3.1 Stage A: Castlefield Viaduct and Water Street

3.1.9
Repair and restoration: Stage A (LBC Condition 2 - Schedule of works)

A Schedule of Repairs was submitted within the TWAO documentation (refer to Appendix 7 of the Heritage Assessment) which focused on the fabric repairs required for Stephenson's Bridge; 1830 Viaduct; Zig-Zag Viaduct and Water Street Bridge; 1845 Brick Bridge; and Castlefield MSJ&AR Viaduct. The extents of repairs required, as indicated to the schedule, were determined by a fabric condition survey undertaken by the Morton Partnership and this forms the basis for the proposed scope of fabric repairs.

This scope has been reviewed since the TWAO documentation. This review has consisted of additional desk based studies and site surveys. The site surveys are being undertaken in two stages. The first stage was undertaken from ground level, and the second stage will be following vegetation removal and once scaffold access has been provided to enable up close inspection to all areas. It is therefore anticipated that the extents of repairs required may be greater than currently assessed.

It is agreed that the extent of repair works is closely monitored on site and that as-built records are produced by the construction team which confirm the final extent of fabric repairs. The as-built records will be provided as part of the building record.

Two packages of drawing and specification information have been prepared to define the current asssessment of the repair and restoration work. These drawings are 100201 to 100204 (inclusive) and those listed on pages 43 - 45 of this document.

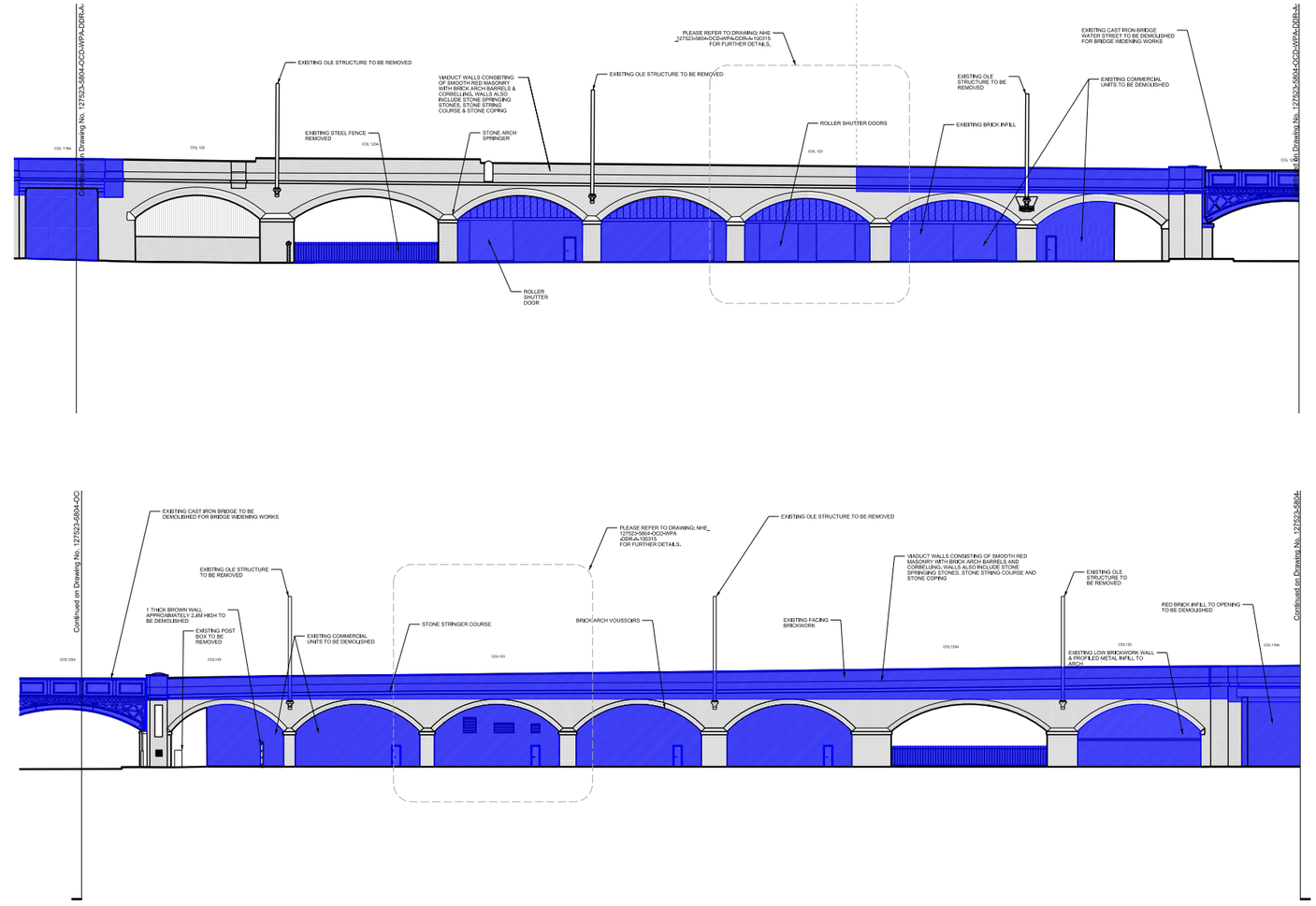


fig 3.1.xxi indicative diagram of fabric repairs

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.10
Equipment: COL 112 and COL 117

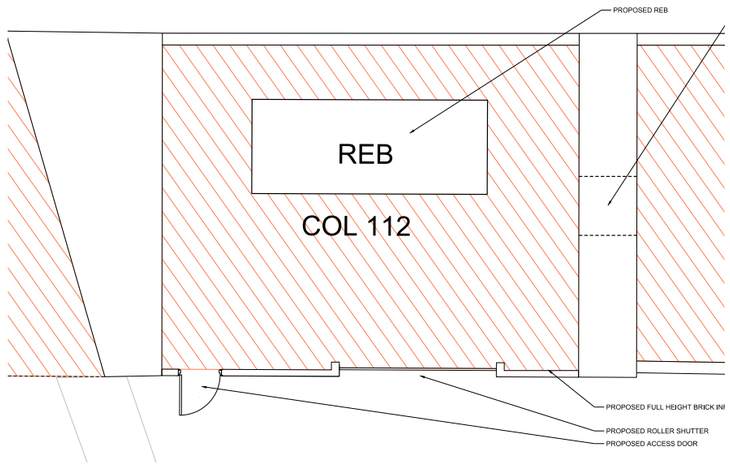
As part of stage A works ancillary electrical equipment (housed in a structure known as a Remote Equipment Building) is required. The aim of the project is to keep as much rail infrastructure and equipment at high level as possible, however an REB is too large to be positioned at track side so it is proposed that two will be located within COL 112 and 117.

These locations are proposed to minimise the visual impact of these insertions into the viaduct. The location is constrained by cable lengths and proximity to track junctions and hence their approximate locations are defined. Within the areas required, COL 112 and 117 have been chosen as they can accommodate the various equipment relatively discreetly.

Whilst the REB itself is a single structure it is accompanied by a number of free-standing elements and cable troughs. To minimise the visual clutter that could result, both locations will be enclosed (to a varying degree) to screen views of the interior of the arch from neighbouring residential properties.

COL 112 is an arch which is already enclosed with a brick wall on both elevations. The wall to the southern elevation is to be demolished to accommodate the new equipment; this wall will then be replaced with a new brick infill.

COL 117 is the first arch of the viaduct which will be widened with a new concrete structure (see section 3.1.11 below).



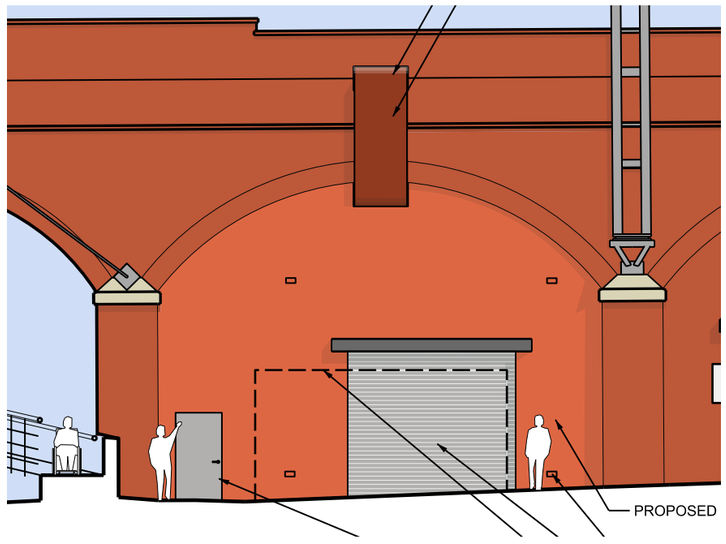
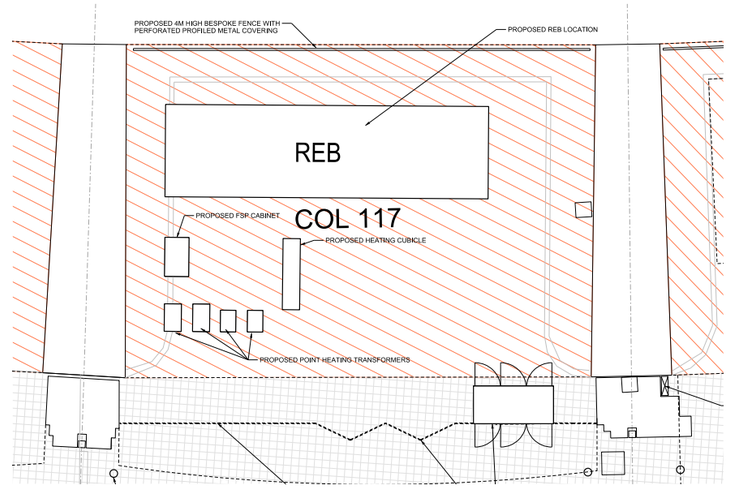


fig 3.1.xxiii REB in COL 112 plan and elevation



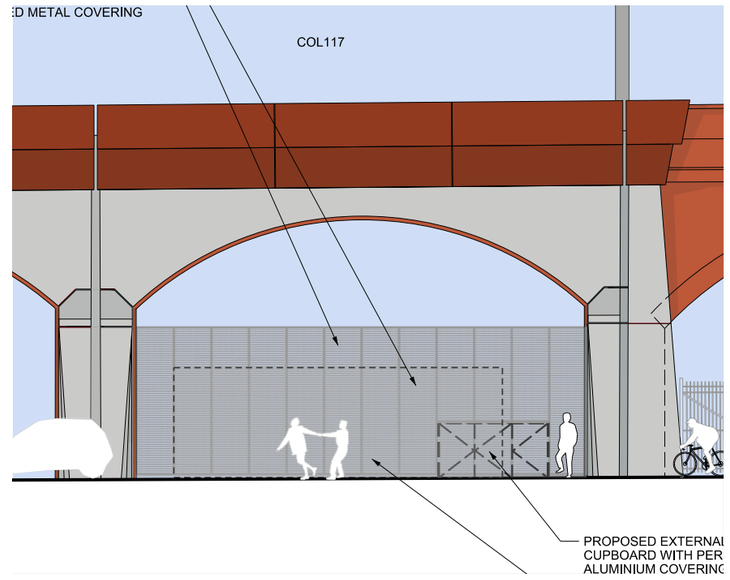


fig 3.1.xxiv REB in COL 117 plan and elevation

fig 3.1.xxii Remote Equipment Building

[for further details of this area refer to drawings 100102, 100210 and 100211]

