)
- Train length (hence station platform length)
- The signalling control system
- The overhead electrical power system
- Route geometry (maximum gradients and also track spacing and curve radii for any speed)
- Tunnel air pressures and safety measures
- Access for persons of reduced mobility



Train operations

The number of trains per hour in each direction on HS2:

Day One maximum = 14 trains per hour

(today's proven technology; significant classic network through running)

Ultimate future maximum = 18 trains per hour

(technology development; operation over largely dedicated high speed network)

Hours of operation:

Start of service – first departure no earlier than 05.00 Mon – Sat, 08.00 Sun

Close of service – last arrival no later than 23.59



Train length

Up to 400m long - similar length to a Eurostar train



200m

200m



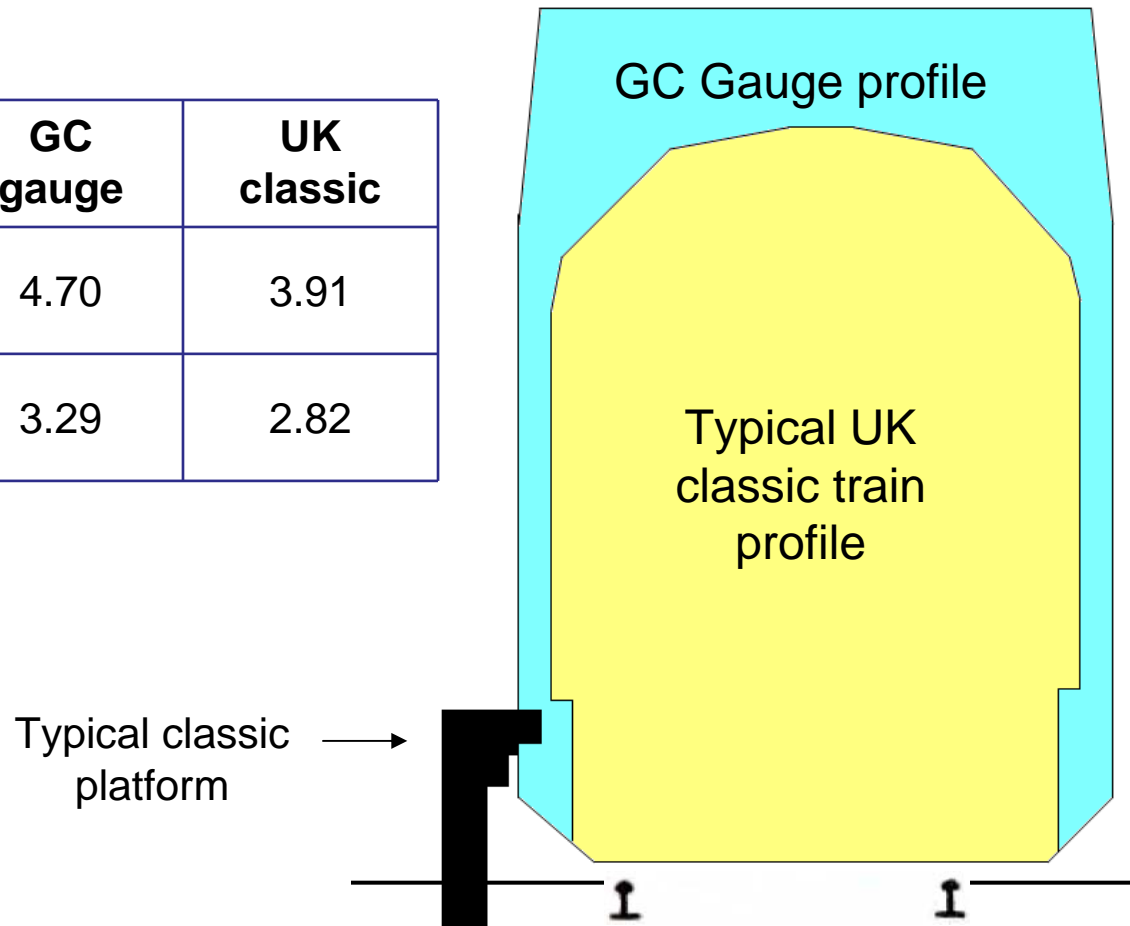
HS2 400m train will carry up to 1,100 people

