
COMMON DESIGN ELEMENT: OVERBRIDGE, UNDERBRIDGE AND VIADUCT PARAPETS

Note: Parapet design subject to testing

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 overbridge and viaduct parapets. Paragraphs 3-27 below define the structures to which the Common Design Element could apply and provides an overview of the design approach and rationale.
3. As explained in paragraph 20 the Common Design Element described in this Planning Forum Note should not be used for Road Overbridges (see definitions below).
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. **Overbridges** are structures that cross over the HS2 line, such as farm access tracks, roads, highways or railways, green bridges, pedestrian, cyclist or equestrian-only bridges.
7. **Road Overbridges** for the purposes of this note, the term Road Overbridges includes any Overbridges carrying motorised traffic, whether on roads, public rights of way or private accesses.
8. **Underbridges** are structures supporting HS2 where it crosses above roads, railways, rivers and other obstacles that do not require multi-span solutions. It is proposed that single span underbridges may adopt the Common Design Element depending on their structure and function.
9. **Viaducts** are structures supporting HS2 where it crosses above roads, railways, rivers and other obstacles, comprising 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 parapet set out in this Planning Forum Note.

10. 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 11 below.

Design Approach

11. 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 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.

12. 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.

13. 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.

14. The design of Key Design Elements comprising viaducts may utilise the parapet 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

15. The approach to the parapet Common Design Element has been to define 'parameters' which provide a visual language to which the design of an element will adhere. The parameters are listed in Appendix A.

16. Parapets have the following main functional and technical requirements:

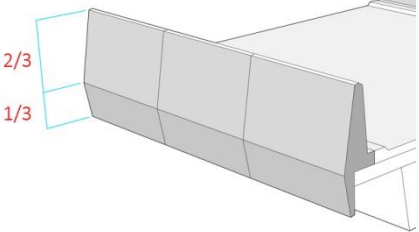
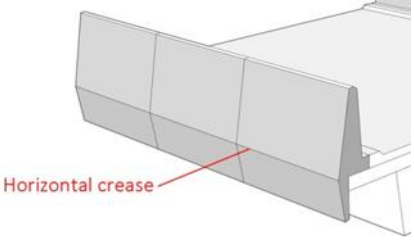
- preventing users of the maintenance/emergency walkway from falling from the bridge;
- preventing vehicular or pedestrian incursion of the railway;

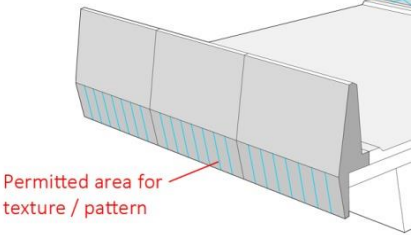
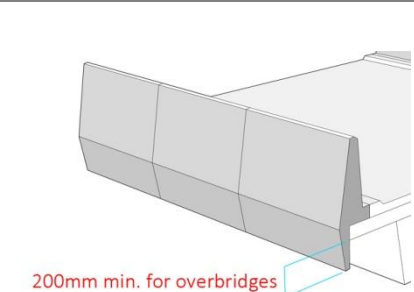
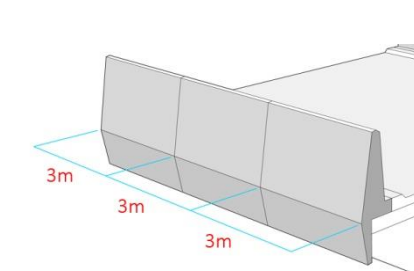
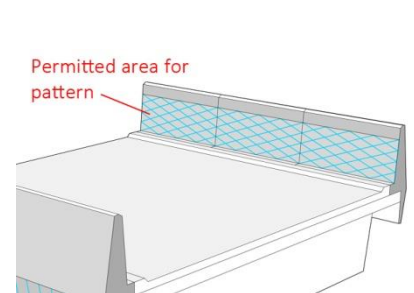
- maintaining electrical safety in the vicinity of the overhead line electrification; and deterring vandalism.
17. Parapets on viaducts and underbridges must be a minimum height of 1100mm above the walkway surface. The height may increase to accommodate acoustic requirements where the parapet also serves as a noise barrier. Where it is necessary to extend the parapet height for noise mitigation purposes, extension by up to 700mm will follow the Common Design Element principles in this document.
 18. The design of extensions to parapets above this height, where required, are not part of the Common Design Element. Such parapets could have a variety of solutions in different contexts and will be discussed with the local planning authority prior to submission for approval under Schedule 17.
 19. On overbridges, parapets must be 1800mm above the paved surface over the section of railway within the lineside security fence line as a minimum, and no less than 3m from edge of rail, whichever is the greater. There is a potential for the parapet to be reduced in height to 1500mm thereafter.
 20. Note that the Common Design Element parapet set out here does not apply for Road Overbridges which have different requirements relating to containment of vehicles and limiting impact severity level in the event of a vehicle colliding with the parapet.
 21. As the outermost face of bridges and viaducts, parapets have potential to express both commonality and particularity. The regularisation of dimensions and fold lines through CDEs will help to ensure visual similarity when viewing the structures from a distance; the 'family' appearance will be clear from the way the leading edges match in terms of proportions and the manner in which they will catch the light in the same way.
 22. At the same time, by specifying a discrete portion of the parapet that can be subject to pattern or texture, a finer level of detail can be incorporated in the ground-facing bottom third of the parapet, addressing closer views from pedestrians. Where utilised in the design, this finer detail helps to accentuate the proportions of the parapet from a distance - reinforcing the 'family' requirement while also allowing specific, localised features.
 23. Similarly, the internal faces of overbridge parapets, where users will experience the structure at close quarters, offers a good opportunity for texture and pattern, again breaking up the large expanse of material but also to provide a broader 'canvas' for locally specific detail.
 24. When and how texture and pattern will be implemented in accordance with the CDE parameters will be determined in consultation with the Local Authority.
 25. Parapets will be made from concrete. The concrete parapets will be designed, detailed and manufactured to be durable and low maintenance meeting the 120-year design life of HS2.
 26. Removing laitance resulting in a light / medium exposure of aggregates will be undertaken resulting in a durable finish which will take on its final appearance soon after the completion of the works.