3.1 Stage A: Castlefield Viaduct and Water Street

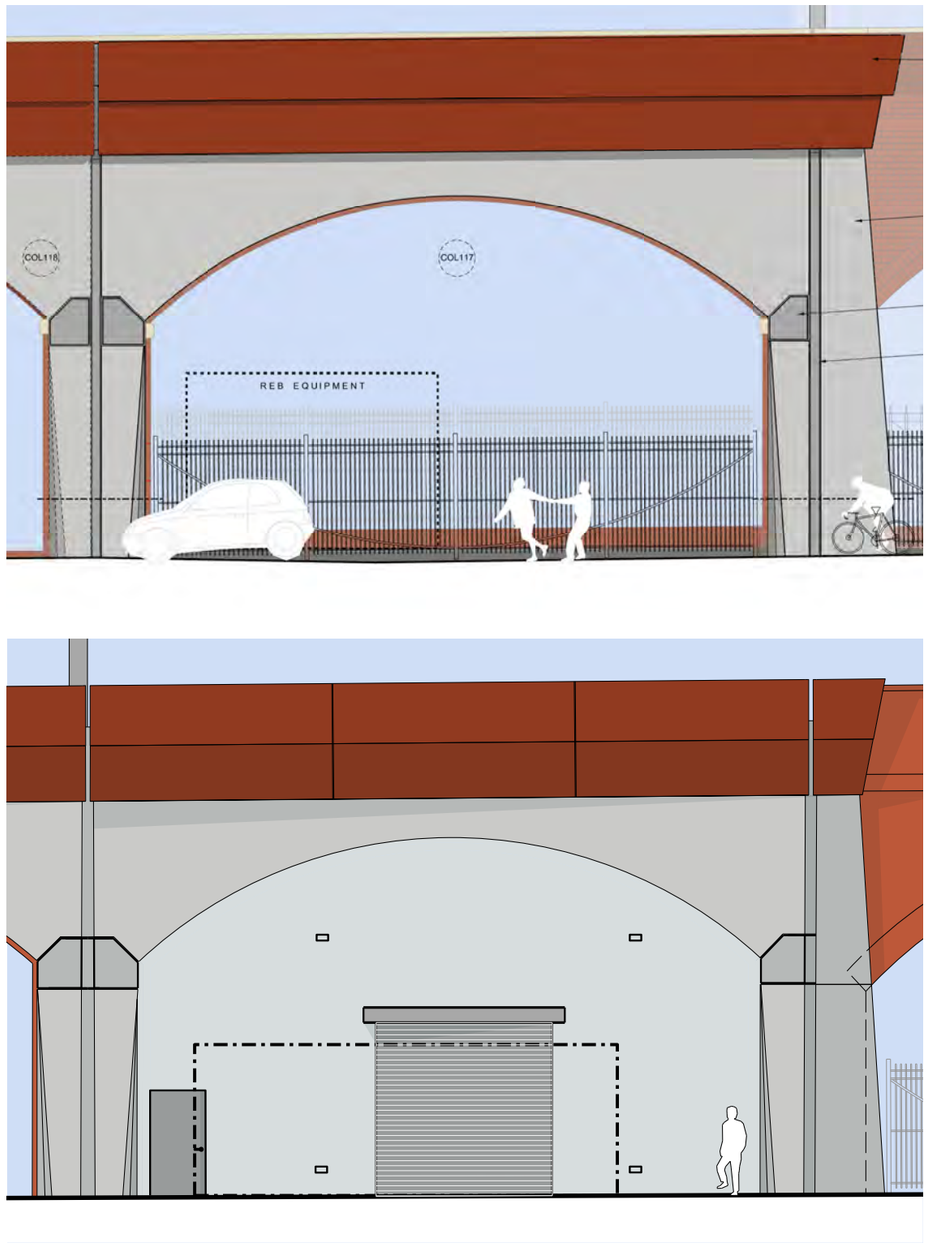


fig 3.1.xxv consideration of options for infill of arch COL 117; top left - railings as other arches, top right - part height screen, bottom left - solid infill, bottom right screen to springing point of arch

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.11
Arch widening: COL 117

The southern end of the site is the location of the first physical intervention of the Ordsall Chord in the public realm (fig. 3.1.xxvi). The first arch widening location forms the end of the structure which ultimately meets the Castlefield Bridge over the River Irwell. For structural reasons this end bay of the structure is required to 'prop' the rest of the concrete structure and hence the outside face of the concrete splays outwards at this point. The structural requirements of this position are proposed to be reflected in the aesthetic treatment, with the splayed angle acting as a 'bookend' to this end of the concrete (fig. 3.1.xxvi).

Sections 3.1.6 and 3.1.12 explain the general principles of how the proposed arches relate to the existing, acting as a frame which does not overlap the original brick vaults behind. To maintain this respectful relationship in this location the splay described above a gradually folded back towards the face of the viaduct such that the concrete meets the brick with a vertical alignment.

As with the rest of the viaduct, the concrete upstand with a steel parapet, which is expressed at this end as individual sheets whose thickness is legible when viewed from below. Each of the two steel bands terminates slightly beyond the end of the concrete structure. The concrete face runs up behind the lower of the two to form a kerb detail and weathering steel railings will close off the gap behind the upper band and the existing brick parapet to the viaduct. These railings will fan out in their vertical orientation from parallel to the viaduct out to the angle of the parapet cladding (fig. 3.1.xxvii)

