

PLANNING FORUM NOTE 15

COMMON DESIGN ELEMENT: VIADUCT PIERS

Introduction

1. Paragraph 4.1.4 of the Phase 1 Planning Memorandum states: *'The Forum will consider common design items for certain structures associated with the railway (such as bridges, acoustic barriers or retaining walls for example). Unless there are particular local circumstances relevant to the grounds in paragraphs 2 and 3 of Schedule 17 to the Bill, there will be a presumption in favour of the approval of such designs when submitted.'*
2. Appendix A to this Planning Forum Note sets out the parameters which define the Common Design Element for viaduct piers. Paragraphs 4-19 below define the structures to which the Common Design Element could apply and provides an overview of the design approach and rationale.
3. It is not proposed that overbridges (structures that cross over the HS2 line) will adopt the Common Design Element pier as in many cases they will not be visible to the general public. However their design could be based on similar principles if deemed beneficial.
4. In accordance with HS2 Information Paper D1, HS2 undertook public engagement on the proposed common design elements for lineside noise barriers, bridge and viaduct parapets and viaduct piers between the 2nd and 30th January 2020.

Definitions

5. A **Common Design Element** is a structure or part of a structure comprising common design parameters that would be adopted at multiple locations on the Phase 1 route.
6. **Viaducts** are structures supporting HS2 where it crosses above roads, railways, rivers and other obstacles, comprise multiple spans supported by piers. Subject to consultations with the local authority referred to below, it is proposed that viaducts adopt the Common Design Element pier set out in this Planning Forum Note.
7. **Key Design Elements** are structures or buildings of particular significance and/or in sensitive locations. The list of Key Design Elements is contained in HS2 Information Paper D1 (Table 1). The relationship between Key Design Elements and Common Design Elements is described in paragraph 10 below.

Design Approach

8. The approach to all Common Design Elements follows the principles governing the overall design of the railway set out in the HS2 Design Vision, and in HS2's design policy as set out in HS2 Information Paper D1 (Section 3). The design policy includes (but is not limited to) the principles that the design of all visible elements of the built and landscaped environment in both rural and

INDEPENDENT PHASE ONE PLANNING FORUM FOR HS2

urban areas are sympathetic to their local context, environment and social setting, and also that design cohesion is achieved through a strong aesthetic ethos and a recognisable architectural language.

9. Common Design Elements are to be considered as part of a holistic approach to the design of all the railway infrastructure and landscaping, founded in a thorough appreciation of the specific local context and what is appropriate in that setting. Whether a Common Design Element is appropriate in the context of the overall railway design at a particular locality, or whether there are particular local circumstances justifying a different design approach will need to be reviewed by HS2 designers in collaboration with Local Authorities and other relevant stakeholders early in pre-application discussions, prior to submission of requests for approval under Schedule 17. Relevant Undertakings & Assurances will need to be adhered to.
10. The new railway structures may be experienced as one in a linear series or through a singular interaction. Therefore they need to be sympathetic to their surroundings in their own right but also in relation to one another. No two structures can be exactly the same; they will vary according to location, dimension and purpose.
11. The design of Key Design Elements comprising viaducts may utilise the pier Common Design Elements. Whether the specific local context of a Key Design Element requires that the Common Design Element should or should not be used, or should be used in a modified or developed form, will be determined in consultation with the local authority and informed by public engagement on proposed Key Design Element designs by HS2, prior to submission of requests for approval under Schedule 17.

