

# HS2 Common Design Elements

Architectural Elements within  
Civil Engineering Works

Planning Forum 25/26 January 2017

**ATK EDP**

Bob Barlov RIBA – CDE Civils Technical Lead

Lineside Noise Barriers

Retaining Structures –  
Architectural Treatment

Handrails

# HS2 CDE Key Background Documents



Phase One Project Requirements Specification  
 Document no.: HS2-102-0A-SPE-000-000008  
 Revision: 01a

## High Speed Two Phase One Project Requirements Specification

Document no.: HS2-102-0A-SPE-000-000008

Revision	Author	Checked by	Approved by	Date approved	Reason for revision
P01	G. Howard	N. Rabada	G. Thomas	20160416	Draft Revision to support Phase One Civil and Environment ESD.
P02	G. Howard	N. Rabada	G. Thomas	20160416	Revision to support development of M1002/ITP documentation.
P03	G. Howard	S. Leash T. Kunnalajan	N. Rabada	20160416	To support M1002/ITP release.
P04	S. HICKMAN G. Howard S. Leash	G. Howard S. Leash	N. Rabada	20160416	Further design development of the Employers Requirements Design for Euston station under the 'MBA 1 contract'. Enabling Works Contract (EWC) Award.

Page 1 of 159

Template no.: HS2-102-PM-TM-000-000004

Uncontrolled when printed





## People

Design for everyone  
to benefit and enjoy

- 1 Design for the needs of our diverse audiences
- 2 Engage with communities over the life of a project
- 3 Inspire excellence through creative talent



## Place

Design for a  
sense of place

- 4 Design places and spaces that support quality of life
- 5 Celebrate the local within a coherent national narrative
- 6 Demonstrate commitment to the natural world



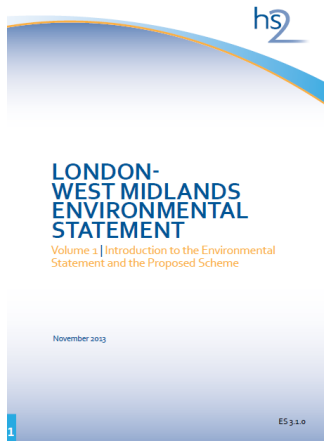
## Time

Design to stand  
the test of time

- 7 Design to adapt for future generations
- 8 Place a premium on the personal time of the customers
- 9 Make the most of the time to design

# Lineside Noise Barriers

# HS2 CDE Lineside Noise Barriers – Key Background Documents



- ... the assessment has generally been based on noise barriers having a noise reduction performance equivalent to a noise fence barrier with a top level **3m above the top of the rail**, that is acoustically absorbent on the railway side, and located **5m to the side** of the outer rail.



- ...there is a balance to be struck between the benefits gained by a set of line-wide standard components ... against the need for the noise barriers to sit comfortably within their context. There is an opportunity here to consider **one adaptable system**, a related urban and rural system etc.



- Wherever possible **combine security fencing** with noise barrier to reduce visual clutter

# HS2 CDE Lineside Noise Barriers – Scope



*Lineside 'Fence' Noise Barrier – included in CDE Scope*

*11.4km fence barriers on both sides and further 23.2km fence barriers on one side of railway (HB).*

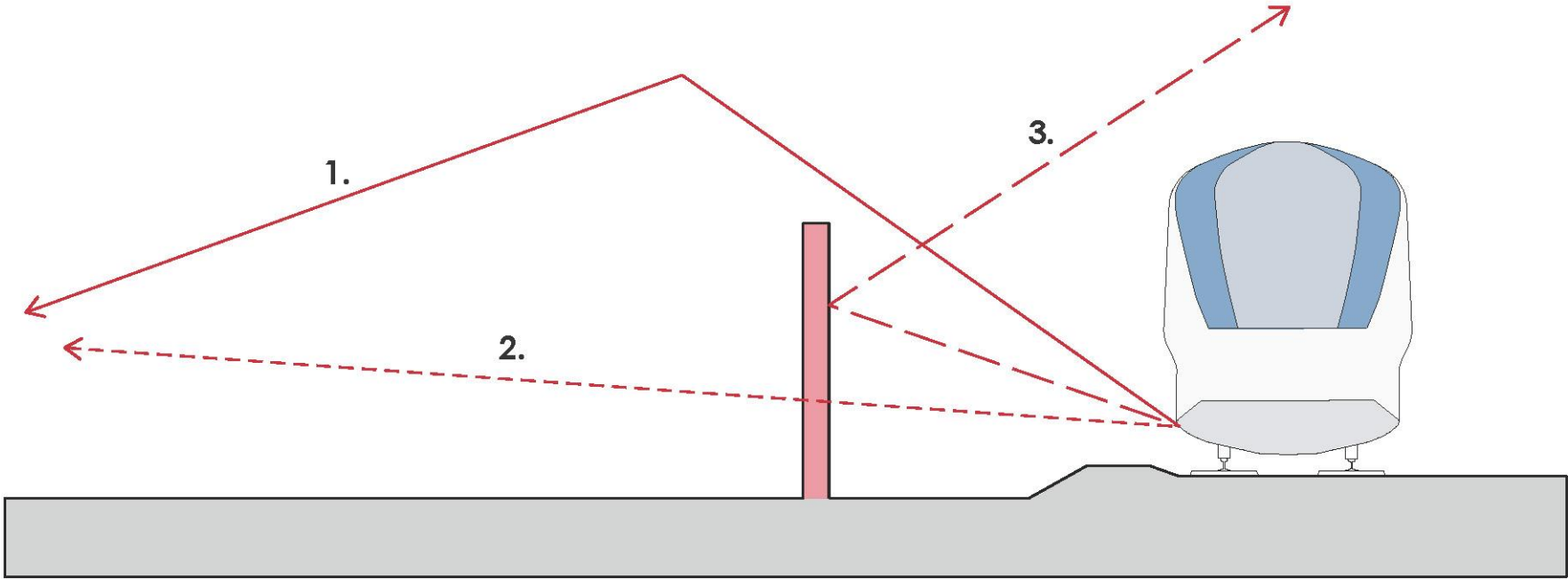


*Viaduct Noise Barrier – not included in CDE Scope (part of Viaduct design), but coordination is required*



*Noise mitigation achieved with earthworks – not included in CDE Scope*

# HS2 CDE Lineside Noise Barriers – Acoustic Criteria



- 1. Diffracted sound over the top and around the ends of barrier
- 2. Transmitted sound through the barrier
- 3. Reflected sound from the face of the barrier



Lineside Noise Barriers  
Typical Types

# HS2 CDE Lineside Noise Barriers – Timber & Metal Hybrid



**HS2 CDE** Lineside Noise Barriers – Proprietary Metal System



# HS2 CDE Lineside Noise Barriers – Precast Concrete Steel Frame



# HS2 CDE Lineside Noise Barriers – Gabion Wall



# HS2 CDE Lineside Noise Barriers – Precast Concrete Wall



# HS2 CDE Lineside Noise Barriers – PC Base & Steel Frame



# HS2 CDE Lineside Noise Barriers – Construction Types Summary





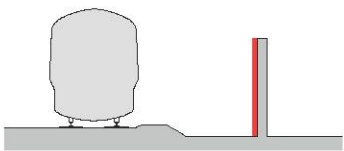
## HS2 CDE Lineside Noise Barriers – Construction Types SIFT Criteria

Construction Feasibility	Appearance and Response to context	Vulnerability to Vandalism
Maintainability	Durability & Reliability	Initial Capital Costs
Whole Life Costs	Sustainability	Safety