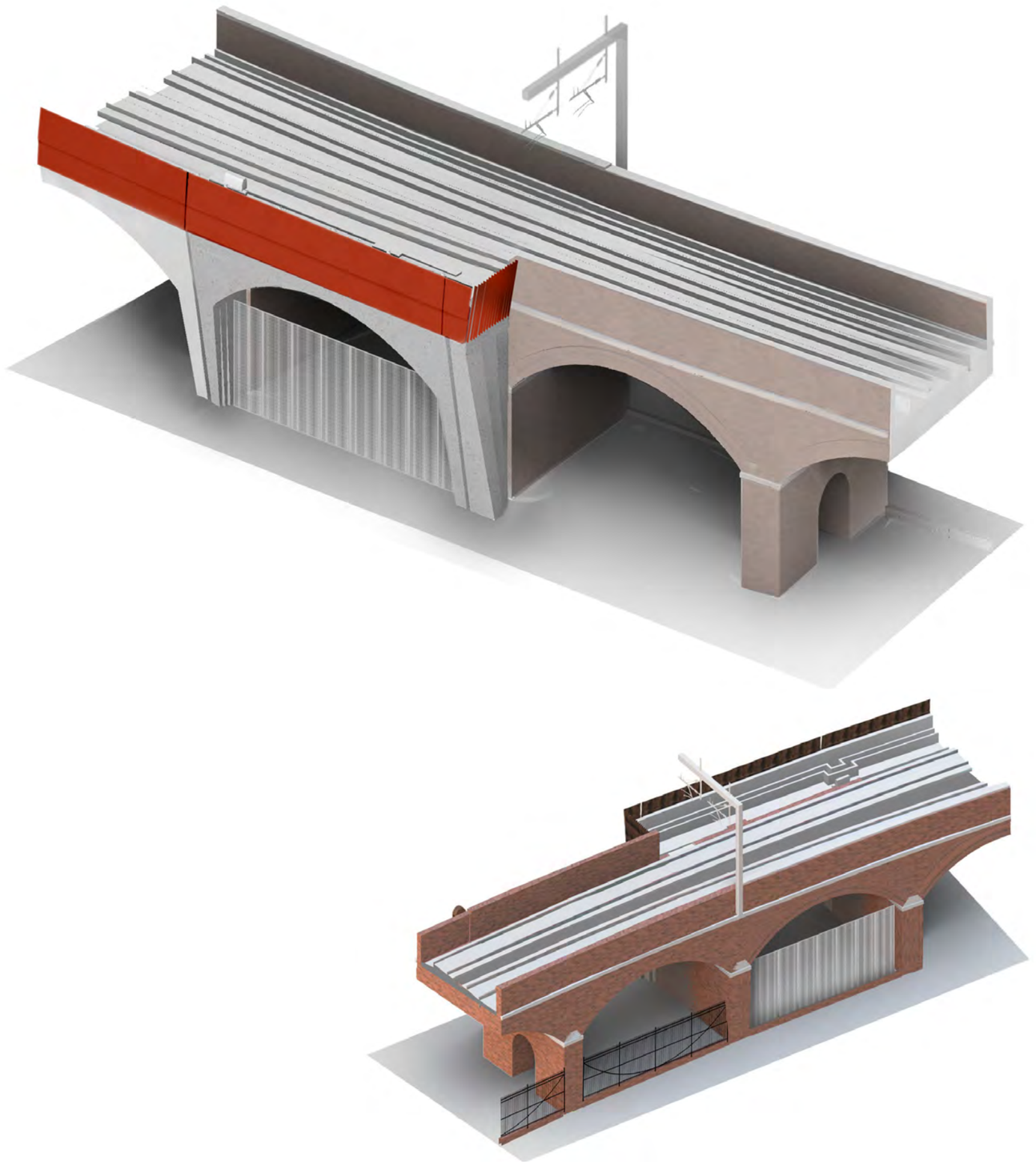
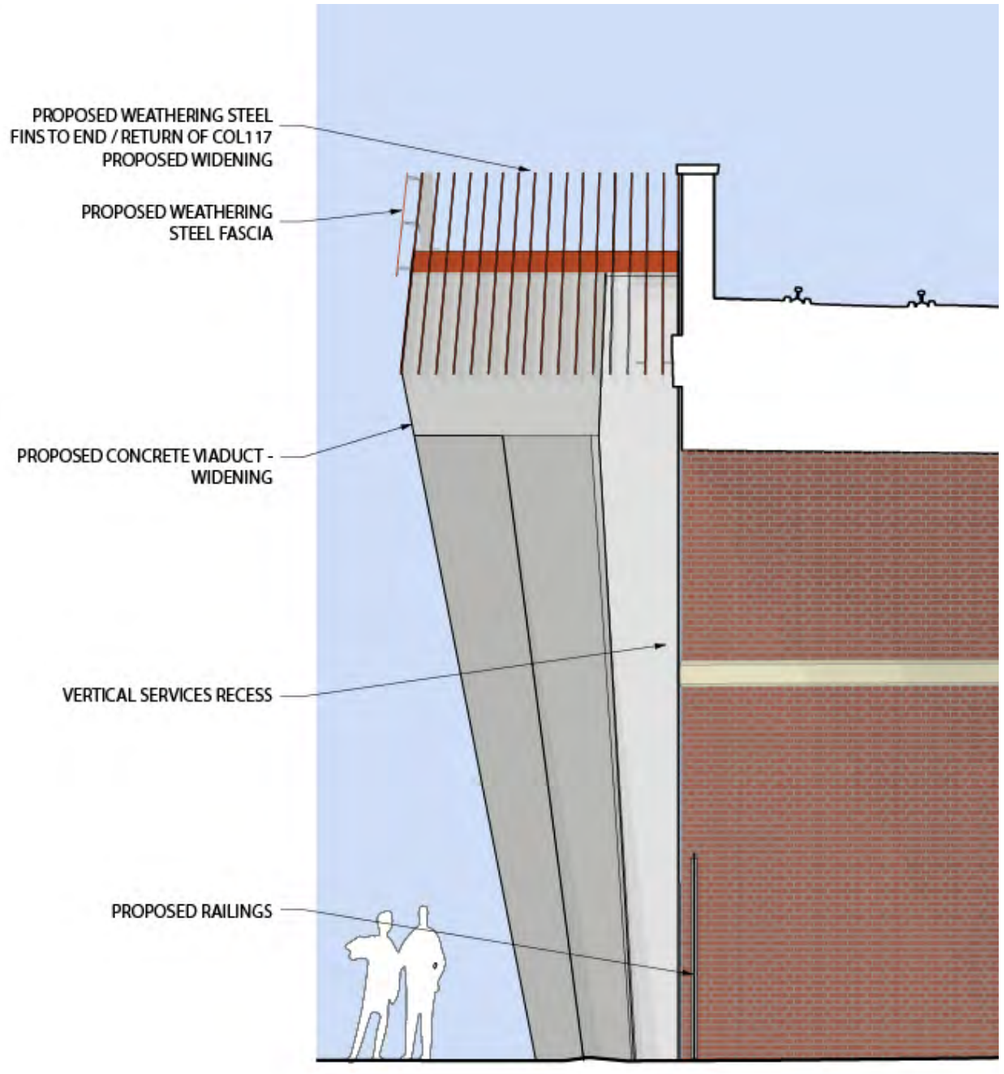


fig 3.1.xxvi COL 117 south elevation (end return to terminate concrete arches) and north elevation (unchanged)

[for further details of this area refer to drawing 100301]

3.1 Stage A: Castlefield Viaduct and Water Street



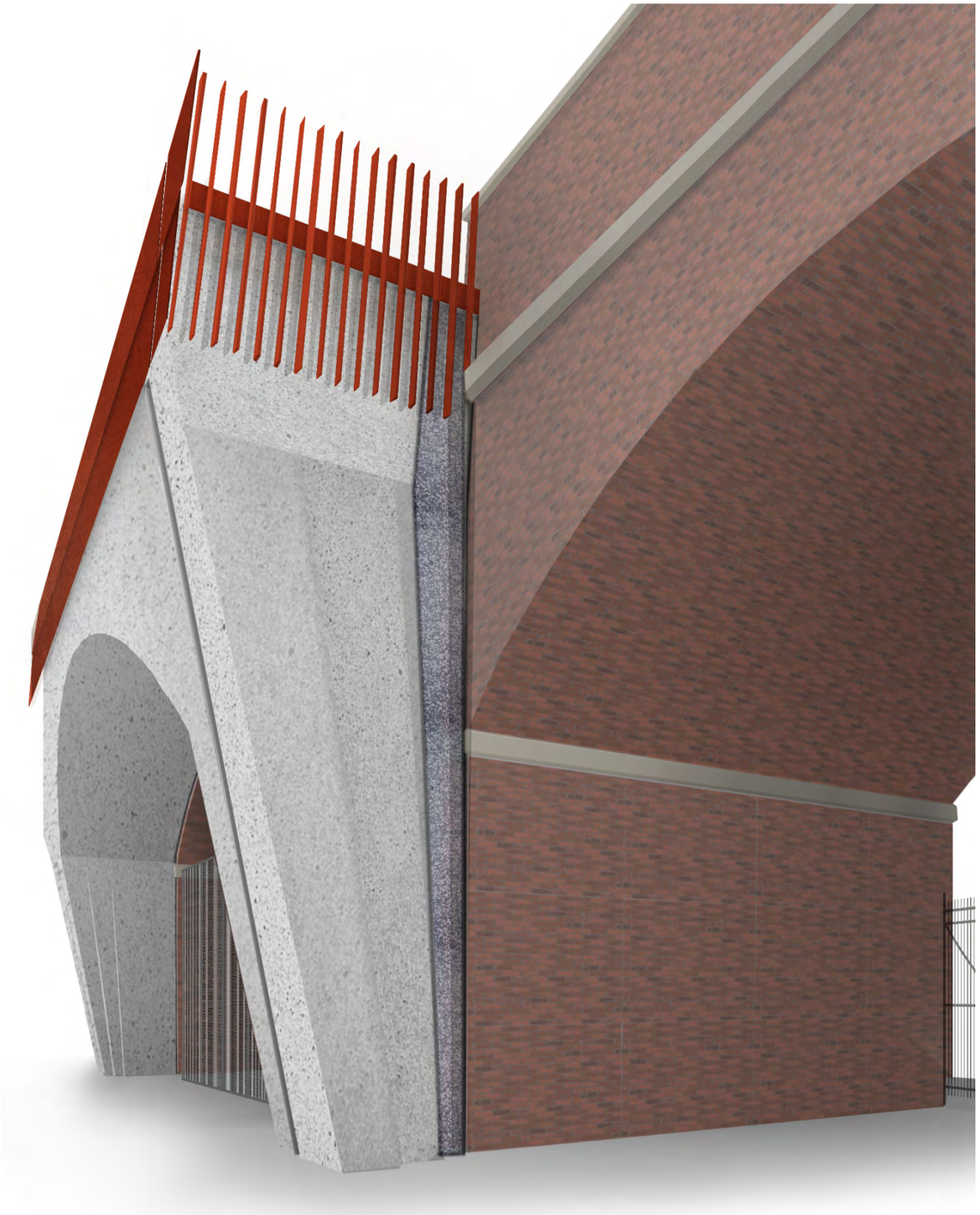


fig 3.1.xxvii concrete widening end elevation and perspective

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.12
Arch widening: COL 119A

In this location the existing viaduct has a flat slab structure which forms a break in the original construction of the brick vaulted viaduct structure. This existing structure will be replaced with a concrete structure with a largely similar construction whose appearance will be substantially the same as the current structure.

To the south the concrete bridge will span between the concrete piers; the bridge will sit on continuous bearing shelf, formed as the existing stone bearing. The angle and design of the bridge aligns with the neighbouring concrete widenings, with a weathering steel parapet tying into the neighbouring parapets

To the north the brick parapet is to be removed with a new cast concrete parapet, in matching relief to the existing brick parapet, continuing the appearance of the neighbouring structures whilst appearing modern in manner.

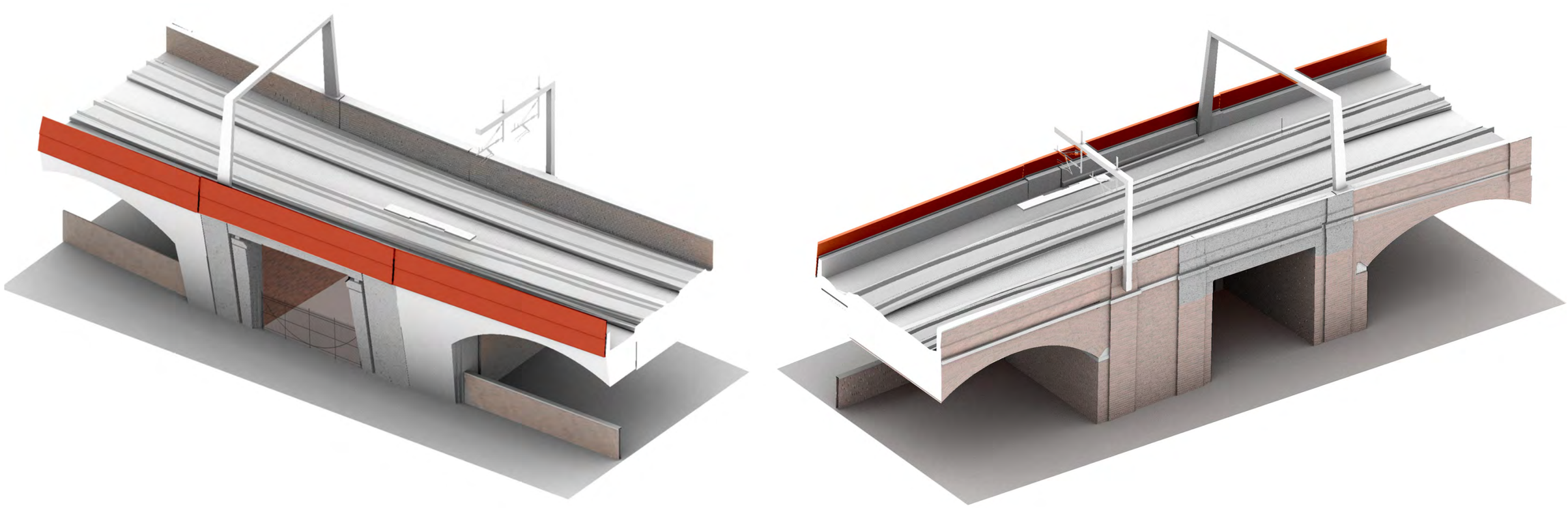


fig 3.1.xxviii 119A Bridge span, north and south elevations

[for further details of this area refer to drawings 100305 - 100309]