Design Rationale

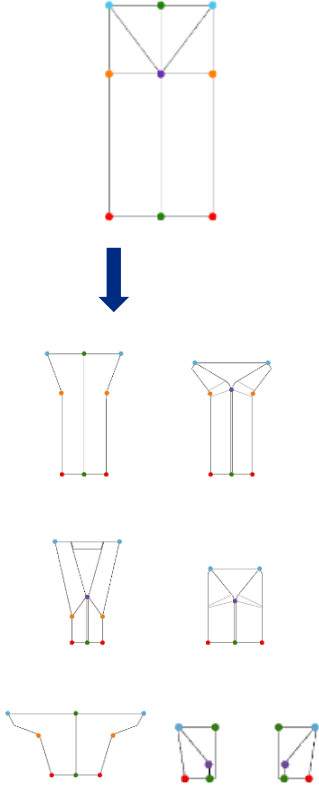
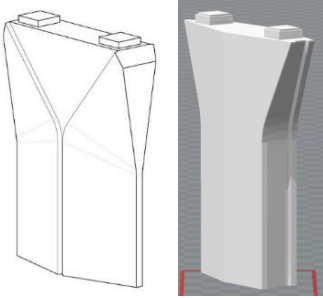

12. The pier Common Design Element has been conceived with a focus on technical requirements and the HS2 design policy..
13. Piers are a fundamental part of a viaduct substructure, transferring load from the viaduct deck to the supporting ground. Their proportions must be designed as such to deal with the significant forces that act on them and efficiently transfer the load.
14. However, as a prominent component of a viaduct, piers, like parapets, provide an obvious opportunity to demonstrate architectural design, to express both commonality and particularity.
15. The pier Common Design Element comprises a 'family' of piers based on founding principles that set a geometric relationship between the front face angles and the top bearing surface. These relationships remain alike no matter how tall the pier becomes or how broad the pier-head needs to be for a given application. The geometry allows for different pier types, based on the same governing philosophy and therefore all sharing the same distinctive architectural language.
16. Texture and pattern may be added to the piers breaking up the large expanse of material but also to provide a broader 'canvas' for locally specific detail within the boundaries of the CDE parameters. When and how texture and pattern will be implemented will be determined in consultation with the Local Authority.

INDEPENDENT PHASE ONE PLANNING FORUM FOR HS2


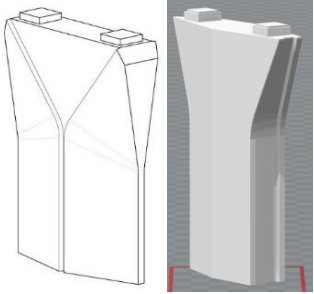
17. Appendix A sets out the viaduct piers common design element parameters. Appendix B contains illustrations indicating the locations of Common Design Elements Parameters in different pier family members.
18. Viaduct piers will be constructed from concrete. They will be designed, detailed and manufactured to be durable and low maintenance, meeting the 120-year design life of HS2.
19. Concrete permits flexibility to create different pier forms in accordance with Parameter 1. It also permits the inclusion of textures and patterns if specified.
20. Detailing of concrete faces will consider weathering, specifically any potential for stagnant/running water to prevent staining of the concrete faces. Patterning may be used to add tone, light and dark to the structure to create illusion of different shades. The concrete colour cannot be selected. No colour additives are to be used.