# HS2 CDE Lineside Noise Barriers – Construction Types SIFT Selection



# HS2 CDE Lineside Noise Barriers – Proposed Precast Concrete Wall Module

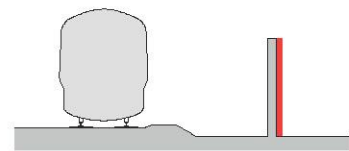
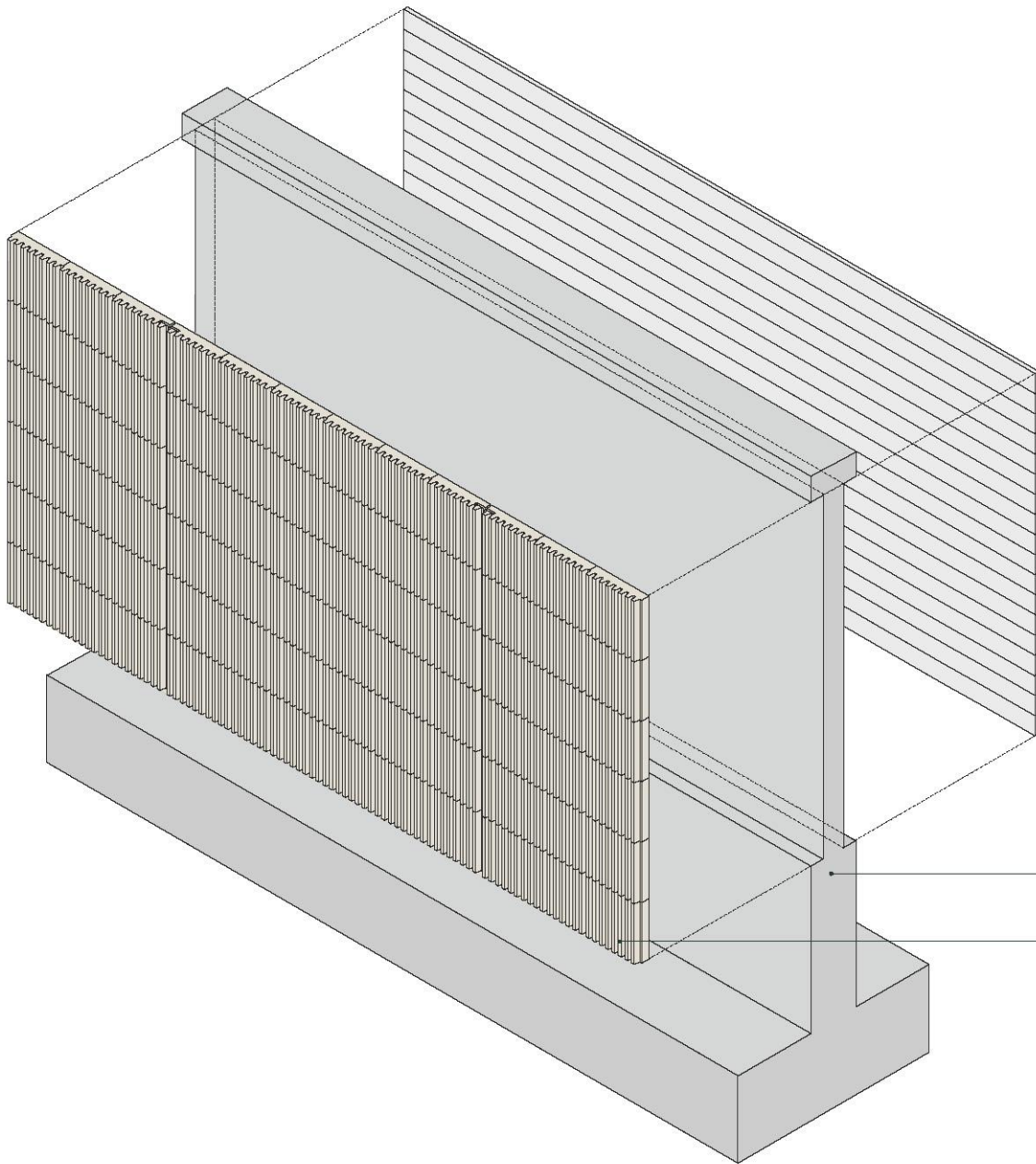


### TRACKSIDE

Acoustic Absorbent Cladding

#### Materials:

Wood-cement  
Expanded Clay



### NON-TRACKSIDE

Adaptable Cladding  
to Suit Urban and  
Rural Contexts

#### Materials:

Timber  
Coconut Fibres-Climbing  
Vegetation  
Brickwork  
Precast Concrete

Precast Concrete

Acoustic Absorbent  
Cladding

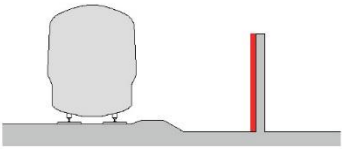
# HS2 CDE Lineside Noise Barriers – Noise Absorbent Cladding Facing Track



Wood Cement

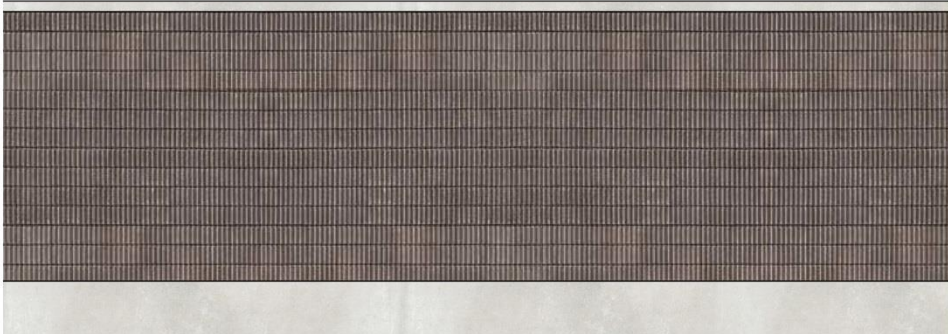
Light Expanded Clay Aggregate

# HS2 CDE Lineside Noise Barriers – Noise Absorbent Cladding Pattern Options

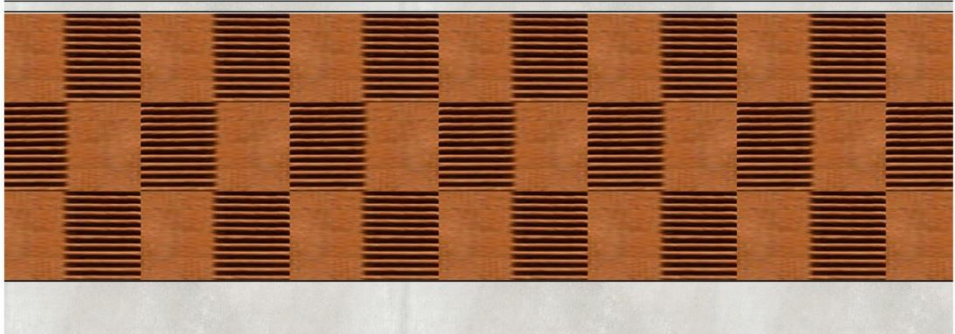


TRACKSIDE

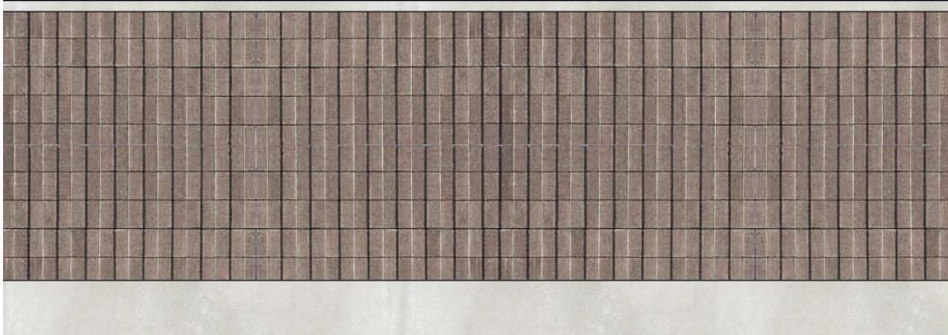
1



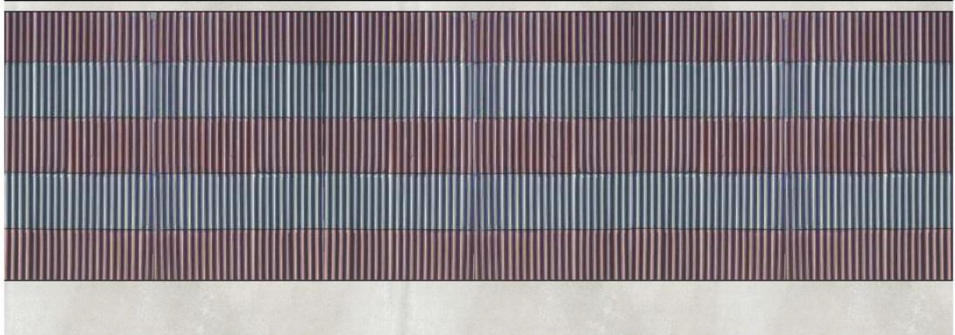
2



3

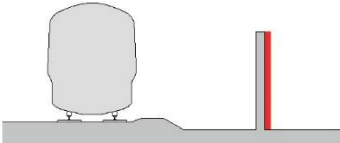


4



# HS2 CDE Lineside Noise Barriers – Cladding Options Facing Away From Track

*Cladding material to be selected on a case by case basis and in response to local context.*