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.13
Under-ringing to existing viaduct: COL 120A

The underside of COL 120A was originally hidden behind protective sheeting (concerns about its condition led to under-ringing forming part of the original TWAO application drawings). Monitoring of viaduct movements indicated that movements in this arch barrel were excessive relative to other spans, and the sheeting was removed. This revealed a series of significant cracks running longitudinally along the arch barrel, giving rise to serious concerns about the safety of this span. An emergency repair was undertaken, comprising conventional “cross-stitching” of the cracks, however, this was not effective, and the cracks have in several cases re-opened. The safety of the span is currently being assured by means of regular monitoring of the cracks to ensure they do not degrade further. This, however, is not an acceptable solution beyond the short-term, and it is vital that the arch be made safe as soon as possible.

The degree of movement in the arch is also of sufficient magnitude that the waterproofing and slab solution cannot cope with this level of movement. It is therefore essential not only to strengthen the arch barrel, but also to reduce the degree of its movement. The brick arch barrel cannot be considered to have any long-term capacity to bear railway traffic, and the proposal is therefore to render it effectively redundant by providing a new concrete arch barrel below. This new concrete arch will restrict the movement of the brickwork, but must also be designed to carry all railway loads. It is essentially a new bridge span below the existing barrel, which is retained unaltered, thus preserving its historic fabric, but assumed to be structurally redundant. An alternative solution would be to install steel ribs to support the arch, but these would not have sufficient stiffness across the arch barrel’s width to restrict its movement.

The concrete under-ringing is therefore the most appropriate solution, creating a new span which is visible and can be easily inspected to ensure its continued safety. The design deliberately leaves the edges of the existing arch rings exposed, and it is currently proposed to use a precast under-ringing arch to ensure it is compatible in appearance with the adjacent widening.

With all other arch widening locations the relationship of concrete to brick is based on a one-brick offset when viewed in elevation. A similar strategy is proposed for the concrete arches proposed beneath the existing viaduct, in that the outer edge of the concrete is set back from the face of the brick when viewed from below (see fig. xxix for detail).

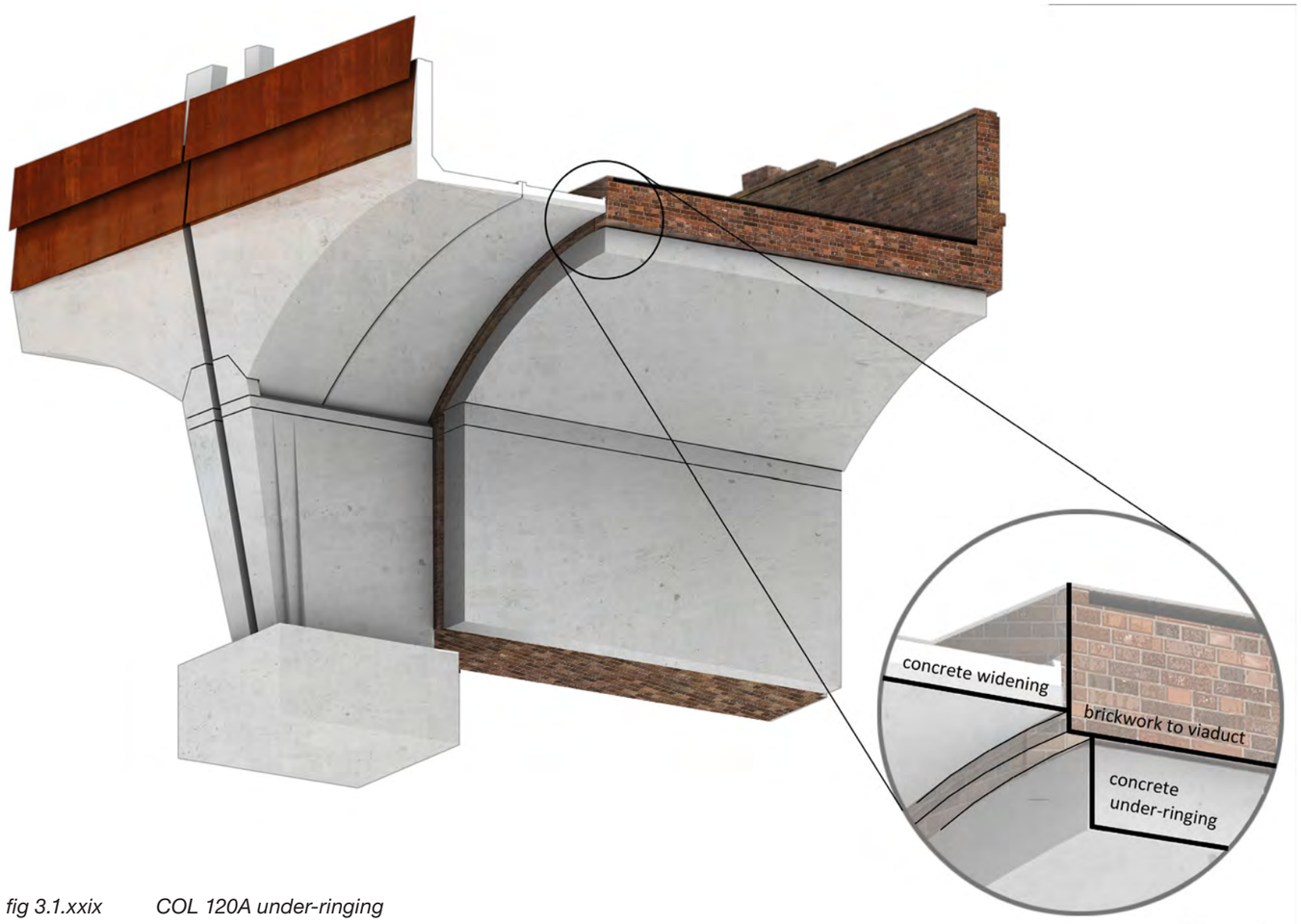


fig 3.1.xxix COL 120A under-ringing

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.14
Arch widening: COL 123

The Northern Hub project proposes a number of locations where the existing masonary viaducts will be widened. These are in extremely significant locations and hence the quality of design and materials is critical to their success as elements in their historic and townscape context.

A number of common themes are proposed, with specific details developed for particular locations. All of the widening structures (fig. 3.1.xxx) are to be a combination of concrete in in-situ (the pier from ground level up to the springing point of the arch) and pre-cast finishes (the arch intrados (barrel) and spandrel (outside canted wall). COL 123 is a typical archway where an existing infilled arch has been extended.

The surfaces of the concrete will be of a colour, texture and surface variation that enables these two production methods to sit alongside one another comfortably. To break up what could otherwise become unremitting expanses of a single material across a planar surface, folds are proposed to the corners of the concrete piers (which is a strategy further exploited at key locations). In addition to this, steel and aluminium detail divides and define surfaces.

The concrete pleats will form a regular motif to the end of each arch widening pier. When viewed at street level (particularly in elevation) the pleats will taper the structural mass as it reaches the ground, lightening its visual appearance. The outer face of each pier will also be broken by a vertical metal channel inset into the concrete; this will further reduce the physical scale of the concrete elements at the crucial zone where pedestrians will interface with the structure. This metal channel will combine a drainage route down from the railway above and a services route up from street level to lighting, etc. in the arches.

The metal finishes proposed for this area have a hard-wearing, direct expression of each material. Natural mill finish aluminium and galvanised steel both provide a long-lasting finish that improves with age and that requires minimal maintenance. Whilst both are metals, they have surface variation which will enable them to sit comfortably alongside the textures of the adjacent concrete and weathering steel elements.

At the impost (or springing point) of the arch spandrel, an inset detail will be formed to seperate the outer (insitu) face of the pier from the outer (precast) face of the spandrel.