Appendix A: Pier Common Design Elements Parameters

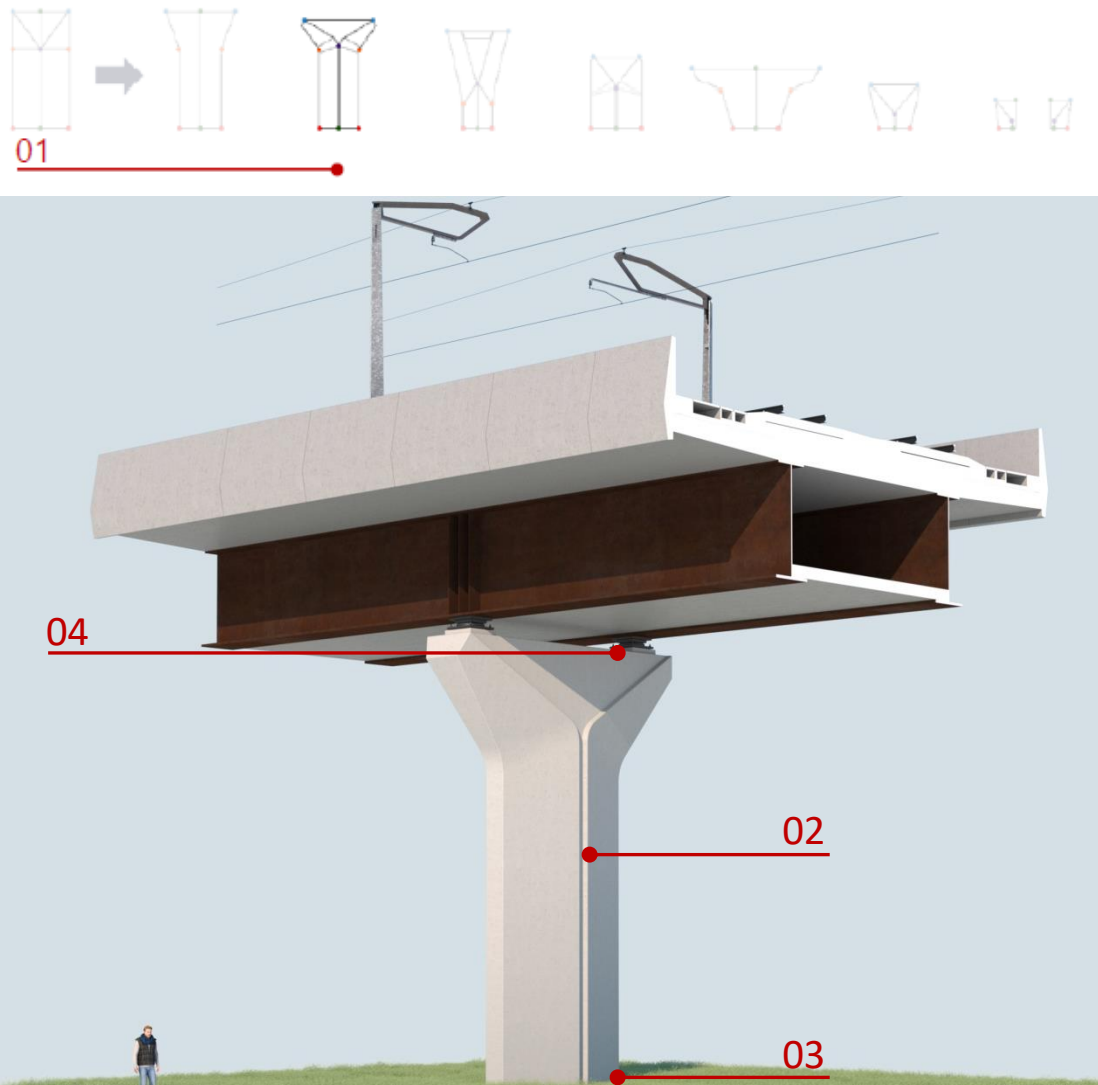
Table 1: Common Design Element Parameters - Piers

#	Parameter	Description
1.	Pier Geometry	 <p>Piers will be designed using the same fundamental geometric principle: shown left, in the first instance control points have been defined on a basic rectangular pier around a vertical axis of symmetry. These points can then be manipulated horizontally and vertically to give different pier forms dependent on the viaduct typology whilst also providing a common architectural thread.</p> <p>The structural demands for each pier application determine how far apart these points are and any particular requirements there might be, e.g. hammerheads, crossheads or split piers.</p> <p>As the control points are positioned to suit circumstances, the lines connecting these points define the external faces / creases on the face of the pier. In this way the form of two given sets of piers can be related even where the structural form is markedly different.</p> <p>This principle primarily utilises facets rather than curves for surface articulation.</p>
2.	Pier Recesses	 <p>Recesses may be included on pier faces in co-ordination with the geometric principles. Recesses are a simple architectural detail emphasising the pier verticality, thus making them look more slender.</p> <p>Recess could be patterned (in consultation with the local planning authority) adding detail to complement the local identity of specific assets.</p> <p>Recesses can also serve a functional purpose, allowing services such as drainage to be visually integrated into the structure.</p>
3.	Pier Size – longitudinal dimension variation	 <p>Where Parameter 2 is employed, the minimum width of the concrete face either side of the recess shall be no less than 300mm.</p> <p>This parameter has a very practical purpose in that a minimum width is required to accommodate reinforcement detailing around</p>

