# northern hub

## Ordsall Chord

Project - Ordsall Chord

Design Guide

January 2016

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# Contents





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# 1.0 Introduction

## 1.1
## The Design Guide

The purpose of this document is to provide information related to the design of the Ordsall Chord, a project proposed by Network Rail. The proposed works straddles the River Irwell and hence affects sites in both Salford and Manchester. The Design Guide is intended to sit at the heart of a suite of documents that provide the information required for the discharge of planning and listed building conditions as defined in the Transport & Works Act Order relating to this project. A list of the planning conditions is included as section 2.9 of this document

## 1.2
## Other Related Documents

As noted on the contents page of this report, there are a number of other documents that have been prepared to enable the discharge of Planning and Listed Building Consent Conditions. Where relevant these are cross-referred to in this document, and as a consequence they are included as an appendix.

## 1.3
## Background

The cities of the North are linked by a network of 14 key rail corridors which converge on Manchester, recognised to be a rail hub (Manchester hub). These inter urban and inter regional services are supplemented by express services to the North and South of the country.

The railway infrastructure in the area of Manchester and Salford dates back to 1830. Driven by the economic requirements of the time it was not intended to form a combined rail network and was developed in a largely piecemeal fashion by different commercial operators.

The nature of the infrastructure's configuration now restricts movement across Manchester, and thus significantly limits the ability to increase rail capacity and adequately serve changed transport nodes in the region. This in turn is a very significant constraint on the potential of the rail network to contribute to economic growth.

The emergence of Manchester Airport as a key transport node in the region is not reflected in the existing rail network to any great degree. The current rail access to the airport has been added onto the largely Victorian layout and is sub-optimal as a consequence.
The alignments now restrict movement across Manchester, and thus significantly limit the ability to increase rail capacity. This in turn is a very significant constraint on the regeneration potential of enhanced rail usage.

In its 2009 report, The Northern Way identified Manchester Hub as the single most critical infrastructure investment in rail for the whole of the North because of the limitations of the rail network in central Manchester, which:

- constrain the frequency and speed of the critical services that link the North's eight City Regions;
- impede the development of the most valuable additional services that could be provided to increase rail access to Manchester Airport;
- reduce the value of the existing and potential wider trans-Pennine network which needs to be able to grow and to support an integrated network of services to many key urban centres;
- had been identified as such in Greater Manchester's Transport Innovation Fund bid work, where rail is seen as having to play an expanding role to support the city's development and growth alongside complementary measures;
- make it impossible to provide efficient north-south rail services across Manchester to connect areas of low employment with areas of employment opportunity; and
- results in several conflicting train movements in the Manchester Hub area that affects the performance reliability of the network

There is no direct link between Manchester's two largest stations, Manchester Victoria and Manchester Piccadilly. This is due to the configuration of the railway network and the associated rail junctions. Connection can only be made by performing a lengthy move which would require the routing of a train to Salford Crescent station where it would then be reversed in the direction of Ordsall Junction. Such a movement would have a significant effect on capacity.

The following issues need to be addressed

- Trans-Pennine services between Leeds and Manchester . The ability of these trains to access key destinations in the North West including Manchester Airport is limited by capacity across Manchester.
- Manchester Airport is the most significant airport in the North, catering for more passengers than all the other northern airports combined and an important transport hub for the entire region
- It is the only airport in the North with a network of inter-continental scheduled services and is identified by the Department for Transport (DfT) as a key international airport gateway in delivering a sustainable transport system.
- Other than services from the South (via Crewe), Manchester Airport can only be reached by passing through, or reversing at, Manchester Piccadilly. Services operating through central Manchester's other station, Manchester Victoria, currently cannot directly reach the airport.
- Currently six trains each hour (three in each direction) cross the six lines outside Manchester Piccadilly station which are referred to as the station 'throat'.

Each train entering Manchester Piccadilly has a three minute spacing built into its timetabled path in order to provide a safe period of time and distance between services. Due to the nature of the crossing movement, the routes into and out of Manchester Piccadilly are prevented are from being utilised whilst the crossing movement is underway. This capacity constraint equates to 18 minutes being employed per hour, almost a third of the overall available capacity.

Due to the variability in the times trains arrive at Piccadilly, services are routinely held at Ardwick Junction for an available path to clear. This requires a measure of performance time to be built into the timetable referred to as a performance allowance. This requires impacts on services which are using the Trans-Pennine route to Leeds which also have to await a clear signal to proceed. The industry plans for this type of activity by including additional provision within the timetable which could otherwise be occupied with the operation of a train service.

Quite apart from these timetabled performance allowances, during the calendar year November 2012 to November 2013 a total of 9,163 separate performance incidents have been caused by the six trains which cross the Piccadilly throat each hour. These incidents equate to 26% of the overall delay at the station, amounting to a total of 35,923 minutes lost to operations and delay to passengers and goods.