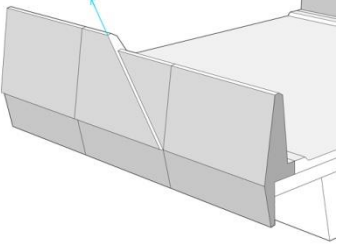
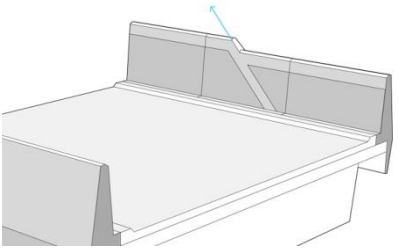
27. The concrete colour cannot be selected. No colour additives are to be used.

Appendix A: Parapet Common Design Elements Parameters

Table 1: Common Design Element Parameters – Parapets

	Parameter		Description
1.	Parapet Proportions		<p>The external face of the parapet will contain a crease detail on the bottom 1/3 of its total height. On overbridge structures where the parapets will have 1.8m and 1.5m sections, the proportion will be achieved on the 1.8m parapet and adjusted on the 1.5m sections to enable the crease level to remain constant across the bridge length.</p> <p>For long distance views the crease provides a shadow/light effect, making the parapet appear slender. Practically, it also promotes water run-off, reducing the risk of staining.</p> <p>NB. The standard parapet height on viaducts and overbridges is 1100 mm. Where it is necessary to extend the parapet height for noise mitigation purposes, extension by up to 700mm will follow the Common Design Element principles in this document.</p> <p>The design of extensions to parapets above this height, where required, are not part of the Common Design Element. Such parapets could have a variety of solutions in different contexts and will be discussed with the local planning authority prior to submission for approval under Schedule 17.</p>
2.	External Crease Detail		<p>The external crease detail will be horizontal and simple with a plain concrete finish to the parapet.</p>
3.	External Face Pattern		<p>It is envisaged for most structures that the external parapet face will be plain concrete as per parameter 2.</p> <p>However, parameter 3 provides an option for texture or a pattern to be applied on the lower 1/3 of the external face where there is a perceived benefit of doing so.</p> <p>No patterning will be permitted on the upper 2/3 face due to the risk of adverse weathering/staining.</p>

		 <p>Permitted area for texture / pattern</p>	<p>Experience has shown that viewing distance determines whether a pattern is appropriate. The external parapet face will be viewed at close distance in the minority of cases such as low-level viaducts crossing footpaths. Long distance, a pattern would not be distinguishable providing little value except to amplify the contrast between top and bottom parapet faces.</p> <p>Implementation of Parameter 3 will be determined through consultation with the local authority.</p>
4.	Parapet Down Stand	 <p>200mm min. for overbridges</p>	<p>The parapet down-stand will extend below the underside of the deck. This will mask the deck edge and any construction joints. Additionally, it will cast the structure below the parapet into shadow with the aesthetic effect of narrowing the structure.</p> <p>The down-stand should incorporate drip grooves to control water discharge and minimise the risk of staining structures below.</p> <p>For overbridges, it will extend at least 200mm below the deck underside. For viaducts, the down-stand will extend at least 50mm below the deck underside.</p>
5.	Joint Spacing	 <p>3m</p>	<p>For overbridges, parapet joint spacing will be 3m. For viaducts, joint spacing will be 3m, +/- 500mm allowing some flexibility to suit expansion joints and viaduct length.</p> <p>Parapet joints are an important aesthetic feature hence they will be consistent along the entire length of an individual structure and will be consistent with noise barriers.</p> <p>A standardised size allows parapets to be more easily replaced.</p>
6.	Inside Face Pattern Overbridges Only	 <p>Permitted area for pattern</p>	<p>A pattern (in consultation with the local planning authority) may be specified on the inside face for overbridge parapets especially where pedestrians will be close enough to see/touch the surface.</p> <p>Any patterning will need to ensure that it does not facilitate climbing. Therefore, the pattern depth will be less than 15mm.</p> <p>Implementation of Parameter 6 will be determined through consultation with the local authority.</p>

7.	Transition External Face Overbridges Only		A 45-degree transition extending to the horizontal crease will be achieved on a single parapet unit between the 1.8m and 1.5m parapet units on overbridges. It will be positioned to meet the vertical joint and the horizontal crease at a single point.
8.	Transition Internal Face Overbridges only		A 45-degree transition feature extending to the deck surfacing will be achieved on a single unit between the 1.8m and 1.5m parapet on the internal parapet face (the same unit as the external face transition).