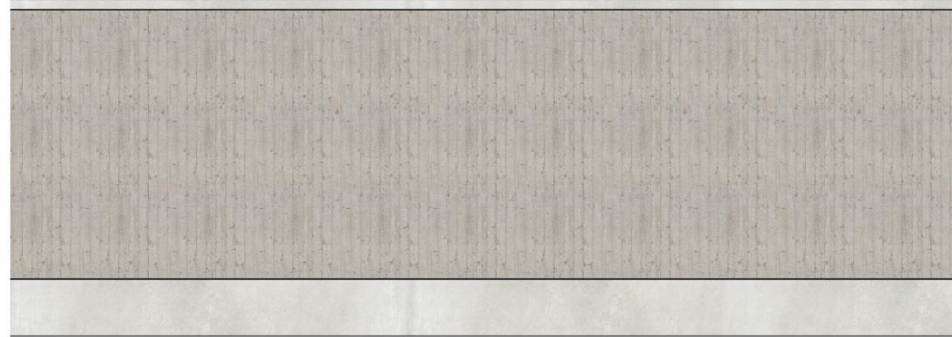
**NON-TRACKSIDE**

**1**



Horizontally Laid Timber

**2**



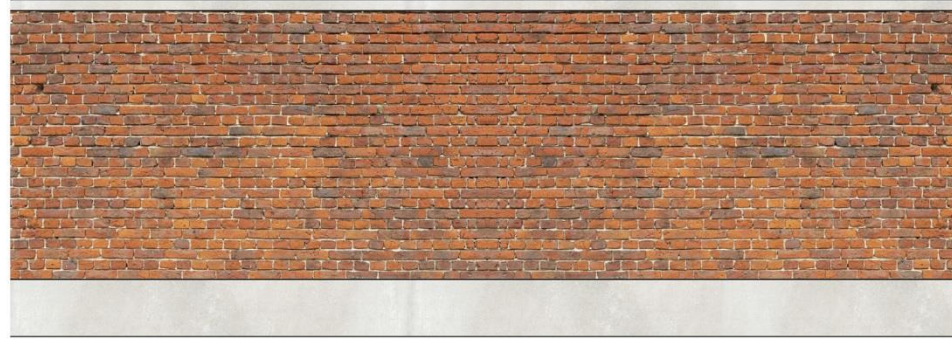
Precast Concrete Pattern

**3**



Climbing Vegetation. Natural material. E.G. Coconut

**4**



Brick Veneer Cast In

# HS2 CDE Lineside Noise Barriers – Timber Cladding Option



# HS2 CDE Lineside Noise Barriers – Brick Cladding Option





**Retaining Structures**  
Architectural Treatment

# HS2 CDE Retaining Structures – Key Background Documents

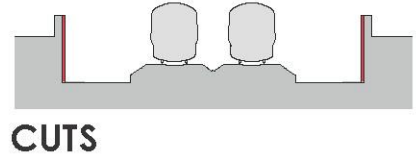


## Bridge Design Requirements

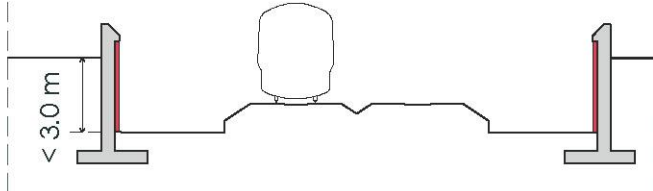
- *Self-finished materials*
- *Prevent water staining*
- *Visible concrete should be Class F3\**
- *Consider application of texture and patterning*

*\*... smooth and of uniform texture and appearance...*

# HS2 CDE Retaining Structures – Cuttings, Family of Types

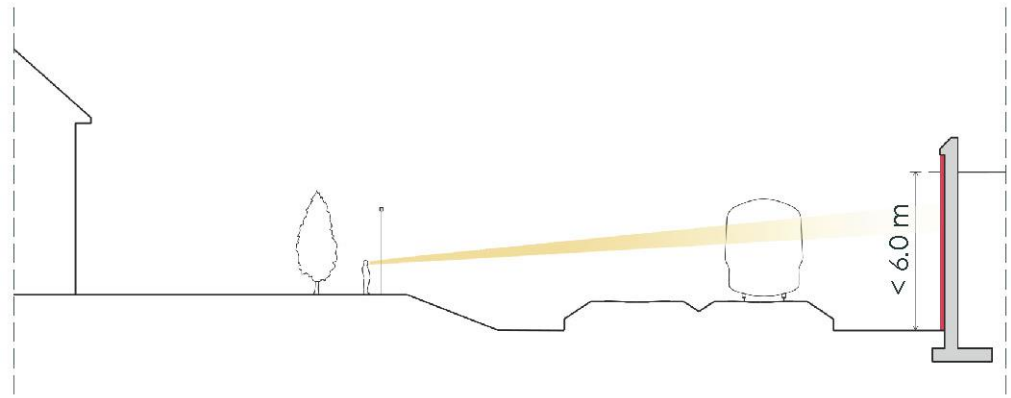


1



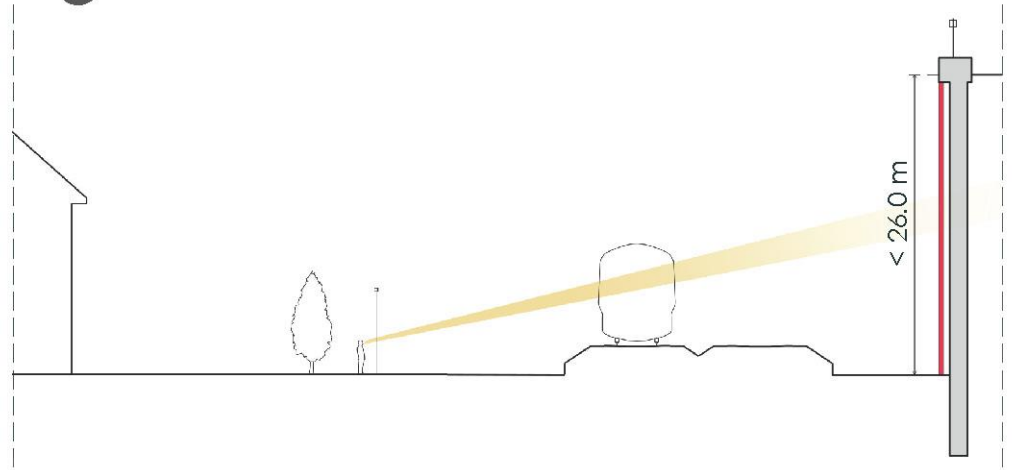
Precast Concrete (Typically  $< 3.0\text{ m}$ )

2



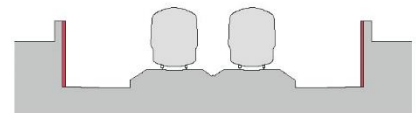
Reinforced Concrete In-situ (Typically  $< 6.0\text{ m}$ )

3



Embedded with Precast Concrete Lining (Typically  $< 26.0\text{ m}$ )

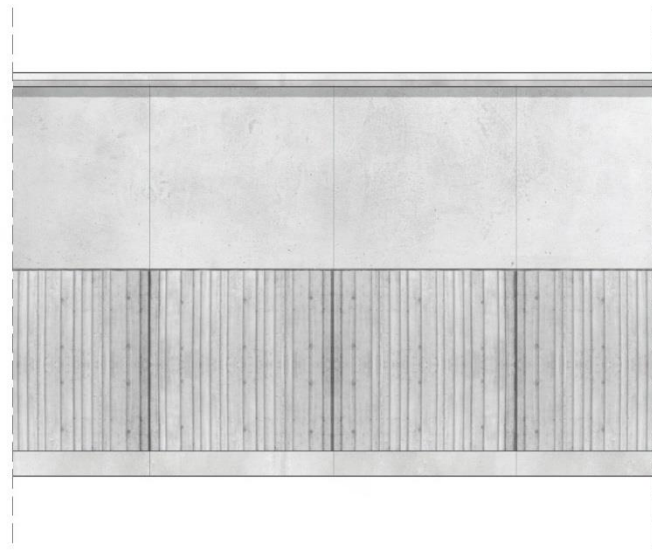
# HS2 CDE Retaining Structures – Architectural Treatment



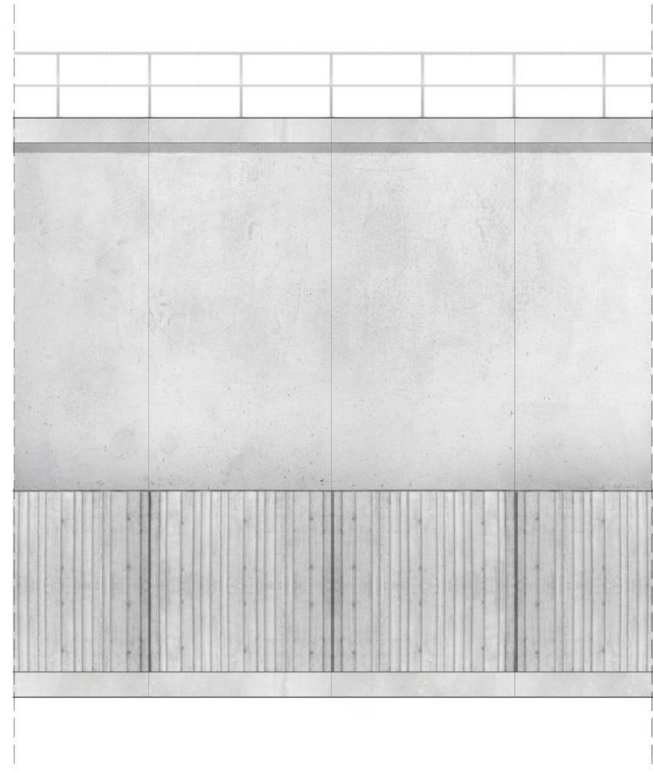
CUTS



Precast or In-Situ Concrete with Patterned Finish

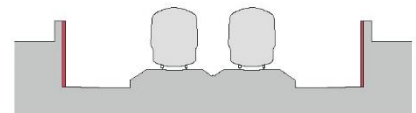


Reinforced Concrete In-situ with Patterned Finish to Bottom Panels

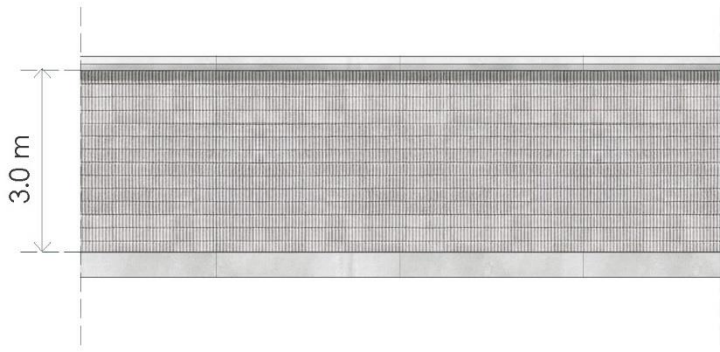


Embedded Wall with Precast Concrete Cladding, Patterned Finish to Bottom Panels

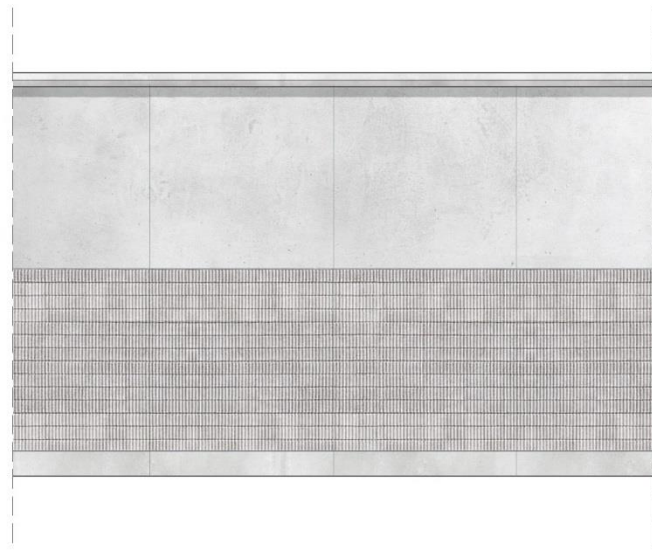
# HS2 CDE Retaining Structures with Noise Absorbent Material - Architectural Treatment