The resulting impact caused by the loss in capacity at Manchester Piccadilly and the inability to route services through Manchester Victoria to Manchester Airport due to the lack of a connection between the two main rail corridors is the fundamental cause of the overall Manchester capacity problem.

# 1.0 Introduction

## 1.4 Objectives

The Ordsall Chord rail link will provide the capability to connect the rail corridors serving Manchester Piccadilly and Manchester Victoria stations and in doing so provides a new rail routing option across the city. This new routing will support a change in operation at Manchester Victoria and will see the station operating predominantly as a through station instead of a terminus.

The ability to route services across the city in such a way will remove the need for services to cross the throat of Manchester Piccadilly and is the key to releasing capacity within central Manchester and the Manchester Hub.

## 1.5 Scope

The benefits of the Ordsall Chord are increased performance of Manchester Piccadilly and the opportunity to mitigate the risk of further delay caused by the services crossing the throat of the station. Services will now be able to be routed via Manchester Victoria and include additional connections to the Calder Valley and Trans-Pennine routes.

The key benefits of the Ordsall Chord are:

- the removal of the need for trains to cross the tracks at Manchester Piccadilly;
- the freeing up of capacity at Manchester Piccadilly can have a positive effect on how many extra train paths will be provided and allow the increase in frequency of services
- the creation of cross-Manchester capacity without passing through Manchester Piccadilly, thus easing passenger congestion at the station as more passengers come into the currently under-used Manchester Victoria Station;
- ability to operate trains from Manchester Victoria directly to the Airport
- provision for a new direct services to be operated between Manchester Airport and places such as Bradford, Halifax, Todmorden and Rochdale
- improved reliability (whenever a bottleneck is removed performance improves)
- takes full advantage of the newly electrified routes which will connect Leeds to Liverpool via Manchester Victoria;
- complements the regeneration of the area around Manchester Victoria (which includes the redevelopment of the station); and
- by alleviating the bottleneck in the Manchester Hub the Ordsall Chord facilitates the delivery of the Northern Hub programme which will unlock the economic potential across the North.

Whilst the Ordsall Chord has a significant economic and financial benefit, further more substantial benefits can be realised as a result of the change in the operation of Manchester Victoria which the Ordsall Chord provides.

Now capable of connecting to all corridors Manchester Victoria will move from being a 17 train per hour largely terminus operation, to a facility being capable of accepting 42 trains each hour.

The increase in services will follow a series of infrastructure enhancements as part of the Northern Hub programme of works which have been recognised in the Government's 2012 High Level Output Specification. In total the enhanced capacity of the network will be capable of providing close to an additional 700 trains each day spread across all of the 14 key corridors.

Overall, the effect of this quantum shift in service provision is assessed as generating £4.2 billion to the UK economy as a result of more passenger journeys and improved freight paths for goods. Without the connection and capacity increase which the Ordsall Chord will provide.

# 2.0 Design considerations

### 2.1
### The Project Design Philosophy

Within the overall Northern Hub programme, no other intervention has a similar importance to the Ordsall Chord in terms of its function, aesthetic or aspirations:
- The historic location is one of the most sensitive sites in the global evolution of the railway
- The values of this site and the existing structures have informed and enriched the design process
- This location is proposed to be ideal for the insertion of new rail infrastructure; the next layer of rail use overlaid on the history of the site
- Holistic quality in the proposed structures is critical to the success of the project, and is at the core of design development
- The legacy of the rail infrastructure, and the urban realm around, is an integral part of the design; the Ordsall Chord will act as a regeneration catalyst
- The network arch bridge will be emblematic of the Northern Hub project and the long-term aspirations of Network Rail

### 2.2
### Urban Design Objectives

The Ordsall Chord project offers an opportunity to provide a new appreciation of important heritage assets which currently are in poor condition or are shielded from view by lesser structures.

The historic value of the area has been a major influence on the design of the proposed structures both in terms of the immediate context of Liverpool Road Station and also the wider context of the industrial role of Manchester, Salford and the encircling perimeter of railway viaducts that define the city centres.

At an urban level, Ordsall Chord is going to connect two existing sequences of viaducts & bridges to provide a link between Piccadilly and Victoria that has not existed previously. The proposed alignment and structural forms have a lean and sustainable approach in the urban and historic context. Very little of the proposed structure is located in what might be termed 'open space'; the majority of the railway is:
- on existing viaducts which have been widened
- sat on existing railway structures
- above the river and canal waterways
- over the Trinity Way dual carriageway

Of the existing structures, bridge forms were designed to fit the constraints of their specific context to include skew arches and trusses (decorated with various paint finishes and colours) inserted as wider spans between comparatively plain viaducts. The viaducts are also impressive in their own way; thousands of bricks went into each, sometimes twisting to alignments influenced by their context.