Platforms on the classic network can currently accommodate one 200m section

Train size

Like HS1, HS2 infrastructure will accommodate 'GC' gauge trains

	GC gauge	UK classic
Maximum height (m)	4.70	3.91
Maximum width (m)	3.29	2.82





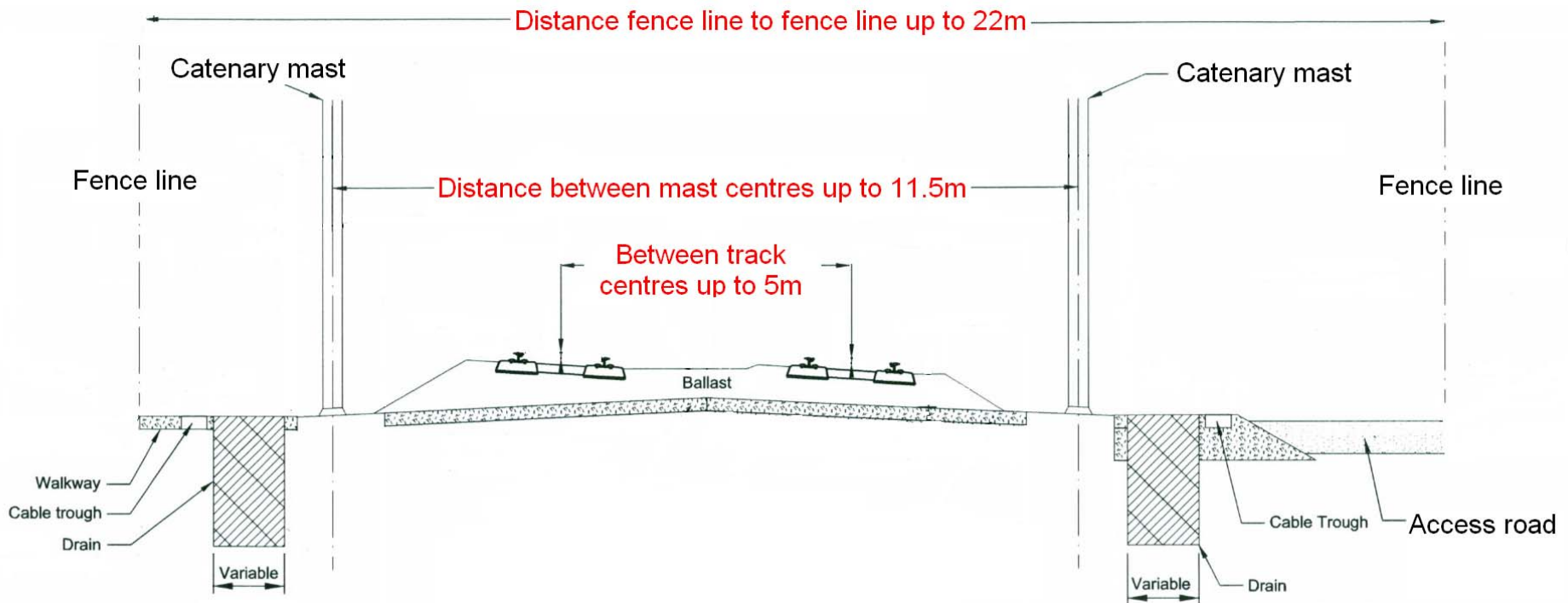
QUESTIONS?



Applications of standards to HS2 route design

Line of route width

In open country the line of route width is about 22 metres



This diagram shows a typical cross-section of the track plus the catenary masts which are used to support the overhead line power system

Line of route width

The line of route trace width will vary for sections in cutting and on embankments



*Example of railway in cutting
High Speed 1*



*Example of railway on embankment
Rome - Naples*



Line of route

Additional considerations

Approaches into city centres:

- Lower line speeds
- Use of existing rail corridors where possible
- Reduced width subject to safety and maintenance access case

Vegetation management:



HS1 and the M20 from Thurnham Lane



Track Curvature

The higher the line speed, the straighter the track



High Speed 1 (Arup)

Minimum desirable radius of curvature:

- 200 kph: 1800m
- 300 kph: 4050m
- 360 kph: 5900m
- 400 kph: 7200m



Stations Designed for Passenger Flows and Connectivity

- HS2 stations will be used by very high number of passengers
- Stations have been sized (platforms and concourse areas) to deal with such volumes of passengers safely and speedily
- Ultimately good spatial design will be key to customers moving around the station easily and also joining and alighting trains efficiently
- Passenger access and connectivity factors have heavily influenced station selection and initial design considerations
- Ease of connection with other transport modes including by foot, tube, taxi, bus, car, conventional rail and air have all been considered

Tunnels

Pros: Solution where no viable surface route due to topography or population density

Cons: High cost, provision of access and ventilation shafts, complexity of design, construction and operation and maintenance



Use of bridges and viaducts

- Use where ground features and topography require
- Recognise and seek to minimise length and height to mitigate impact
- Sensitive design to sit in specific environments



Arsta viaduct (Arup)



Safety

- HS2 will be specified to deliver a safe and reliable railway system throughout its design, construction, operation and maintenance
- Design out risk as far as reasonably practicable
 - Proven standards (including train control and protection)
 - No mixed traffic operation
 - Isolation of HS2 trains from other hazards e.g. no level crossings, appropriate fencing and active security monitoring
 - Design standards at road bridges
 - Automation of inspection and mechanisation of maintenance

Maintenance and inspection

- Separation between operations and maintenance activities
- Frequent automated inspection regimes for infrastructure and stock
- Planned preventative infrastructure maintenance cycles



*Automated train inspection –
Network Rail's New Measurement Train*



QUESTIONS?



Construction logistics development



Construction logistics

Introduction

- The impacts of construction work will be minimised as far as possible and subject to planning law and permissions
- Construction along the route will be phased over a number of years
- The longest construction phases will occur at stations and tunnels
- Proposals regarding logistics and temporary construction effects are being developed for the public consultation in early 2011



Construction logistics

Developing our initial proposals for consultation

- We are developing our guiding principles for the delivery of construction, for example
 - Maximisation of use of rail for materials and excavated spoil movements
 - Use of line of route access road where possible rather than local public roads
- The contract packaging of construction work will influence the phasing of work and the proposed number / location of work sites



Construction logistics

Key considerations

- Options for movement of materials
- Excavated material re-use
- Excavated spoil disposal

Once proposals have developed and been informed through the consultation process, procedures relating to construction works along with associated environmental standards will be described in the Code of Construction Practice for HS2 to be embedded in contracts



Conclusion

- Standard high speed rail technical specifications supporting adoption of proven technology with proven safety, reliability and performance levels
- Sustainable design principles to translate the specifications into sensitive appropriate designs for the route and stations
- HS2 designed to be the core of a wider high speed network built in stages



QUESTIONS?