INDEPENDENT PHASE ONE PLANNING FORUM FOR HS2

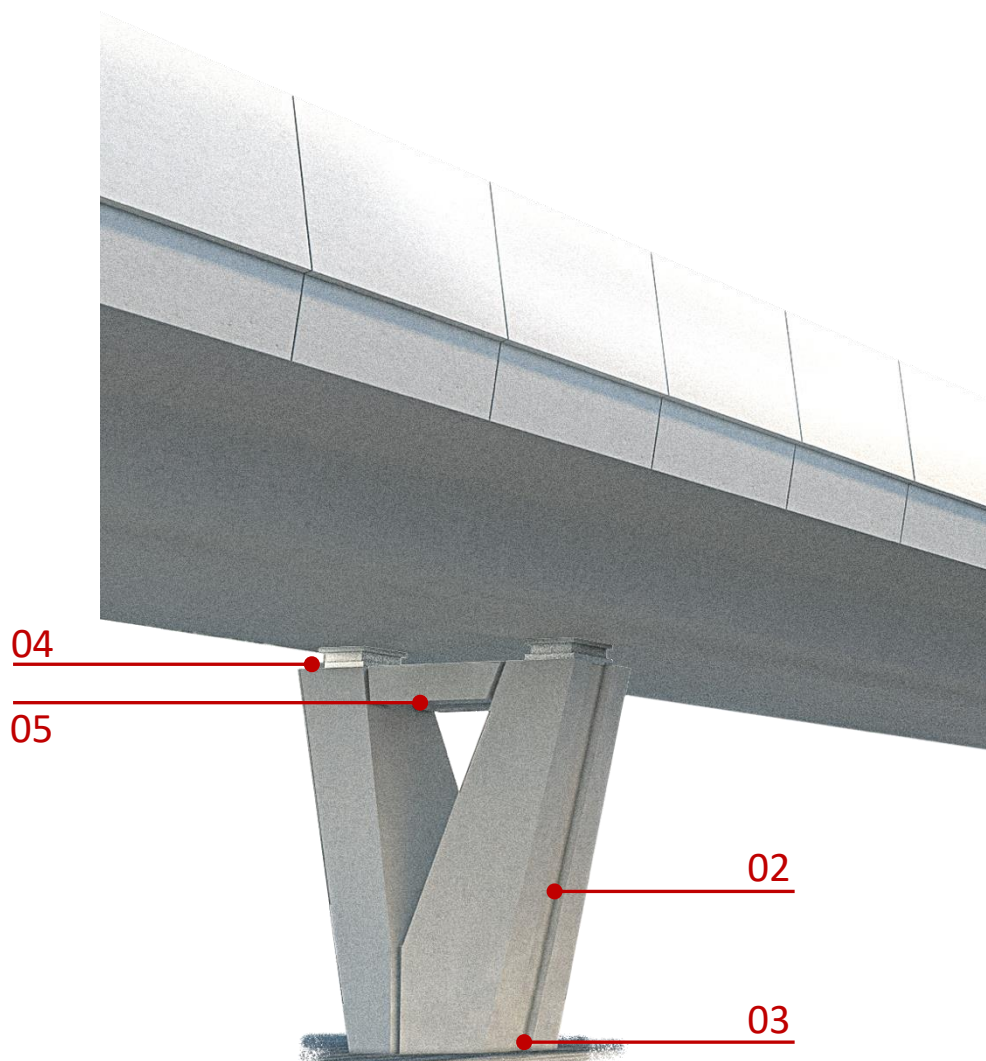
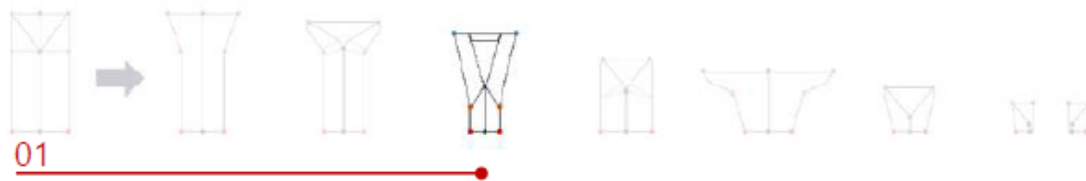
			<p>the recess and to provide working room to install the reinforcement and formwork during construction. The recess width will vary to accommodate different pier thicknesses.</p>
<p>4.</p>	<p>Pier Head Surface</p>		<p>The tops of piers are to be flat/horizontal. This is a progression of pier geometry in Parameter 1; in this case it specifically establishes how all the family of piers interface with the viaduct deck.</p> <p>This also supports safety in construction and maintenance, providing a flat working space for placing, inspecting and replacing bearings.</p>
<p>5.</p>	<p>Drainage</p>		<p>Where drainage downpipes are required, they will be located in recesses (Parameter 2).</p> <p>HS2 standards do not permit drainage pipes to be cast into piers. Recesses in the pier form mask the visual impact of drains, eliminating the impact of downpipes from the crucial appearance of the structures in silhouette while also complying with HS2 technical and maintenance requirements.</p>