The Ordsall Chord proposals will create a series of structures and spaces that perform a positive role in their context across a variety of different scales:
- In a regional context the project offers massive benefits in terms of economic opportunity and regeneration
- In the city centres of Manchester and Salford they are a lean and effective use of existing structures and urban space
- In the context of local regeneration sites they offer a distinctive and unique identity through their design forms, to act as a catalyst for surrounding regeneration
- In the surrounding streetscape they will create a new series of public realm spaces connecting the two cities, which (as a continuation of the previous point) make the area more attractive, encouraging pedestrian use and street life
- In the immediate proximity their choice of material and detail will be appropriate in their setting alongside heritage structures

Developing the issues described above, in particular the fourth bullet point, the project will create a sequence of spaces to form an inter-connecting route from the south to the north. This will connect the original Liverpool Road Station, River Irwell south bank, Manchester Quays, new Prince's Bridge, Irwell River Park and the ECF site.

The Ordsall Chord structures sit over a series of existing routes which run in perpendicular north-west to south-east and south-west to north-east directions (see figure 2.2.i):
1. Hampson Street
2. Irwell River Park
3. Water Street
4. Liverpool Road

Whilst each of these routes is well-established, the Ordsall Chord project will provide benefits and enhance each of them.

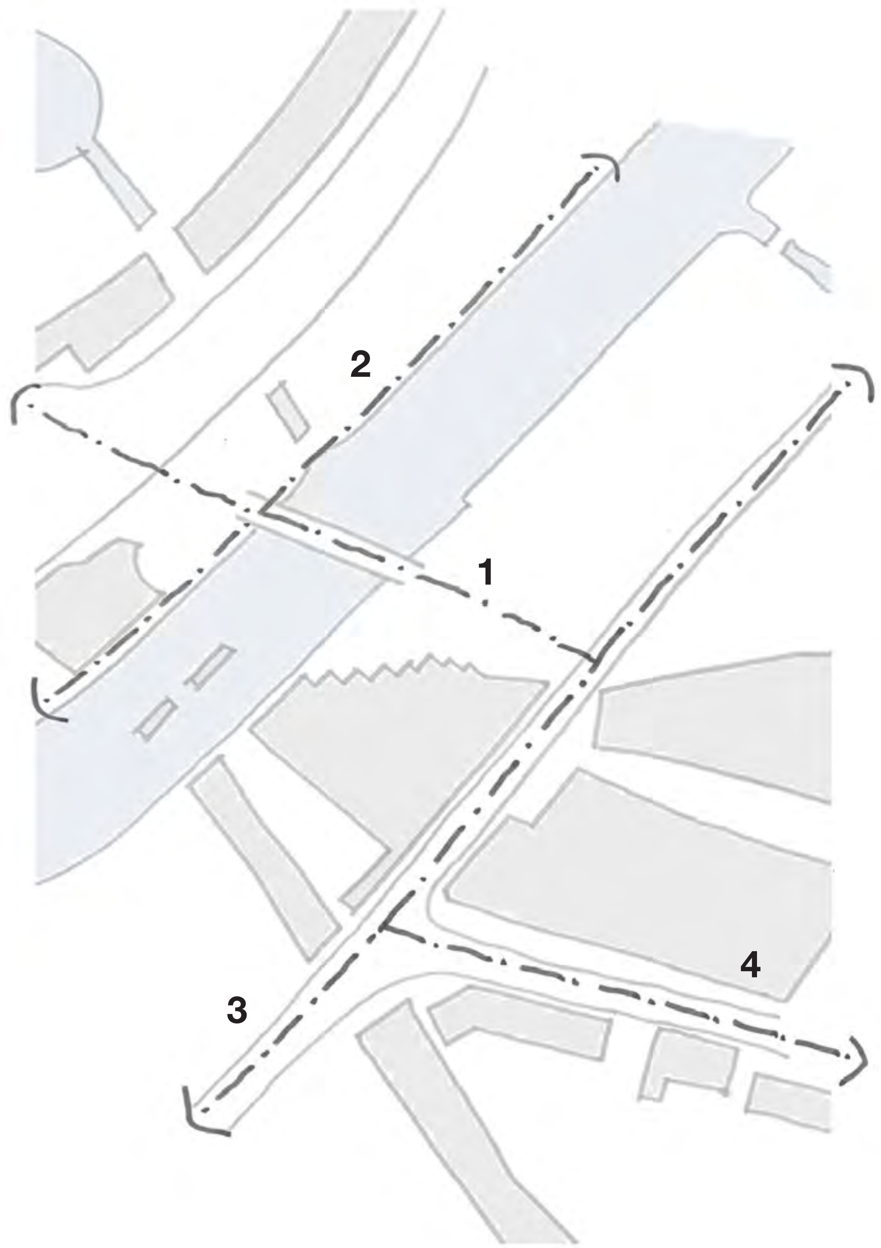


*fig. 2.2.i Pedestrian, cycle and vehicle routes*

# 2.0 Design considerations

The routes interconnect at node positions (figure 2.2.ii) that form junctions between each:
1. Princes bridge / River Irwell Park
2. Hampson Street / Water Street
3. Water Street / Liverpool Road

At each of these positions pedestrian and cyclist accessibility is to be enhanced, as part of public realm enhancements.

