

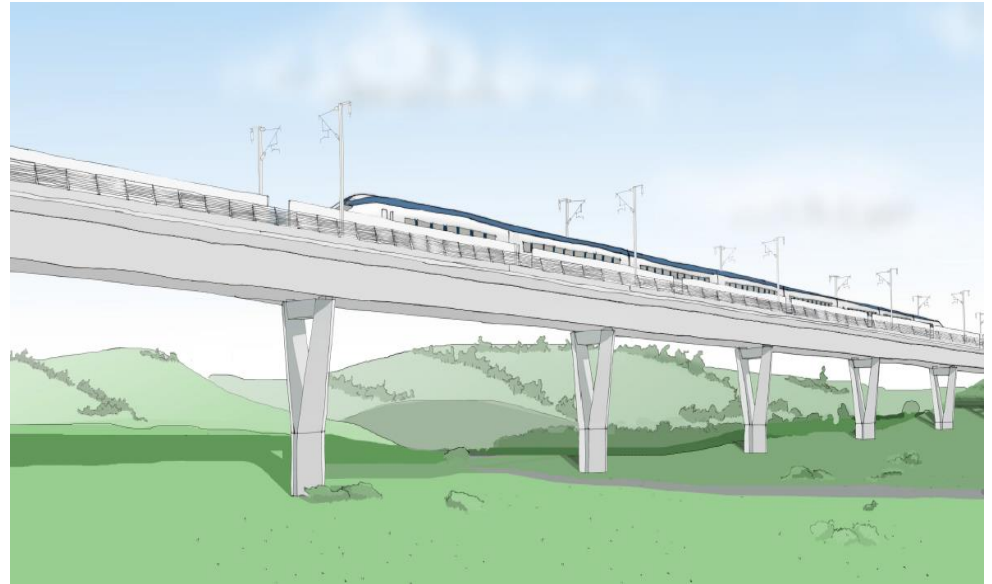


# Bridge Design Requirements

---

## Bridges in Phase 1

- 135 Over bridges (bridges above the HS2 railway line)
- 195 underbridges (bridges under the HS2 railway line)
- 70 Viaducts (30 Km in total)



# Efficiency Challenge

The Efficiency Challenge Programme's vision is to set the pace for the UK's infrastructure industry by delivering global benchmarks for efficient delivery and innovation.

Its mission is to support the delivery of HS2 infrastructure by realising significant cost savings through embedding the right sponsor, client and supply chain behaviours and processes.

The Efficiency Challenge Programme comprises 19 projects (Commercial/ Procurement, Skills development, Design strategy...). Two of them are the following:

- **Implementation of BIM**
- **Exploit Offsite prefabrication**



Build off site is always ugly/boring?









High Speed 2

# BRIDGES DESIGN REQUIREMENTS

December 2015



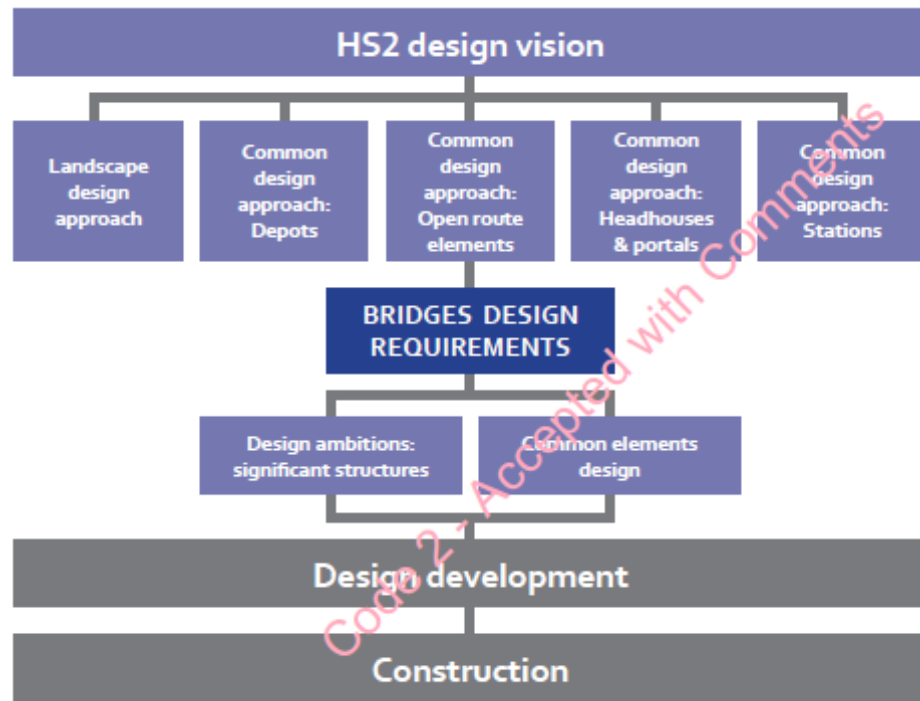
hs *engine for growth*



# Purpose of the document

The document provides guidance and requirements for the design of bridges and associated civil engineering throughout HS2. It defines design principles and best practice to be applied to future design development of the bridges for HS2. The design approach defined here embraces the HS2 vision and reflects the project's commitment to exemplary design.