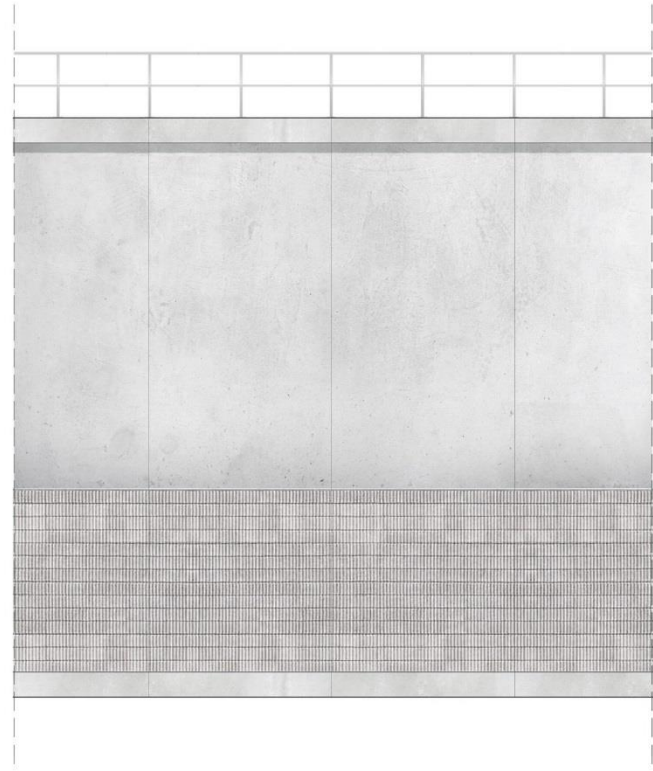
CUTS



Precast or In-Situ Concrete with Noise Absorbent Cladding

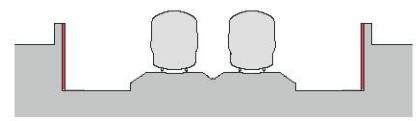


Reinforced Concrete In-Situ with Noise Absorbent Cladding to Botton Panels

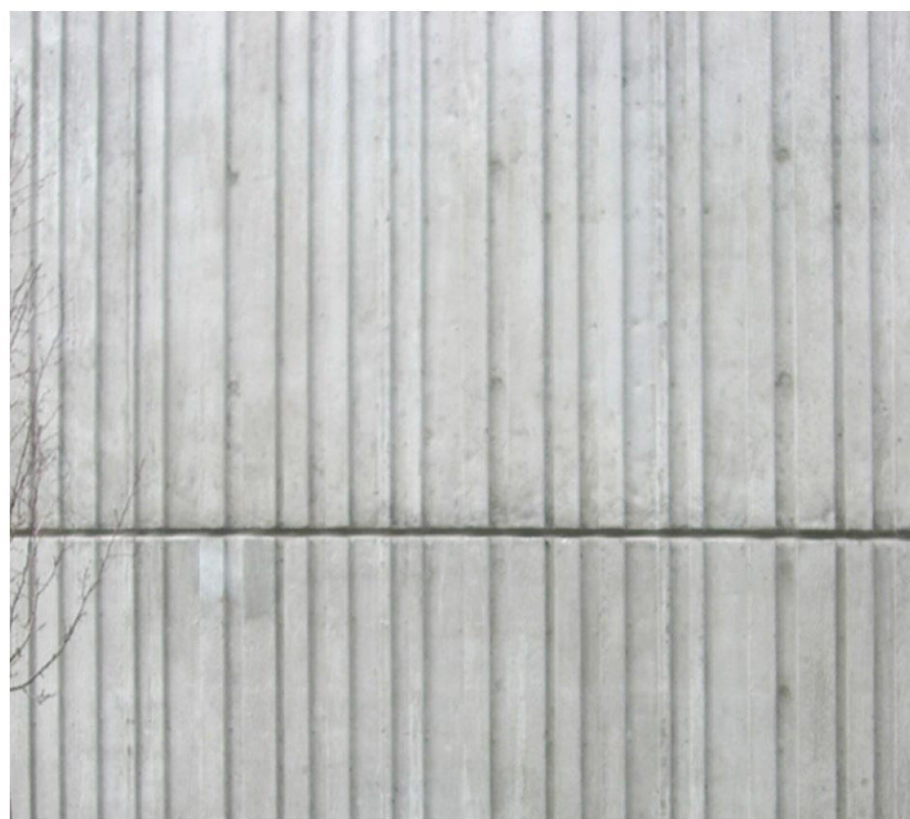


Embedded Wall with Noise Absorbent Cladding to Botton Panels

# HS2 CDE Retaining Structures – In Situ Concrete, Architectural Treatment



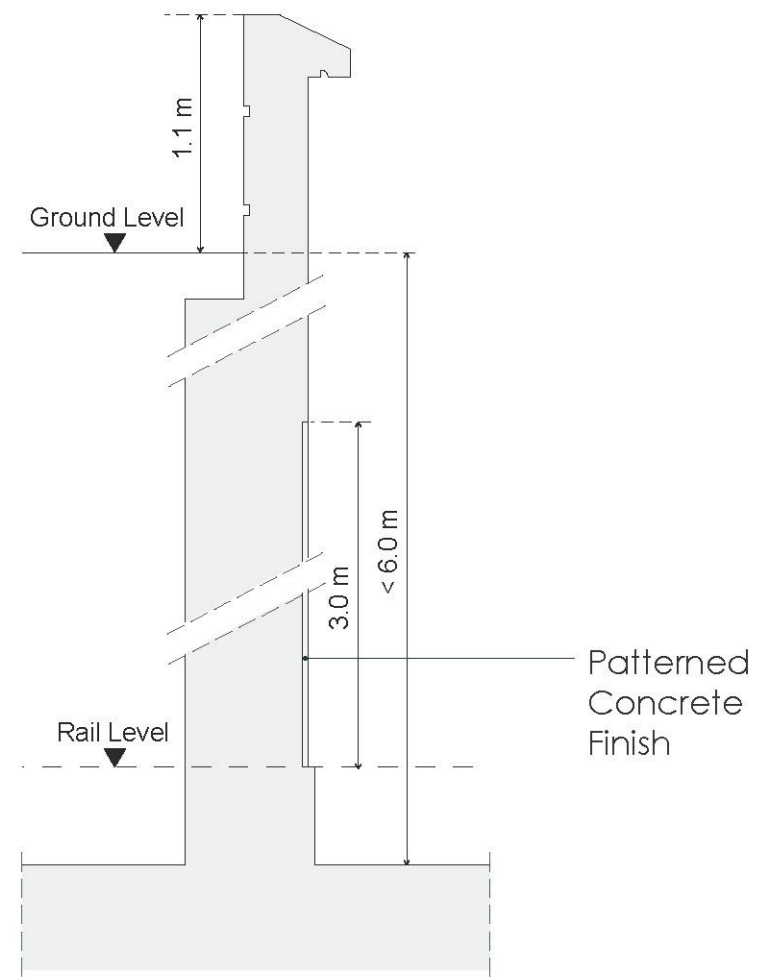
CUTS



*Patterned Concrete Detailed View*



*Plan*

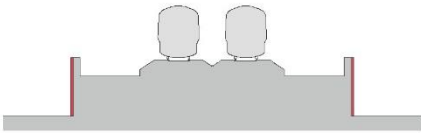


*Section*

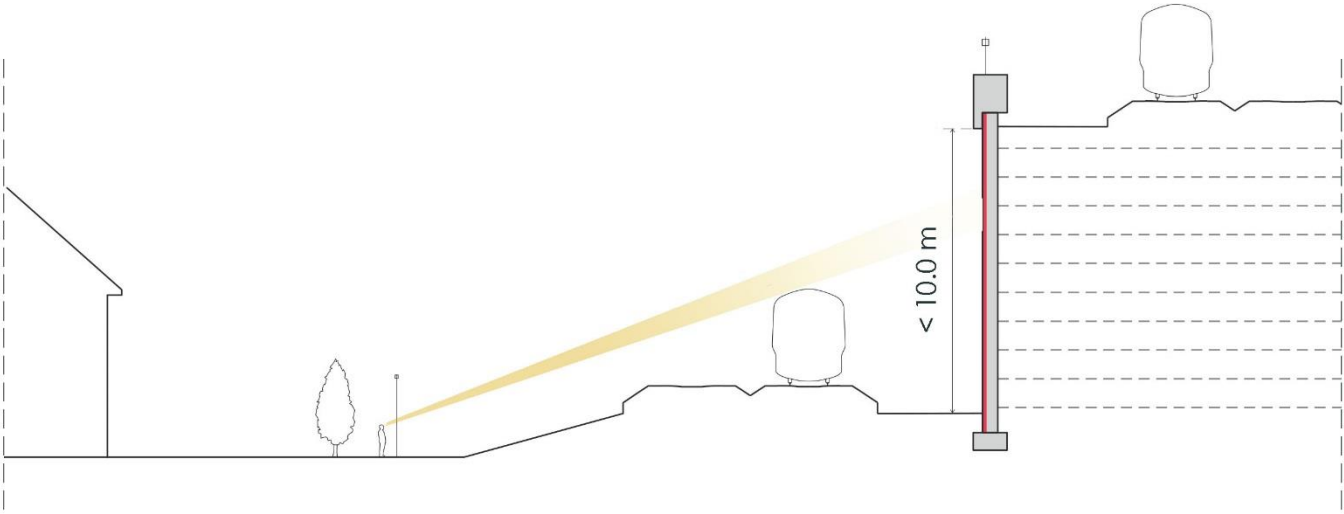
# HS2 CDE Retaining Structures – In Situ Concrete, Architectural Treatment