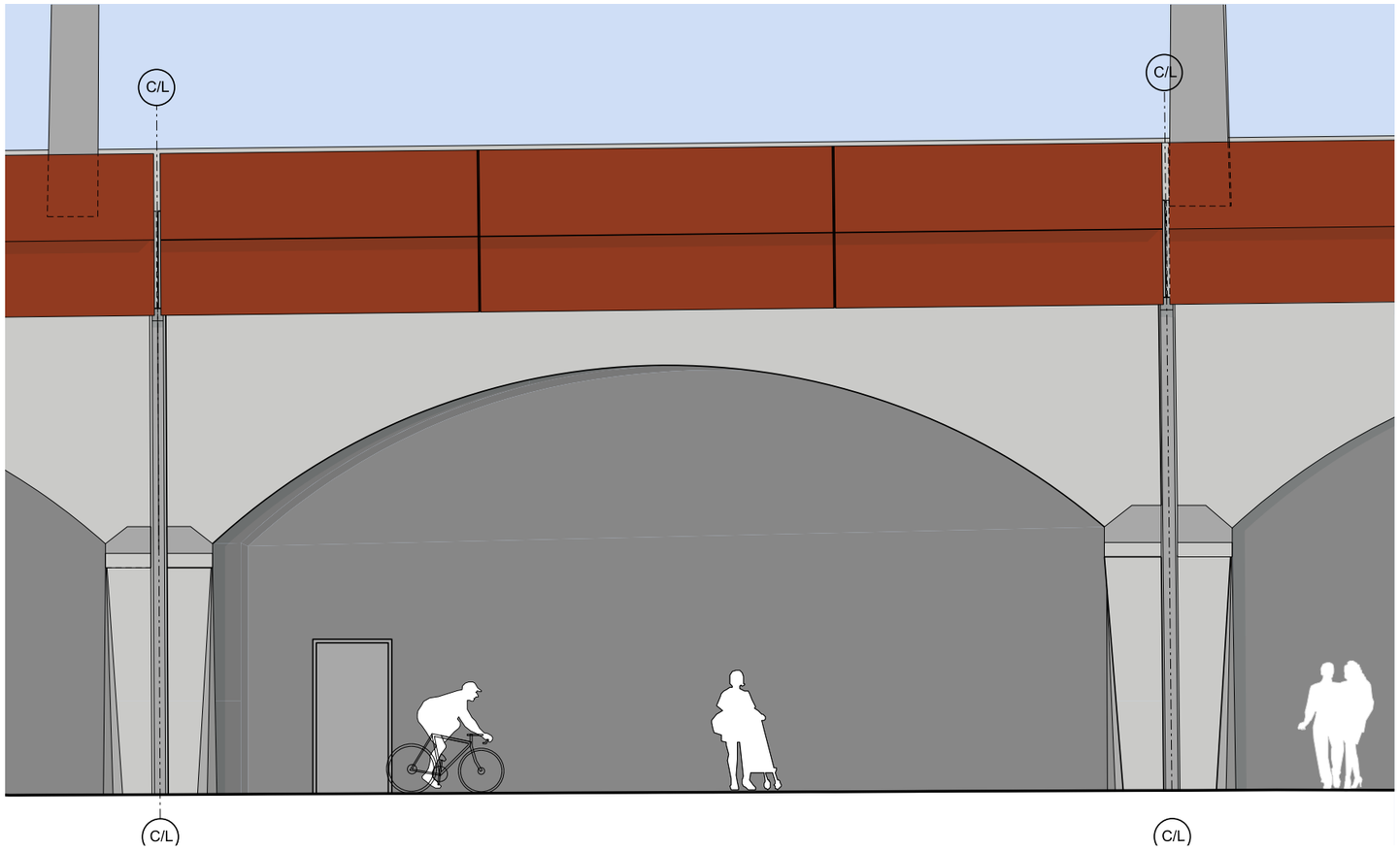


fig 3.1.xxx COL 123 Arch widening (see fig. 3.1.xxxi for cross-section)

[for further details of this area refer to drawing 100315]

3.1 Stage A: Castlefield Viaduct and Water Street

The concrete arch widening cantilevers away from the existing viaduct at an angle of 11 degrees, before the weathering steel parapets lean back towards the railway at an angle of 6 degrees. The parapets will be formed from a pair of weathering steel sheets, each of which will be 1.2m high by 4-5m. Arranged horizontally the two sheets will slightly overlap one another to produce a parapet of approximately 2.5 – 2.8m (dependent on location). The steel sheets that finish the parapet will be divided vertically divided into three sections between piers.

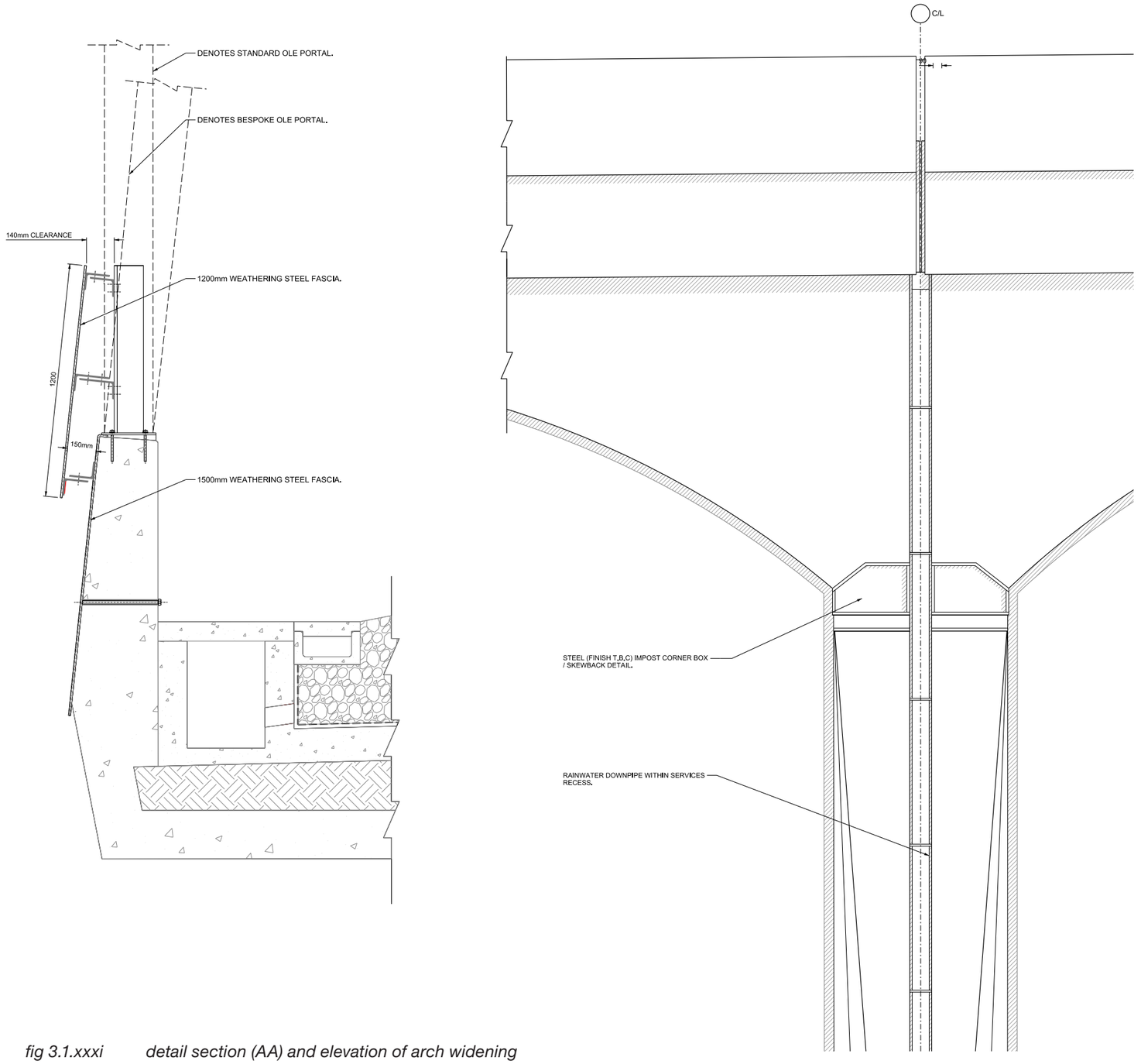


fig 3.1.xxxi detail section (AA) and elevation of arch widening

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.15
Arch widening: COL 129

This location compliments COL 117, as it is the opposite end of the arch widening structures to the south of the Castlefield Viaduct. Therefore, in a similar manner to COL 117 its form responds to its location. At this end the widening meets the Castlefield Bridge, which is wider than the Viaduct and hence there is no requirement for a 'splay' of a similar form to COL 117.

To respond appropriately to the geometries of the original structure at this end a series of folds in the concrete bring the 11-degree cantilever out to the vertical bridge abutment through a series of gradual steps (fig. 3.1.xxxii).

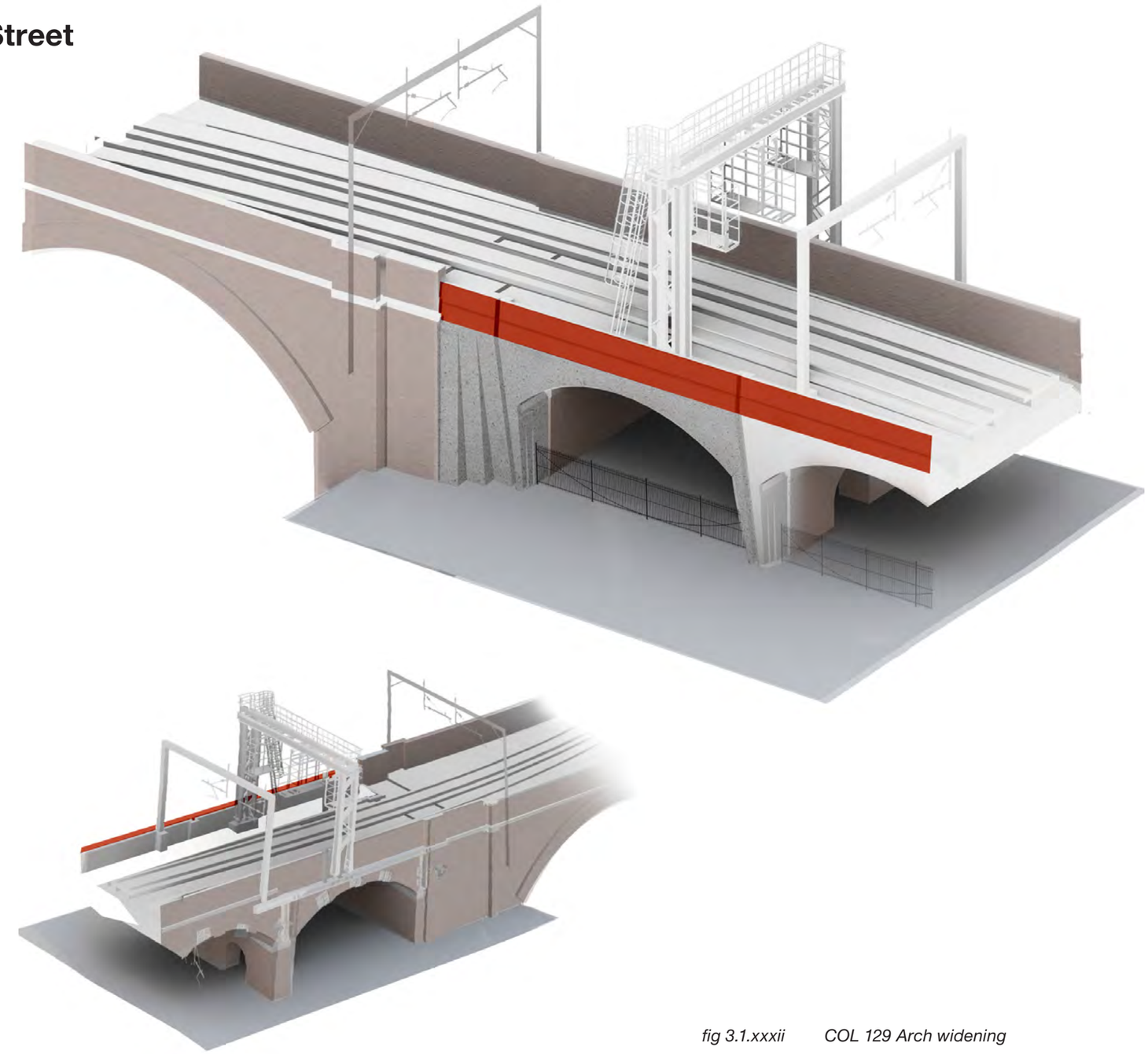


fig 3.1.xxxii COL 129 Arch widening

[for further details of this area refer to drawing 100330]

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.15
Goalpost-type signal supporting structures

The intentions for the proposed signal gantries that are proposed to be placed at mid-span of an arch, is to utilise a 'goal post' structural arrangement. Along the Castlefield Viaduct there are two locations where the structural solution is highly constrained due to a number of operational and safety requirements.