- It is a Technical Standard and as such, MANDATORY
- Difficult to specify aesthetics
- Balance between requirements and flexibility



The Bridges Design Requirements are presented in three sections as follows:

## Bridge design vision



This section presents the bridge design vision for HS2 and shows how this embraces the HS2 Vision and HS2 Design Vision. The bridge design vision aims to demonstrate the highest standards of design and construction, a world class railway that creates a positive lasting legacy and provides a benchmark for the civil engineering design of major infrastructure projects.

## Bridge scenarios



The bridge scenarios present a range of typical HS2 bridges, illustrating the range of structures that will be required along the route. Drawing from the bridge design vision these demonstrate the design approach required for HS2. Clear design principles, with associated guidance for each type of structure, implement the bridge design vision and thus the HS2 Vision.

## Bridge design library



The bridge design library contains detailed advice for elements of design that are common across all bridge types. Some key aspects of bridge design (e.g. response to landscape) are covered in more detail in other design guides (e.g. Landscape Design Approach). This document defines how bridge design will be influenced by those key issues.

## Bridges design library

# Deck structures



Precast concrete deck edge: deck spine beam is cast into shadow, © merseygateway



Cantilevered deck edge: deck spine beam is cast into shadow, © Grimshaw



Exposed crossheads interrupt line of viaduct soffit, Pulandian Bay, China, © Jinzhou New District Information Center

# Piers and bearings



Elegant concrete piers: piers and deck structure designed as one coherent system, © Ferrovia



Pier functions expressed in design: slim integral piers with special piers to resolve braking and bracing forces, © Holger Althaus / SBP

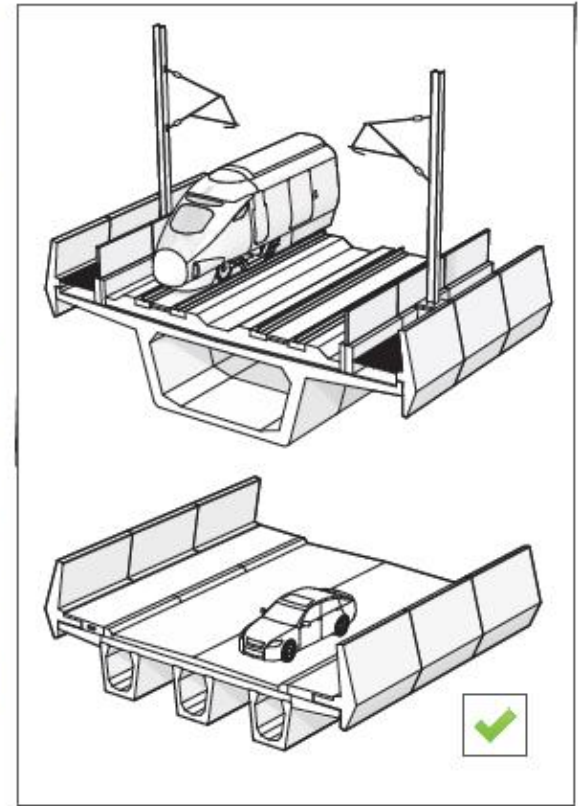
# Parapets



Visual impact of H4a barriers plus pedestrian barrier and additional higher protection above track / OHLE, © Grimshaw



Closer view of H4a barriers plus pedestrian barrier and additional higher protection above track / OHLE, © Grimshaw



Pre-cast concrete parapets have potential to contribute to a line-wide identity for HS2, © Grimshaw

# Abutments and walls



Poor abutment design: substantial concrete abutments and retaining walls, © Grimshaw



Refinement of abutment design: bank seat abutments, visible extent of concrete abutment minimised., © Grimshaw



Secant pile embedded wall: not suitable for walls visible to the public, © Grimshaw

# Materials and maintenance



Concrete finishes: consistent finish used across all structural elements, © Schlaich Bergermann Partner



Precast concrete retaining walls: potential for texture and pattern in pre-cast panels, © Glen Waverley / urban.melbourne