# HS2 CDE Retaining Structures – Embankments, Family of Types



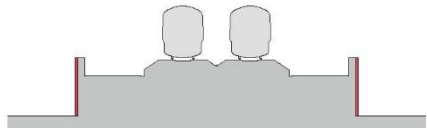
**EMBANKMENTS**



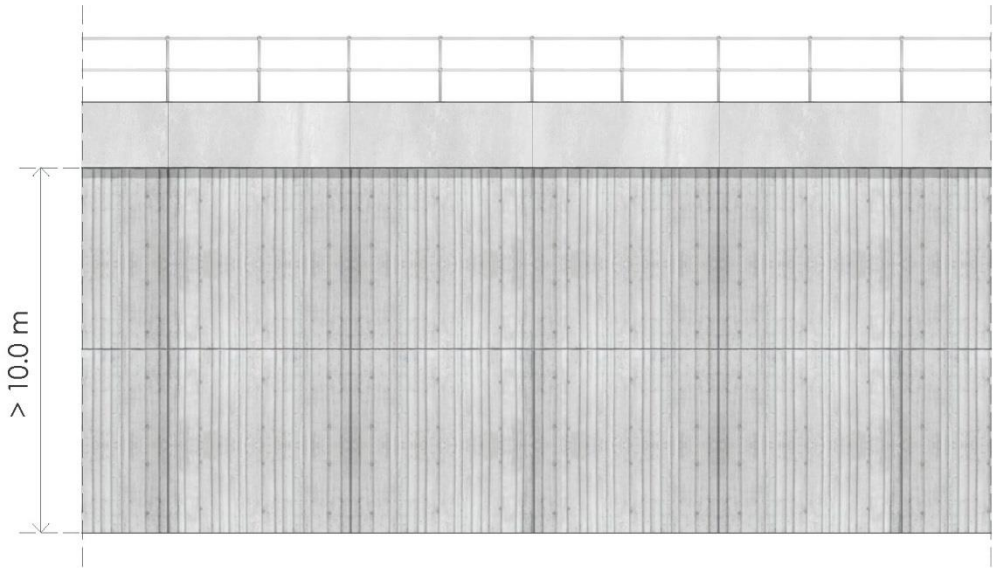
Reinforced Earth / Soil Wall (Typically < 10.0 m)



# HS2 CDE Retaining Structures – Embankments, Reinforced Earth Cladding



**EMBANKMENTS**



Reinforced Earth Wall with Precast Concrete Facing Panels



Similar Use of Reinforced Earth Wall

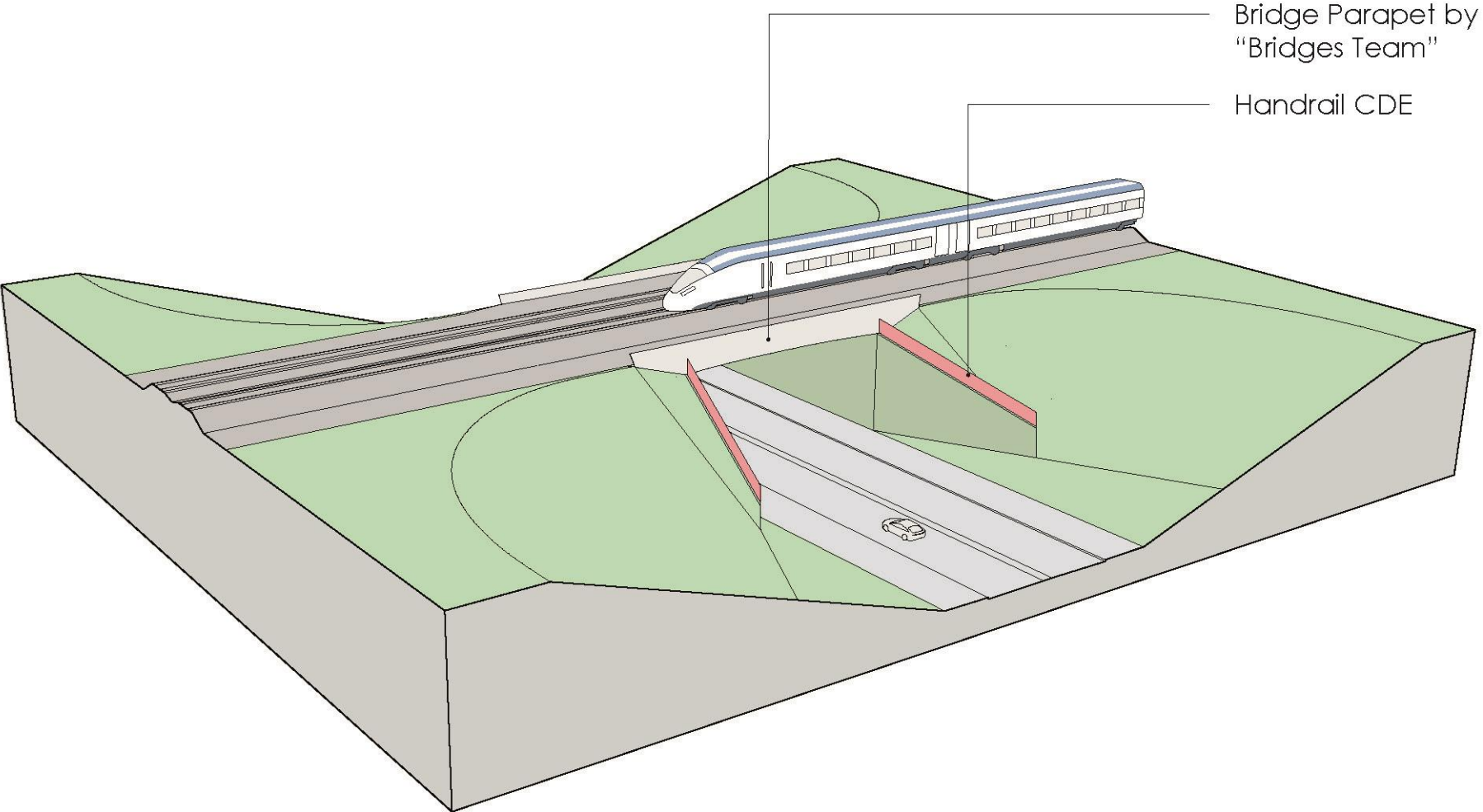
Handrails / Guardrails  
(Within Civil Works only)