There is very little flexibility in where they can be located and hence they do not align with the viaduct pier locations. There is a strong existing presence for this arrangement - OLE equipment positioned off centre of viaduct arch spans. The figure on the right hand side begins to illustrate the existing locations of equipment that reflect these conditions.

At COL129 this is principally due to the proximity of the signals to both the Ordsall Lane Junction (to the north, over the Irwell in Salford, where the Castlefield Viaduct's line meets the Middlewood Viaduct) and the Water Street Junction (immediately to the south, where the new Ordsall Chord begins). Simplified, the overarching rail safety requirements to have 8 train cars able to fit in between the new Water St Junction and this exact location is paramount to the rail infrastructure operating safely

Hertitage Assessment - Goalposts

These structures are typical across the rail network and are seen to comparable locations elsewhere on the Manchester South Junction and Altrincham Railway Viaduct and within the Castlefield Conservation Area. There is some resulting visual impact and physical impact on the listed viaduct. However it is considered that this does not affect the overall assessment of impact that was made as part of the TWAO application. In line with the requirements of the NPPF the assessment of impact concluded that the substantial public benefits offered by the scheme are considered to outweigh the impact and resulting harm caused to the heritage assets.

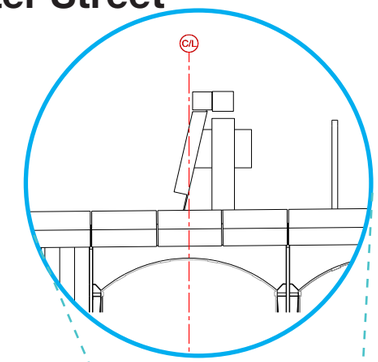


Diagram of COL129 relationship with arch centre

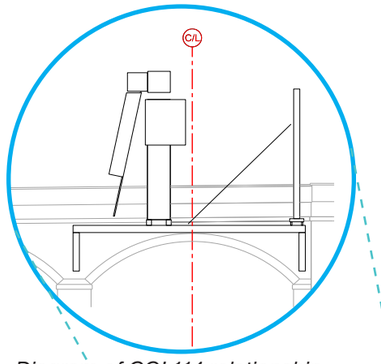


Diagram of COL114 relationship with arch centre

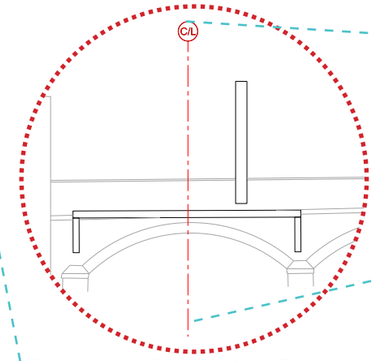
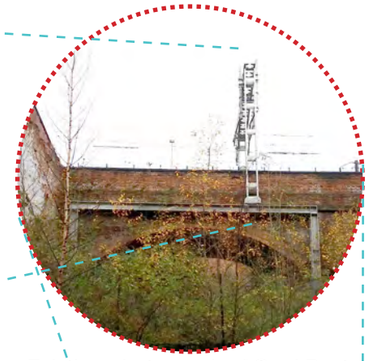
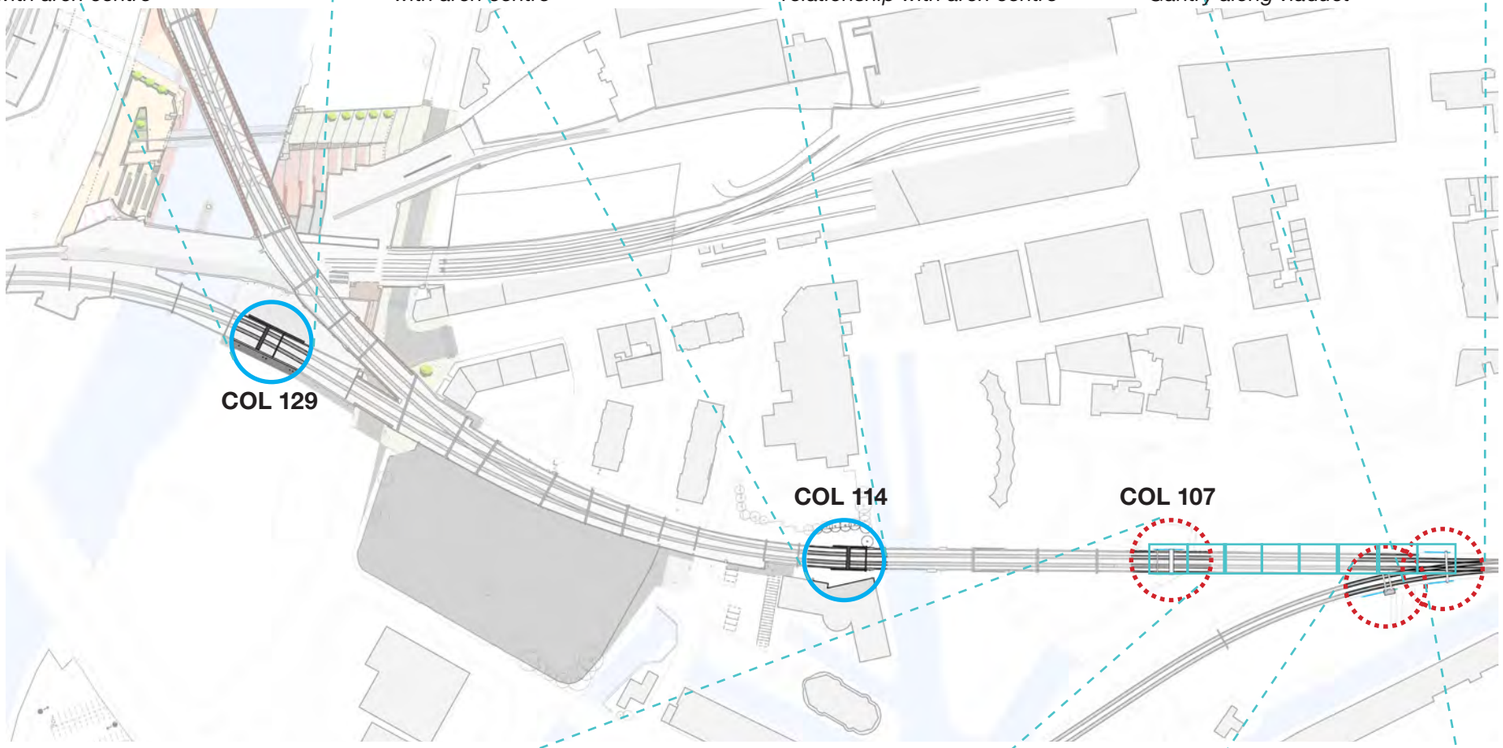


Diagram of Existing Goal Post & its relationship with arch centre



Existing photograph of Goal Post Gantry along viaduct



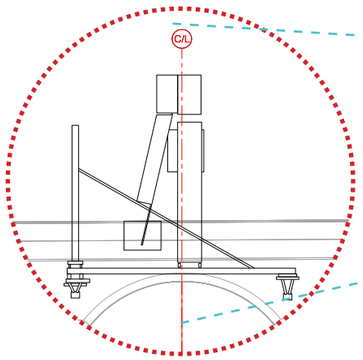
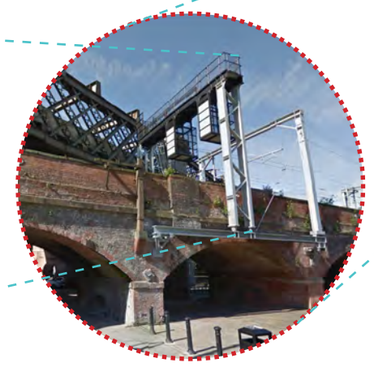


Diagram of COL107 relationship with arch centre



Existing photograph of Goal Post Gantry at COL107

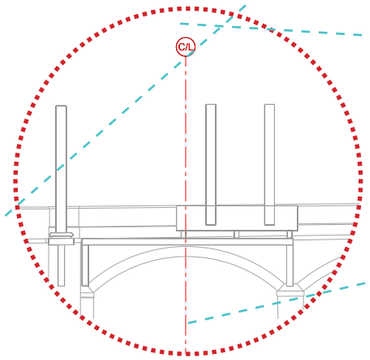
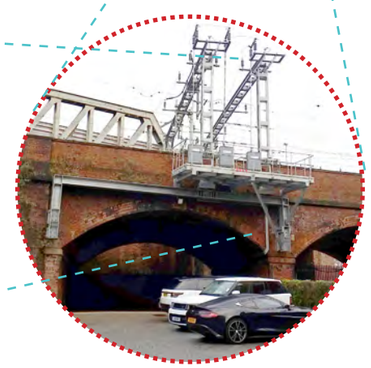


Diagram of Existing Goal Post & its relationship with arch centre



Existing photograph of Goal Post Gantry along viaduct

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.16
Water Street bridges and adjacent arch: COL 125A and 125

The existing Water Street Bridge is to be replaced with a pair of bridges which provide a replacement section within the Castlefield Viaduct and also allow the new Ordsall Chord alignment to peel off to the north. The structural and aesthetic principles of these two bridges aims to combine the horizontal emphasis of the steel parapet line, along with a specific expression of these two structures as individual bridges. They therefore share a material (steel), but the detailing varies.