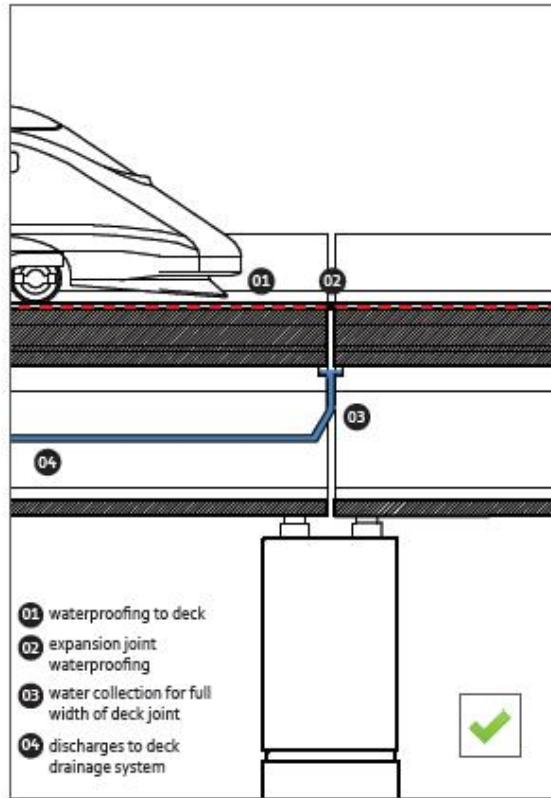


Reinforced earth wall: potential for texture and pattern in pre-cast panels, © Prekast Beton

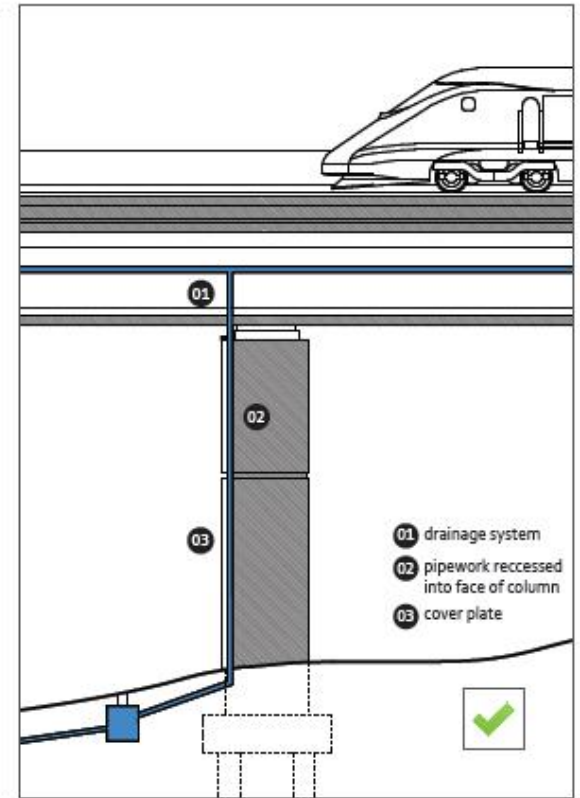
# Rainwater management



Viaduct rainwater collection: exposed rainwater collection pipes, ©Timothy Reichard / m-plex.com



If simply supported structures are used, fit secondary rainwater collection below joints in deck, © Grimshaw



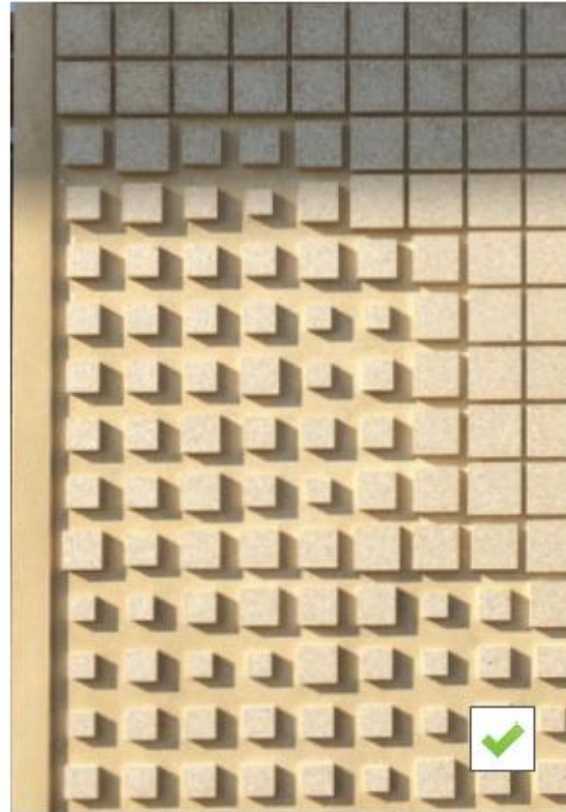
Pier rainwater routes: pipework recessed into face of pier behind cover plate, © Grimshaw



# Concrete



Pre-cast parapet panels: visible colour mis-match between adjacent panels, © Grimshaw



Pre-cast concrete finishes: buff coloured concrete, acid wash, machine polished raised areas, © Grimshaw



Pre-cast retaining wall panels: poor quality finish visible to rear, © Grimshaw