Appendix B: Common Design Element Parameter Locations in Pier Family

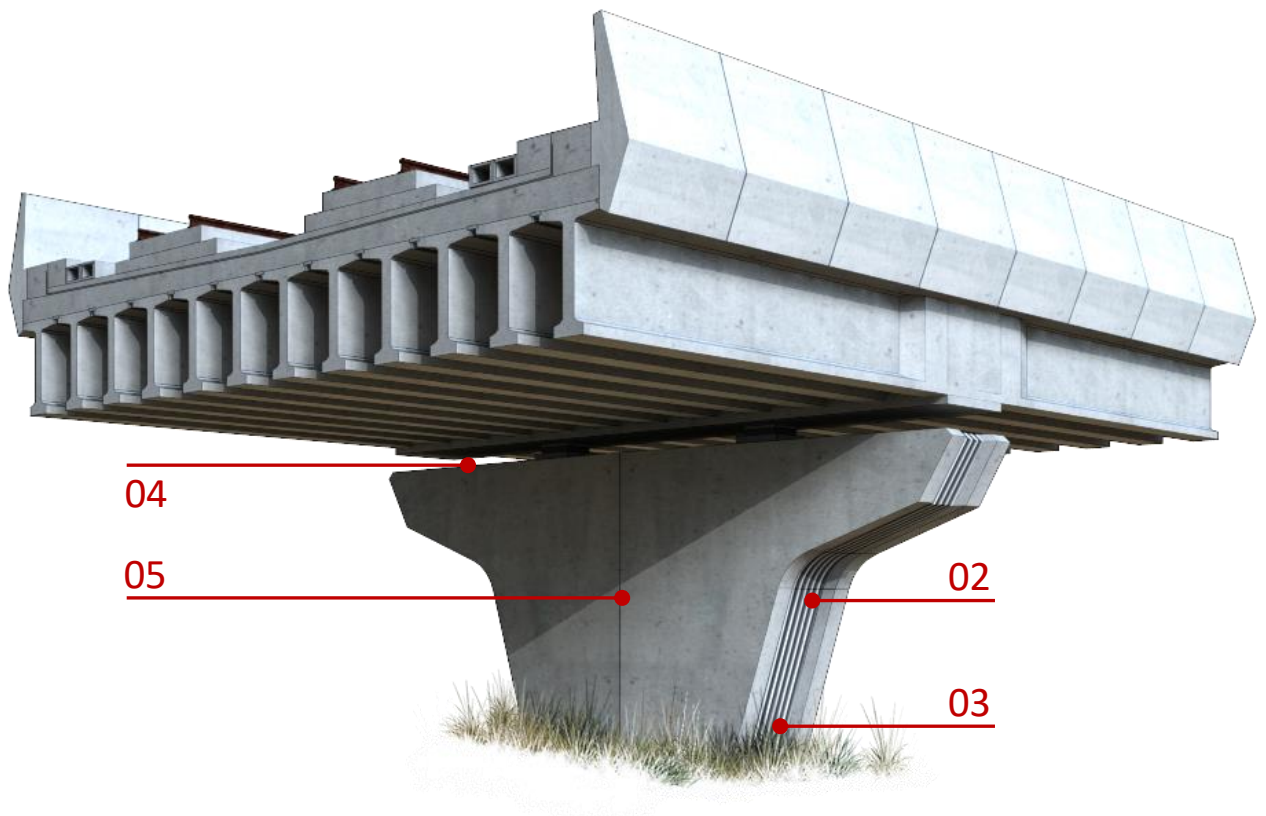


- Parameter 01 – Pier Geometry
- Parameter 02 – Pier Recesses
- Parameter 03 – Pier Size – Longitudinal dimension variation
- Parameter 04 – Pier Head Surface