Design development has evolved the solution such that the steel parapets above the arch widening will be legible as sheets of steel; at the bridge locations these will make way for a structural solution whose cross-section form expresses its function (fig. 3.1.xxxiii). This I-section beam requires stiffener plates to perform its structural role, and these plates are to be shaped such that they relate to the angles of the steel parapet plates and the concrete arches below.

These plates, shaped with an angled outer profile, are spaced at varying centres to emphasise the ends of each bridge; this clustering at the transition from a solid to a recessed surface is a continuation of principles proposed for other elements, in particular the north bank abutment described in section 3.5.14.

The end-product of this approach is one whereby the intended visual effect to be one such that the steel plates have been pulled back to reveal the structure of the bridges. To further emphasise the structural performance of the bridge, the bearing points are opened up to reveal their purpose, but to also tie the sloping folds in the concrete piers into the upper levels of the structure (fig. 3.1.xxxv).

Three of the four ends of the proposed bridges are, in part, supported from new concrete structures sat onto the retained stone springing points from the bridge that will have been removed.

fig 3.1.xxxiii Liverpool Road view

fig 3.1.xxxiv elevated view

fig 3.1.xxxv detail at bridge support position

[for further details of this area refer to drawing 100327]

3.1 Stage A: Castlefield Viaduct and Water Street

The opening up of the COL 125 arch (through the removal of the existing brick structure) is necessitated by construction requirements. This requirement is proposed to be turned to the benefit of the public realm spaces through the provision of clear views through to the original Liverpool Road Station when this important area is approached along Water Street from the south (fig. 3.1.xxxviii).

The bridge structures which replace the existing bridge incorporate vaulted concrete abutments which are similar to the viaduct widening detail elsewhere in this stage. The existing brick structure to the original viaduct will be cleaned and repaired and will be 'book-ended' by concrete vaults of an identical radius and height. The alignment of these structures will be emphasised through the lighting proposals (described elsewhere) that will be entirely lit from the springing point of the arches so that no surface- of column-mounted luminaires will be required (5.2.1 CIA). This strategy, along with the removal of traffic signals from the adjacent junction will all contribute to creating a visually open pedestrian-focussed environment in this area.

These proposed changes will also provide benefits to the setting and position of the Woolam Place apartments, whose façade onto the junction will align with the extended side wall of the viaduct arch. To reinforce this, and enhance security in this area (c.f. planning condition 13), a access control gate will be provided in the gap between the apartment building and the widened viaduct. No public right of way. (5.2.1 CIA). All bollards previously shown have been removed.

fig 3.1.xxxvii COL 125 existing east elevation, with structure to be removed highlighted

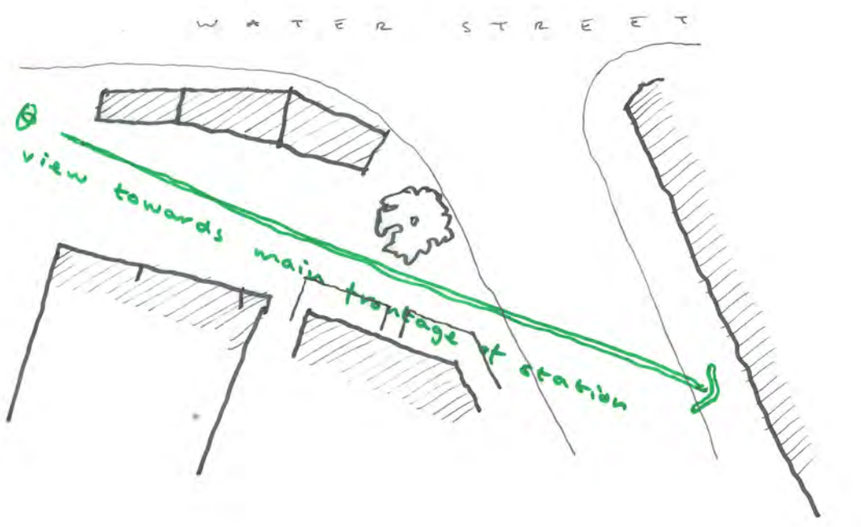


fig 3.1.xxxvi principles of perspective view framed by tree and facade of apartments

fig 3.1.xxxviii sketch view through COL 125

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.17
Public realm: Castlefield Viaduct and Water Street / Liverpool Road junction
(Planning condition 4 - Landscape and lighting)

The junction of these roads forms the setting of the grade-I listed Liverpool Road Station and the Woolam Place apartment building. Both sides of the road currently have some areas of large stone slab paving, although the finish is not comprehensive.

As part of the reconstruction of the junction described earlier in this section, the attractive stone paving will be accompanied by contemporary stone paving in yorkstone, and cobbles in granite. The granite will be utilised to define boundaries between materials and define walking routes. Changes in material will also reflect the footprint of new and old structures, for example beneath COL 125.

Existing historic stone slabs to Liverpool Road are to be lifted, cleaned and relaid, with new diamond sawn Yorkstone laid to the areas where resurfacing is required.

Currently an existing postbox is located where the new widening for the bridge is to be located; this is to be moved to a nearby position.

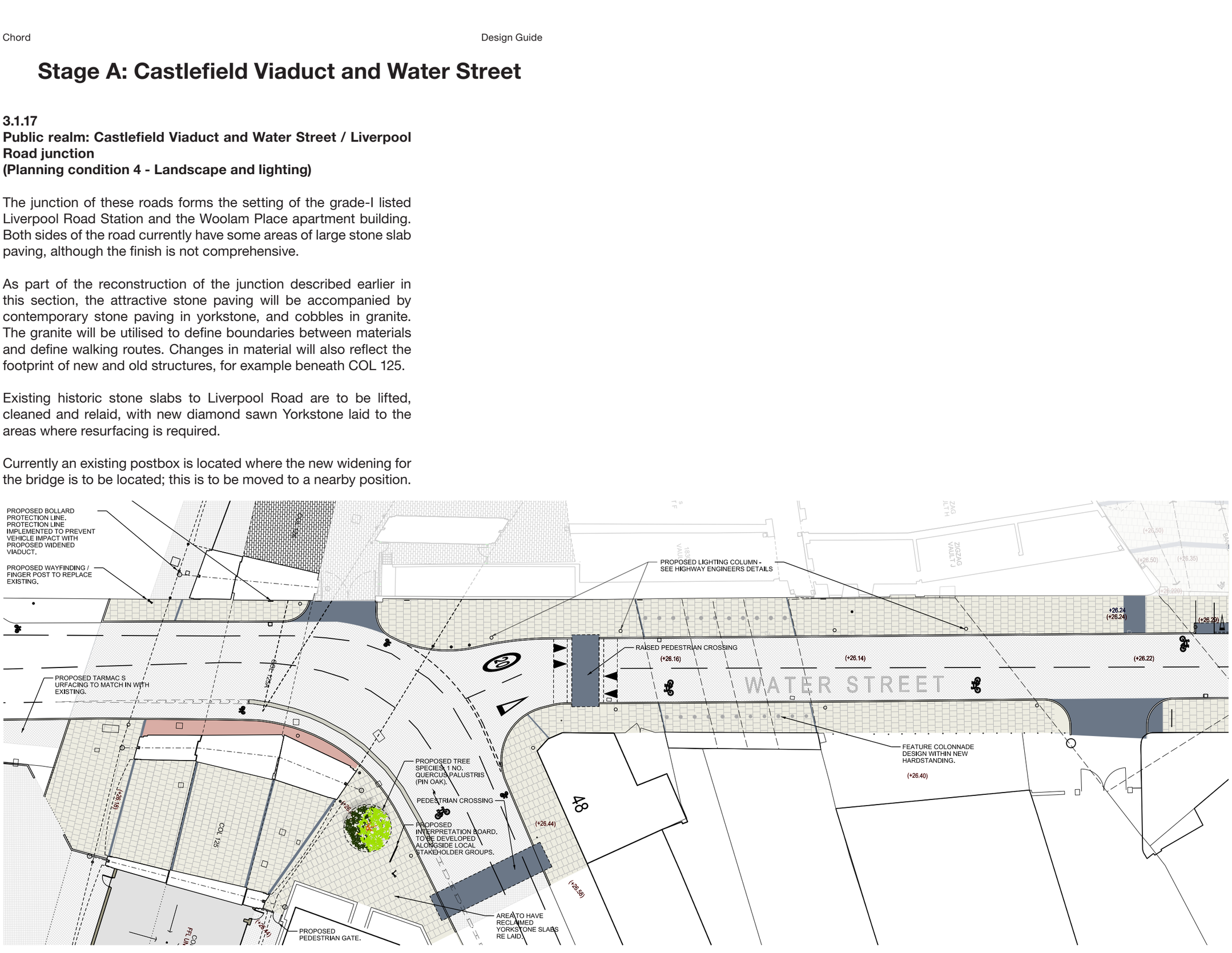


fig 3.1.xxxix Liverpool road and Water St landscape plan

[for further details of this area refer to drawings 100350 and 100351]

3.1 Stage A: Castlefield Viaduct and Water Street

3.1.18
Public realm: MOSI bridges and Water Street / Hampson Street junction
(Planning conditions 4 and 15)

The route from south to north along Water Street currently consists of a basic series of finishes, which do not reflect its current or future role in the townscape. The street and footways will become a key connecting element between the regeneration sites on either side of the railway.

Paving materials will be enhanced to provide improved visual quality and also tie together the important junctions / spaces that they will connect (i.e. the Water Street junction and Hampson Street). The upgrade to this section of the route along Water Street will support the ambitions of Manchester City Council and Allied London in their development of the surrounding sites.