# HS2 CDE Handrails – Technical & Scope Requirements

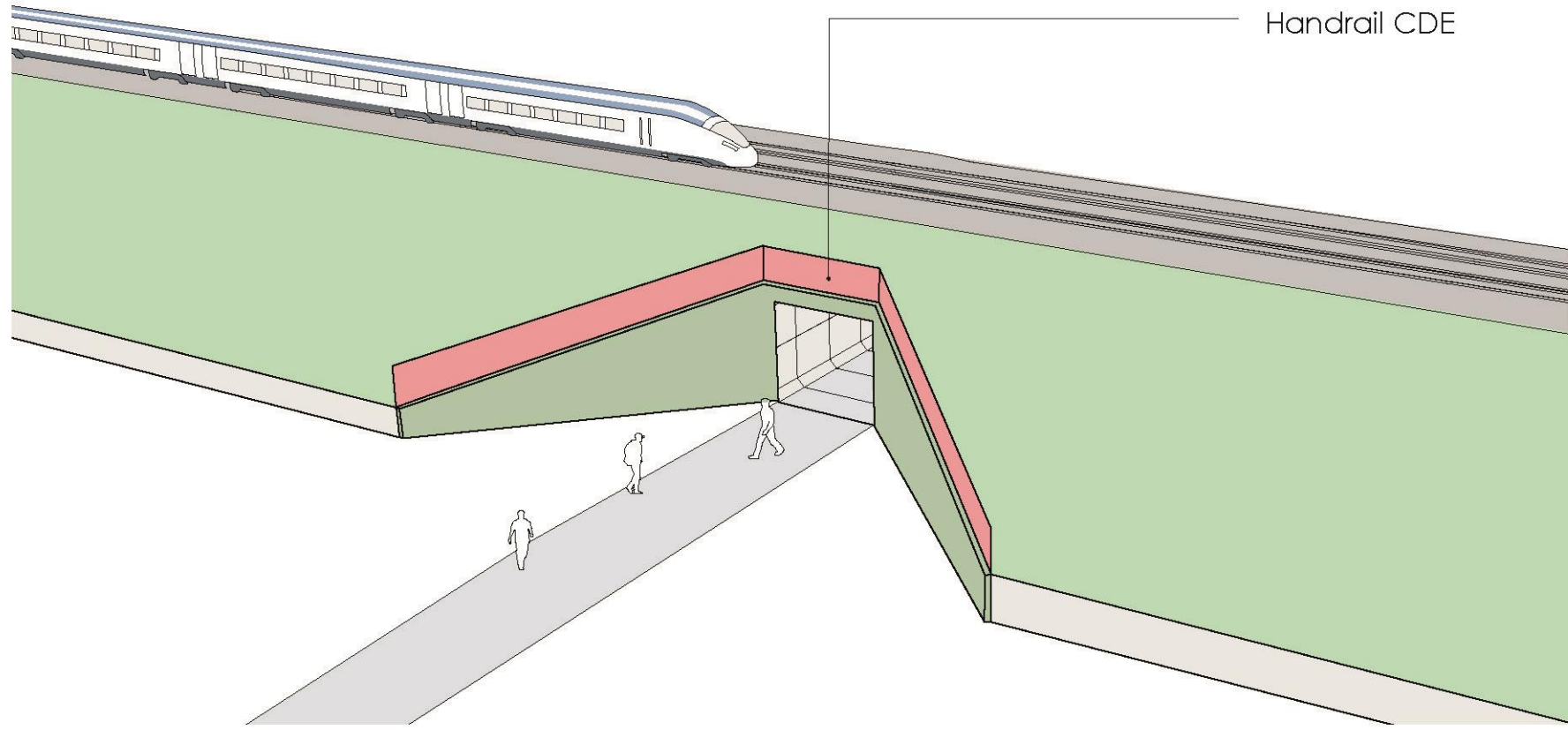


- Kee-Klamps system is considered not acceptable
- Handrails will be within security fences and will not be used by the public
- Fixed to concrete substrate
- Handrails on viaducts are excluded from this package

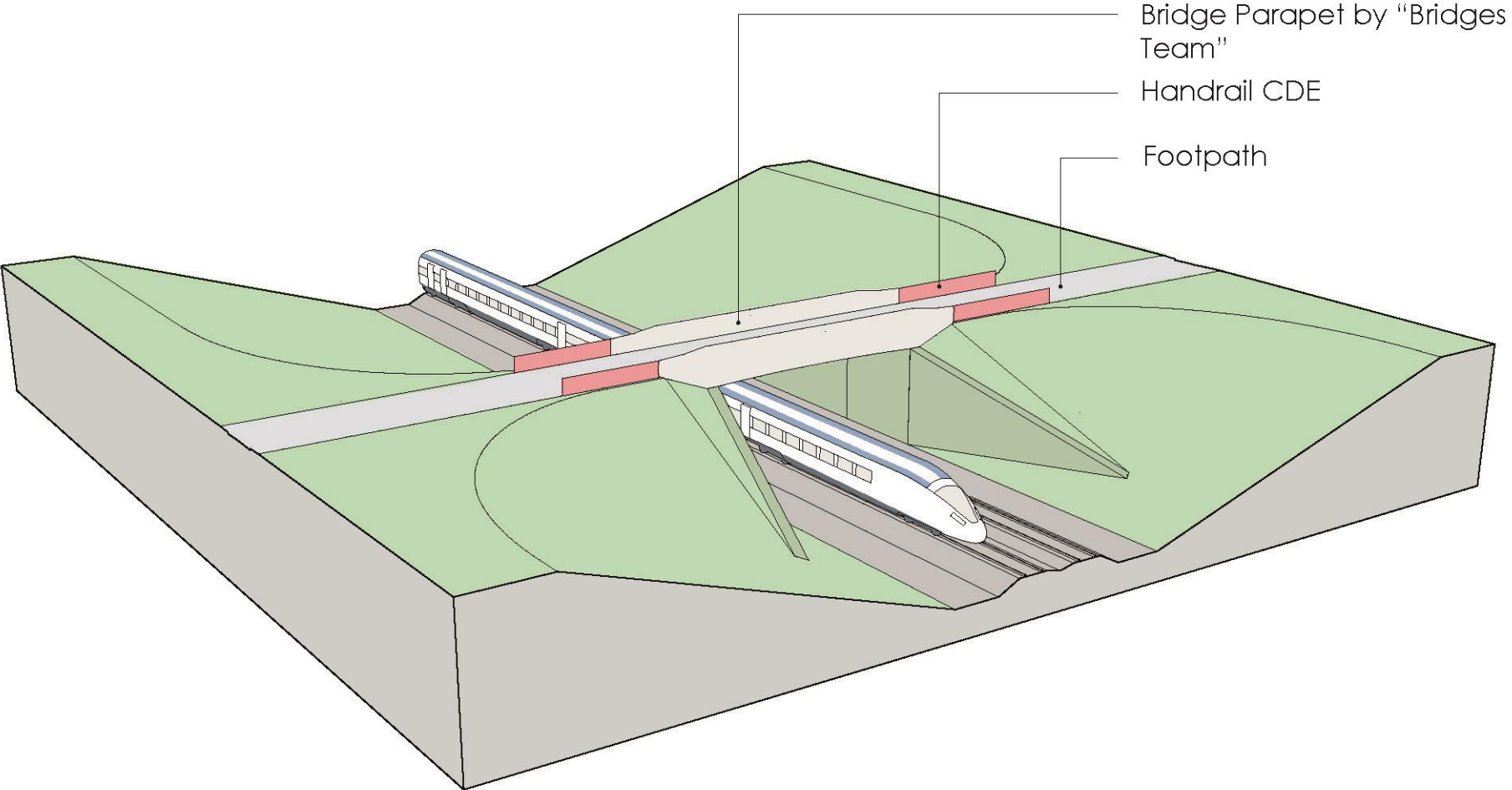
# HS2 CDE Handrails – Typical Locations: Underbridge Wing Walls