- Parameter 05 – Drainage

INDEPENDENT PHASE ONE PLANNING FORUM FOR HS2

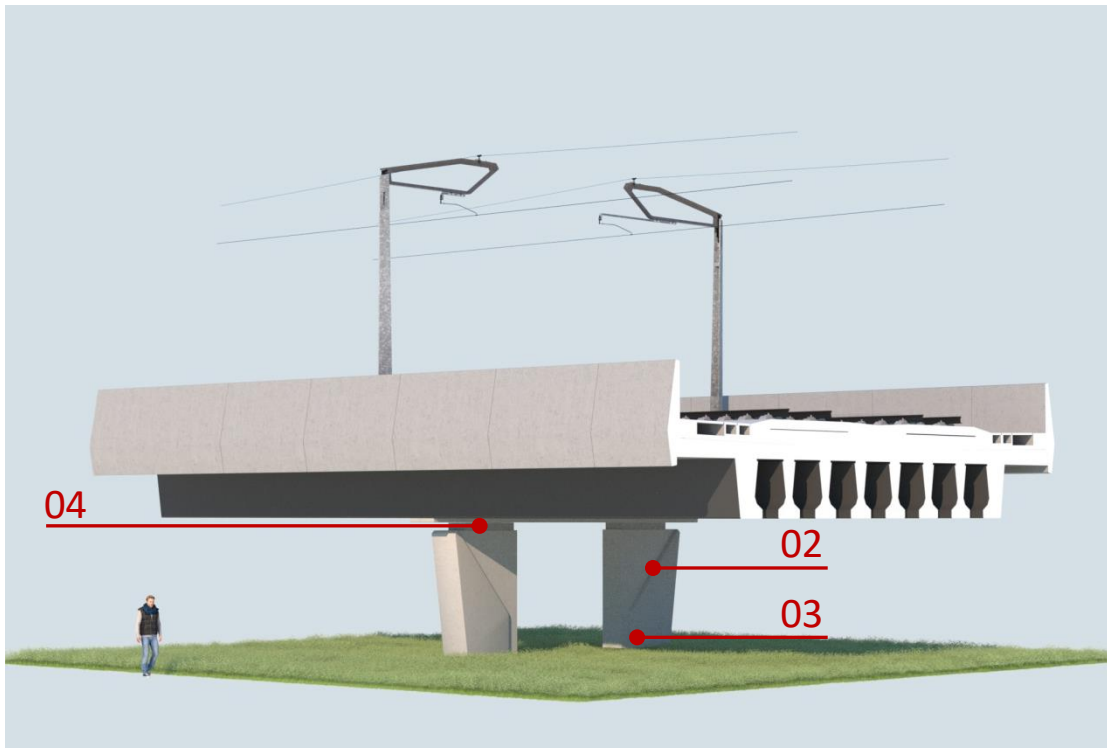


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INDEPENDENT PHASE ONE PLANNING FORUM FOR HS2



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