As with the area immediately to the south, the palette of surface materials has been chosen from a yorkstone source; however this only forms one element of the streetscape. Moving along this north-south sequence of spaces, the walls are formed by the abutments of the various bridges and the soffits are the underside of the same structures. These walls and soffits have historic finishes and details that will be better exposed through cleaning and restoration; this will be supported by a historic lighting scheme to highlight their qualities and also mitigate any negative characteristics that might arise from the repeating bridge structures that cross the road.

The original railway bridge (fig. 3.1.xxxx) over Water Street connecting the station to the 1830 Viaduct no longer exists; the current structure is simpler than its predecessor, which was described by a contemporary writer (source unknown, potentially MEN) as follows:

‘There were 11 Doric columns on each side the footwalks below which form colonnades and gave the interior the appearance of an elegant classical temple the parapet is of cast iron enriched with pilasters and neatly empanelled.”

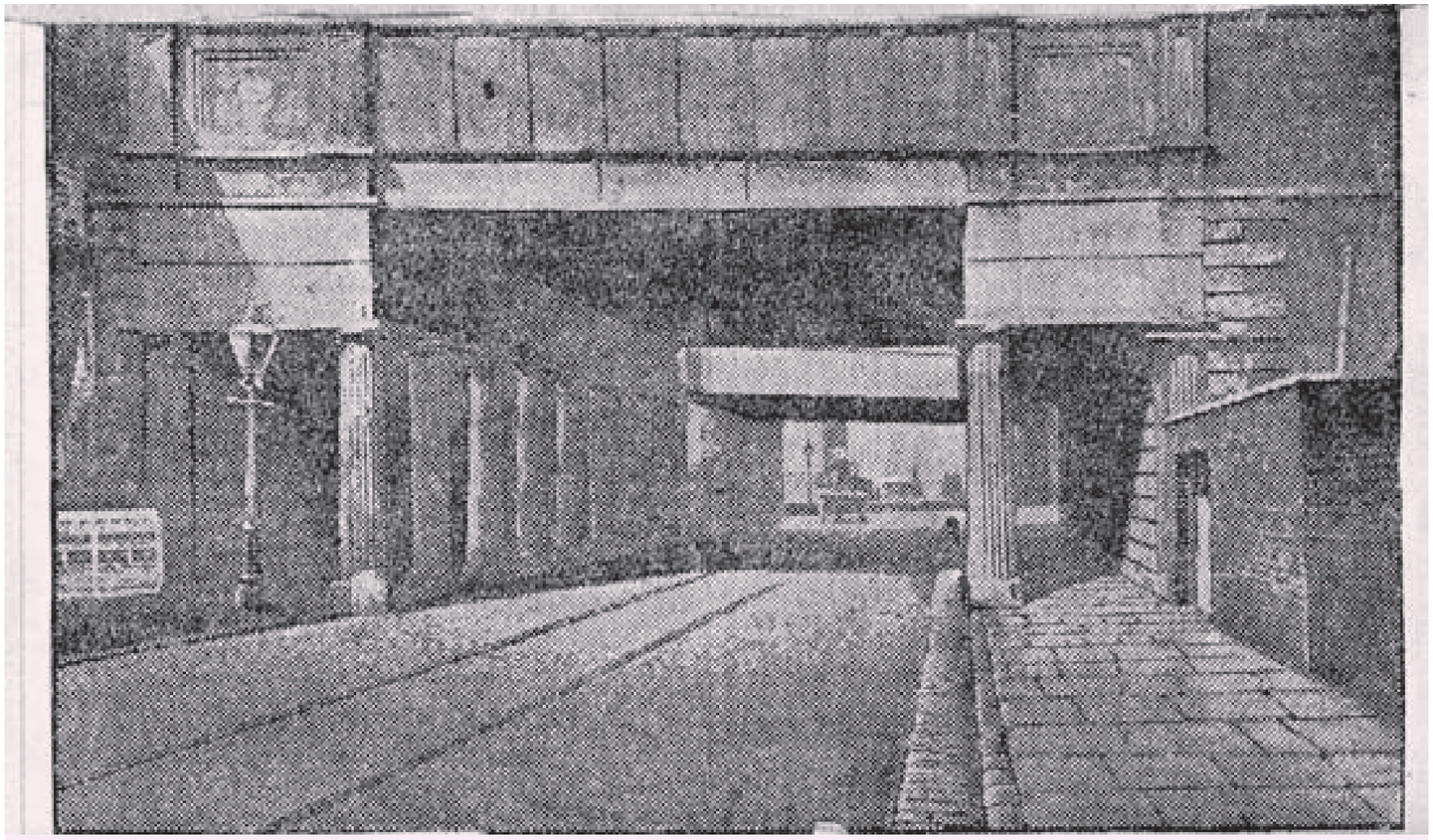


fig 3.1.xxxx original 1830 bridge over Water Street

3.1 Stage A: Castlefield Viaduct and Water Street

To provide a feature along the route along Water Street the proposed design makes reference to the 22 Doric Columns through interpretation and design detailing in the paving. The surface is to use contrasting colours, textures and material finishes referencing the lost structure (whose design was given ‘civic’ characteristics that were lost when it was removed and replaced). In the absence of detailed information on the original bridge, a series of notional column locations have been proposed, with each column itself to be expressed in granite, to contrast with the yorkstone paving of the surrounding area (fig. 3.1.xxxxi). The lighting strategy will further reinforce the interpretation as an inversion of the lost ‘shadows’ made by the 22 columns; individual spot-lights will be positioned in alignment with the granite discs, casting light down the adjacent wall (see section 3.1.8.3).

This approach will give this bridge a specific character which draws upon the past, which will be strengthened by the particular wall finishes to this bridge. Each of the other existing and proposed bridges across the street has a different wall finish unique to itself, and this will be further emphasised through a lighting approach which is specific to each. The cumulative effect of this will be to create an environment made up of four individual spaces, one beneath each bridge; this will prevent the sequence of bridges coalescing into a single ‘tunnel’ which would result if a singular, monolithic approach to materials or lighting were used throughout.

The lighting proposals for these historic elements have been coordinated with the highway and pavement illumination to ensure that the functional and aesthetic requirements compliment one another. All lighting columns have been moved aware from the cattle ramp to mitigate climbing onto operational structures.

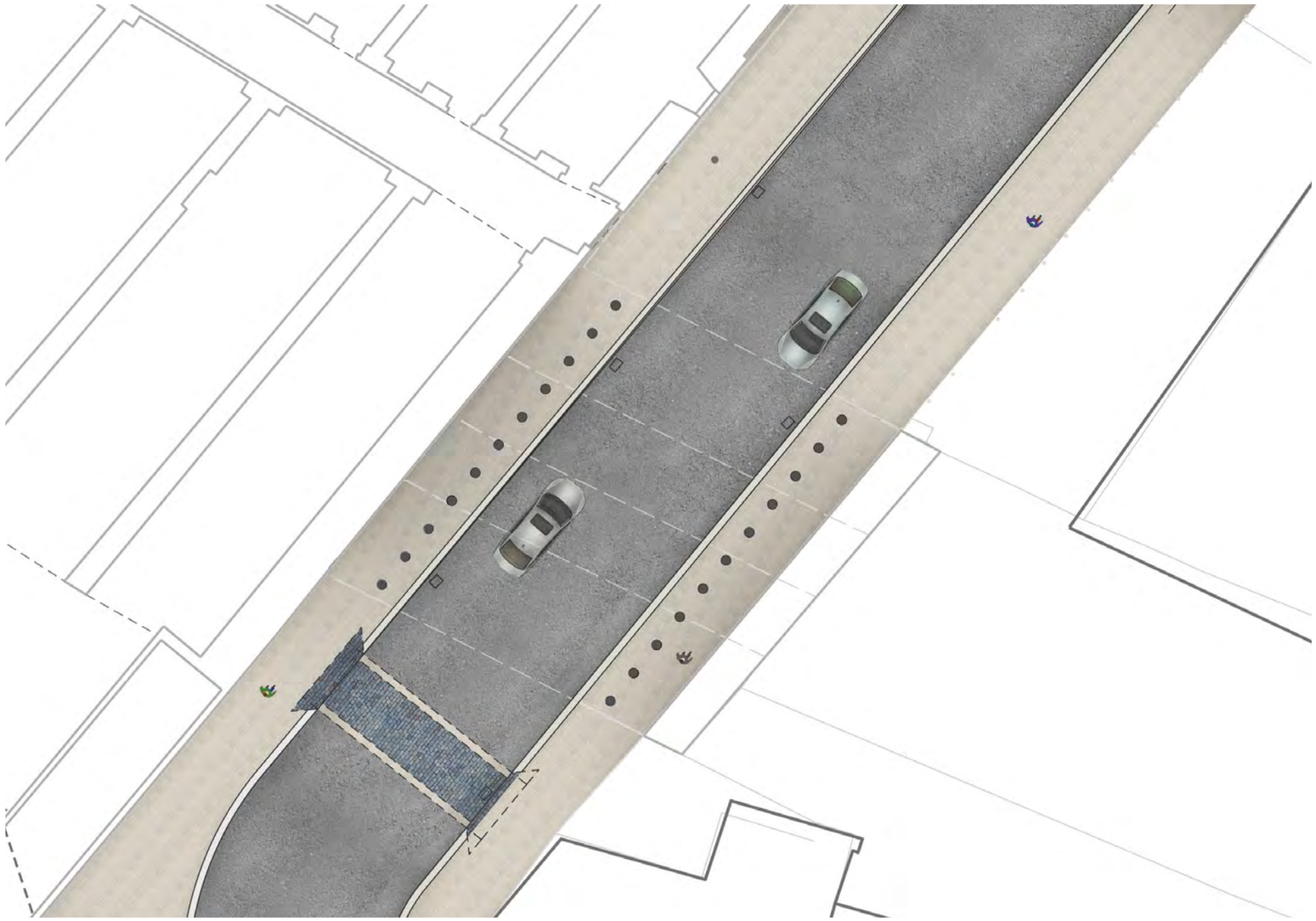


fig 3.1.xxxxi granite disks (11 to each pavement) set into yorkstone paving

3.1 Stage A: Castlefield Viaduct and Water Street

fig. 3.1.xxxxii cut-away perspective section along Water Street - Artist impression of future street scape