# HS2 CDE Handrails – Typical Locations: Underpass Wing Walls

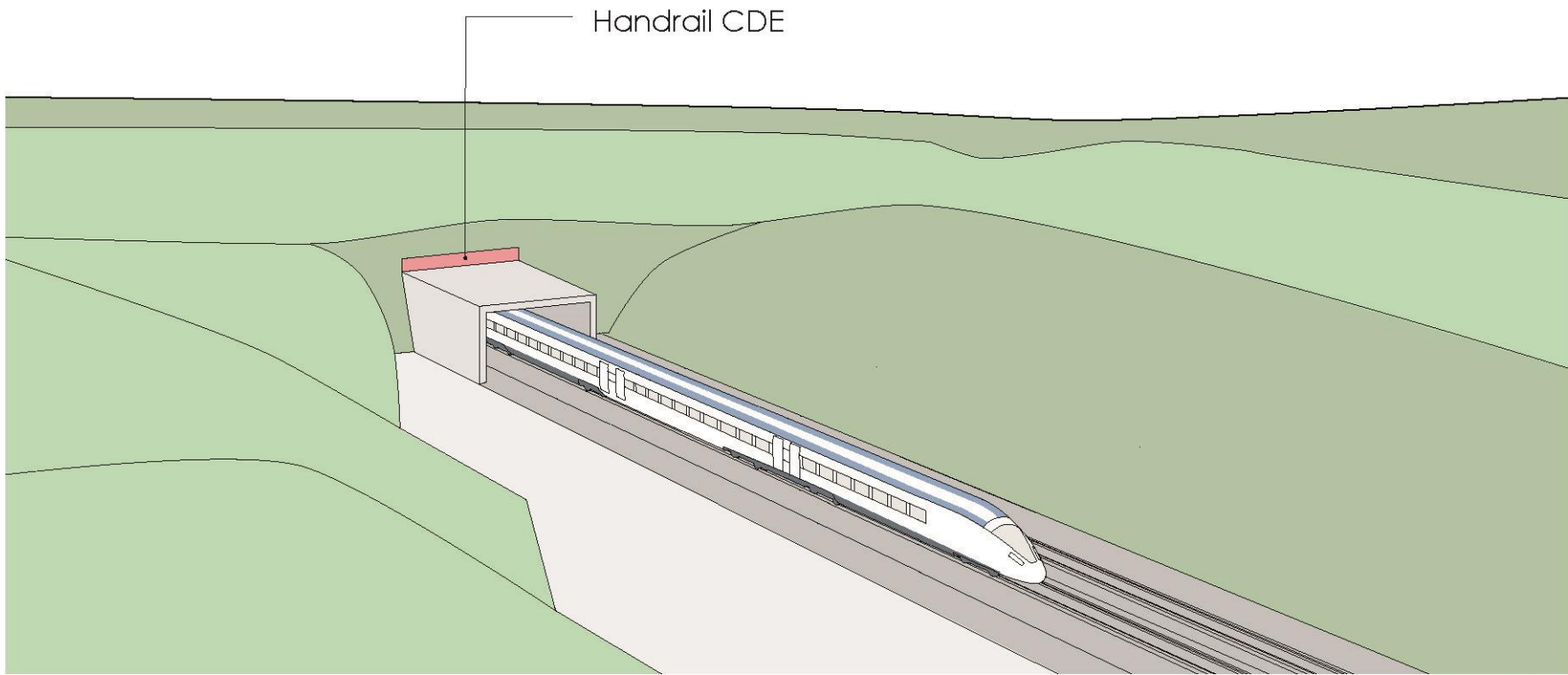


# HS2 CDE Handrails – Typical Locations: Footpaths leading to Footbridges\*

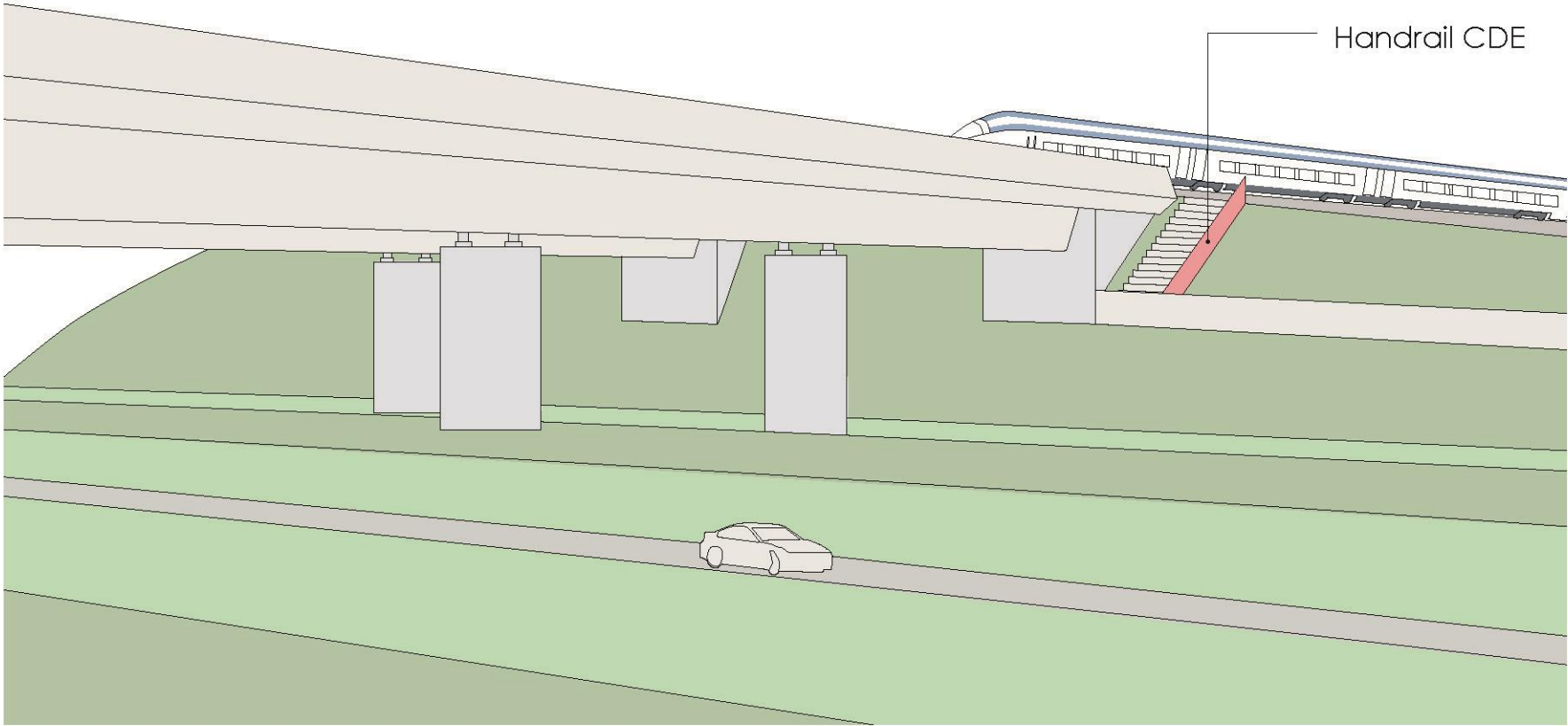


*\*there are 27 footbridges on the route*

# HS2 CDE Handrails – Typical Locations: Above Tunnel Portals

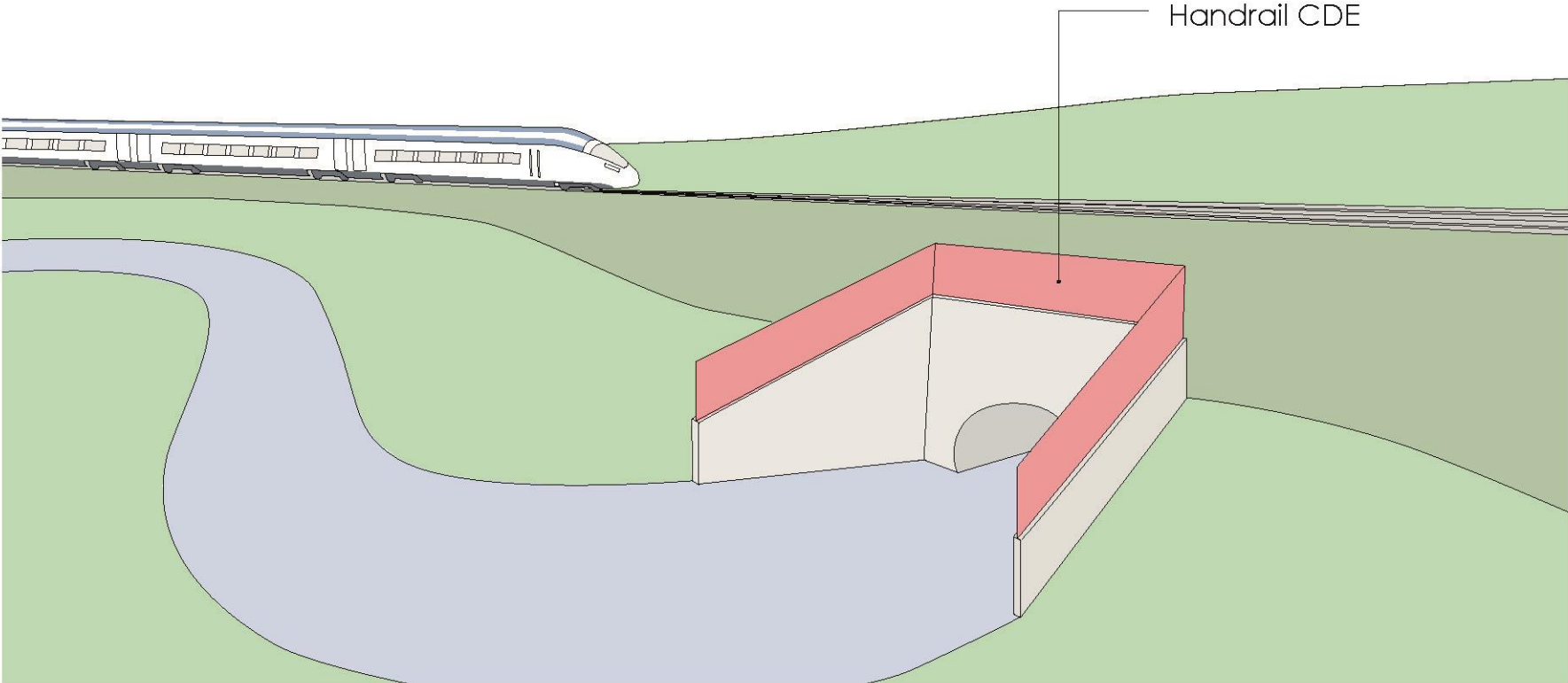


# HS2 CDE Handrails – Typical Locations: Stairs Adjacent to Bridges





# HS2 CDE Handrails – Typical Locations: Culvert Headwalls



**Handrails / Guardrails**  
Concept Options

# HS2 CDE Handrails – Concept Option: Rectangular Hollow Sections



# HS2 CDE Handrails – Concept Option: Flat Baluster Sections



# HS2 CDE Handrails – Concept Option: ‘Ball’ Type Balustrades



# HS2 CDE Handrails – Concept Option: Fibre Reinforced Polymer (FRP)



# HS2 CDE Handrails – Concept Options: Summary



**HS2 CDE Handrails – Concept Options: SIFT Criteria**

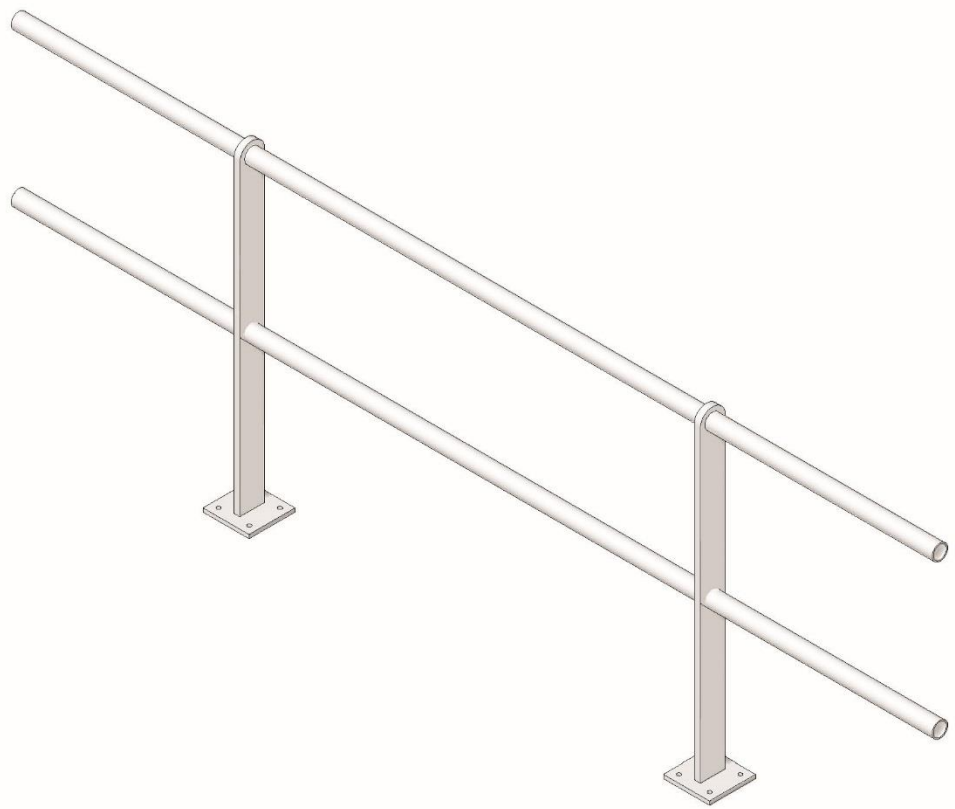
Construction Feasibility	Aesthetics	Vulnerability to Vandalism
Maintainability	Durability & Reliability	Initial Capital Costs
Whole Life Costs	Sustainability	Adaptability to Different Contexts



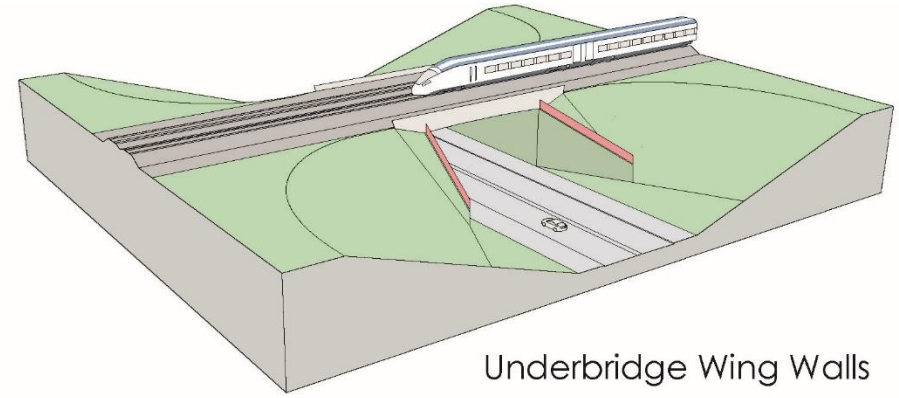
# HS2 CDE Handrails – Concept Options: SIFT Selection



# HS2 CDE Handrails – ‘Front of House’ Application (may be visible to public)

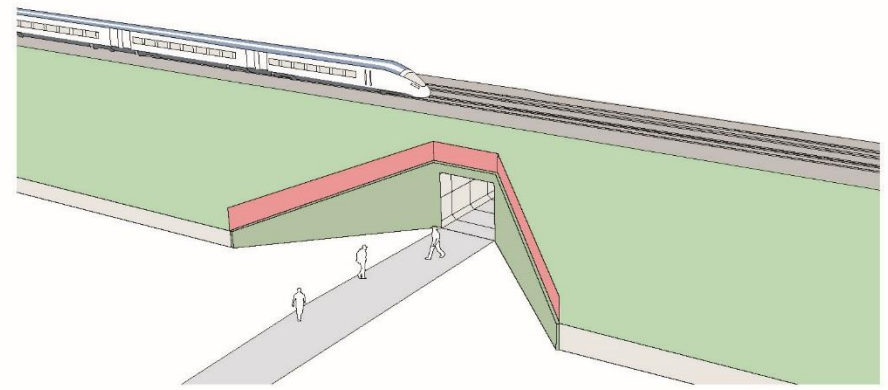


1



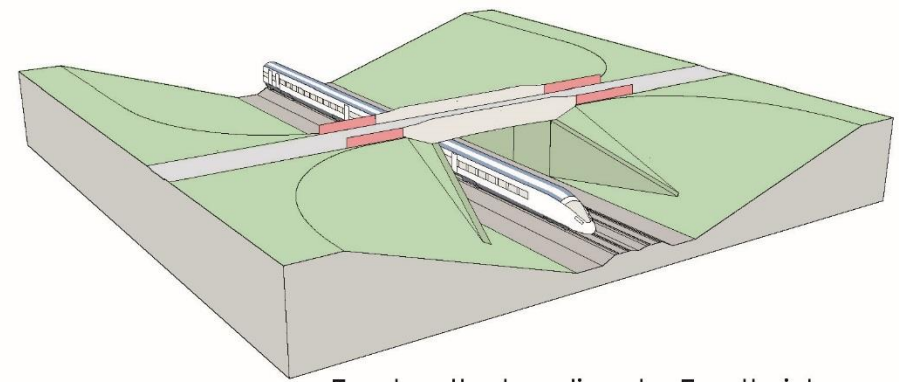
Underbridge Wing Walls

2



Underpass Wing Walls

3

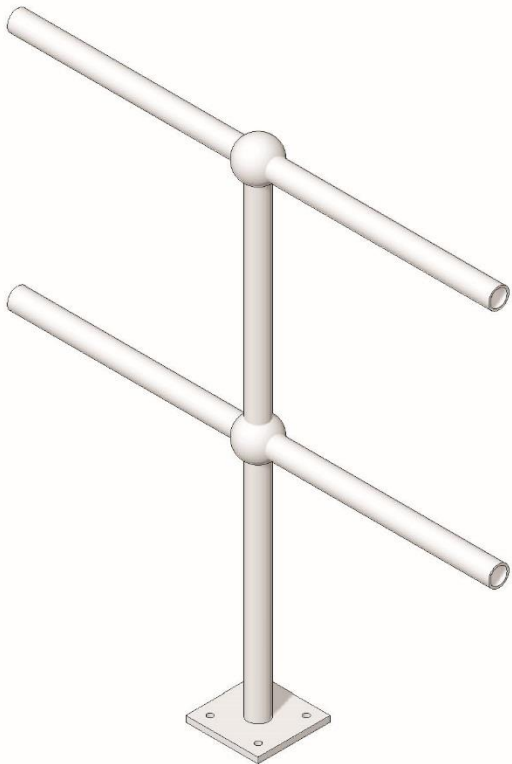


Footpaths leading to Footbridges

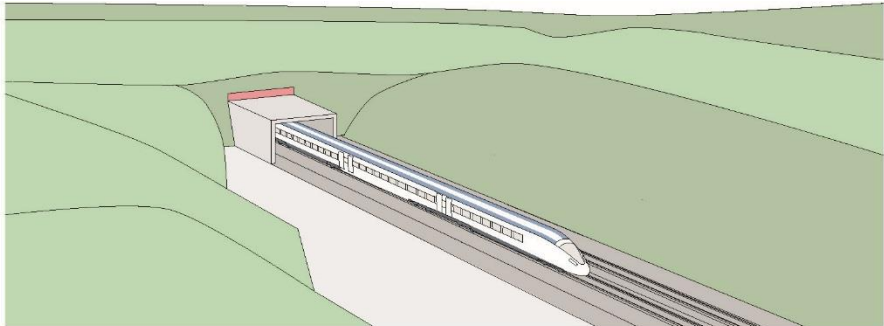
**HS2 CDE Handrails – ‘Front of House’ Application (Underbridge Wing Wall)**



# HS2 CDE Handrails – ‘Back of House’ Application (unlikely to be visible to public)

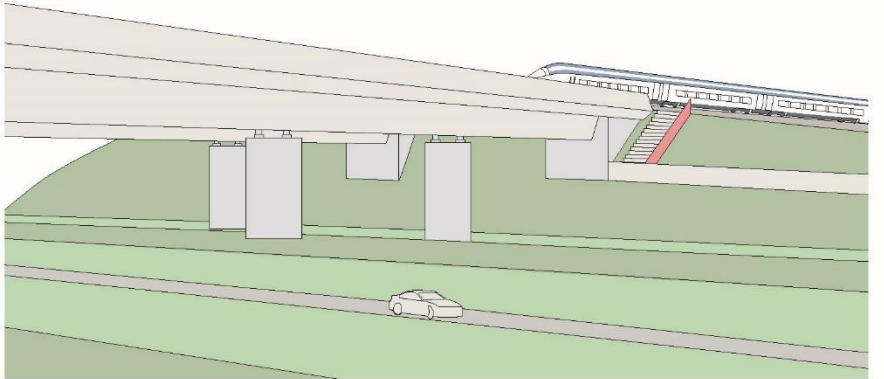


1



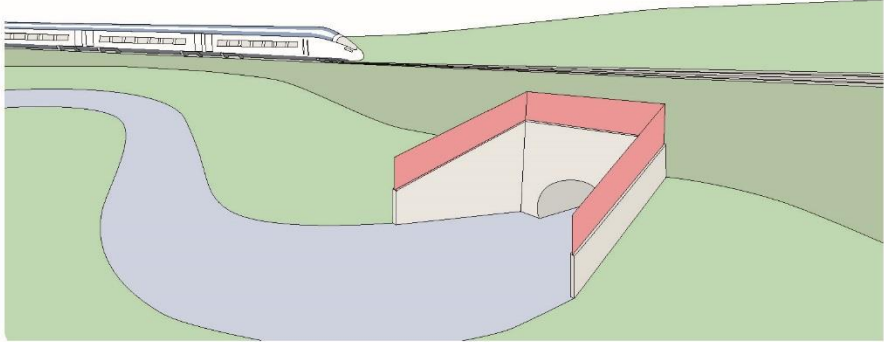
Above Tunnel Portals

2



Stairs Adjacent to Bridge

3



Culvert Headwalls

**HS2 CDE Handrails – ‘Back of House’ Application (Culvert)**



**End**

# ATKINS

Atkins Ltd  
Euston Tower  
286 Euston Road  
London  
NW1 3AT  
UK

+44 (0) 20 7121 2458  
[bob.barlov@atkinsglobal.com](mailto:bob.barlov@atkinsglobal.com)  
[www.atkinsarchitecture.com](http://www.atkinsarchitecture.com)