Also along the routes are specific points of interest (figure 2.2.iii), which do not represent a decision-making point or change in direction, but instead offer individual spaces with particular features:
1. North bank abutment
2. Stephenson's Bridge terrace
3. South bank abutment
4. MOSI west entrance
5. Water Street gateway

The characteristic aspects and potential future uses of each space have been developed into design proposals specific to each location.

The nodes and points of interest are grouped together into three individual public realm spaces (figure 2.2.iv):
1. Irwell River park – Heart of the City (South)
2. Zig-zag arches plaza
3. Liverpool Road Station

Each of these spaces will be given a particular identity through the integration of restored heritage fabric, high quality finishes to engineering structures and public realm landscape features.


*fig. 2.2.ii Nodes / junctions*

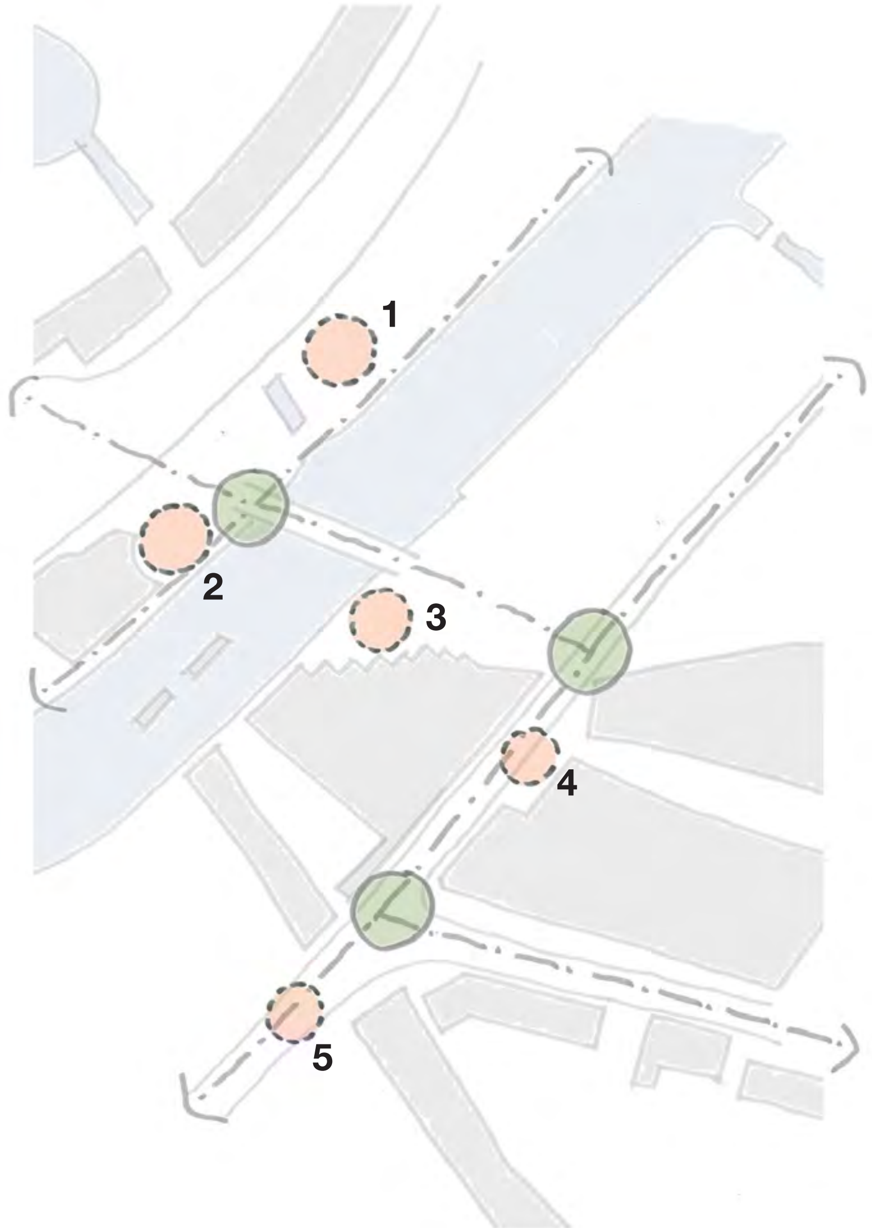


*fig. 2.2.iii Points of interest*

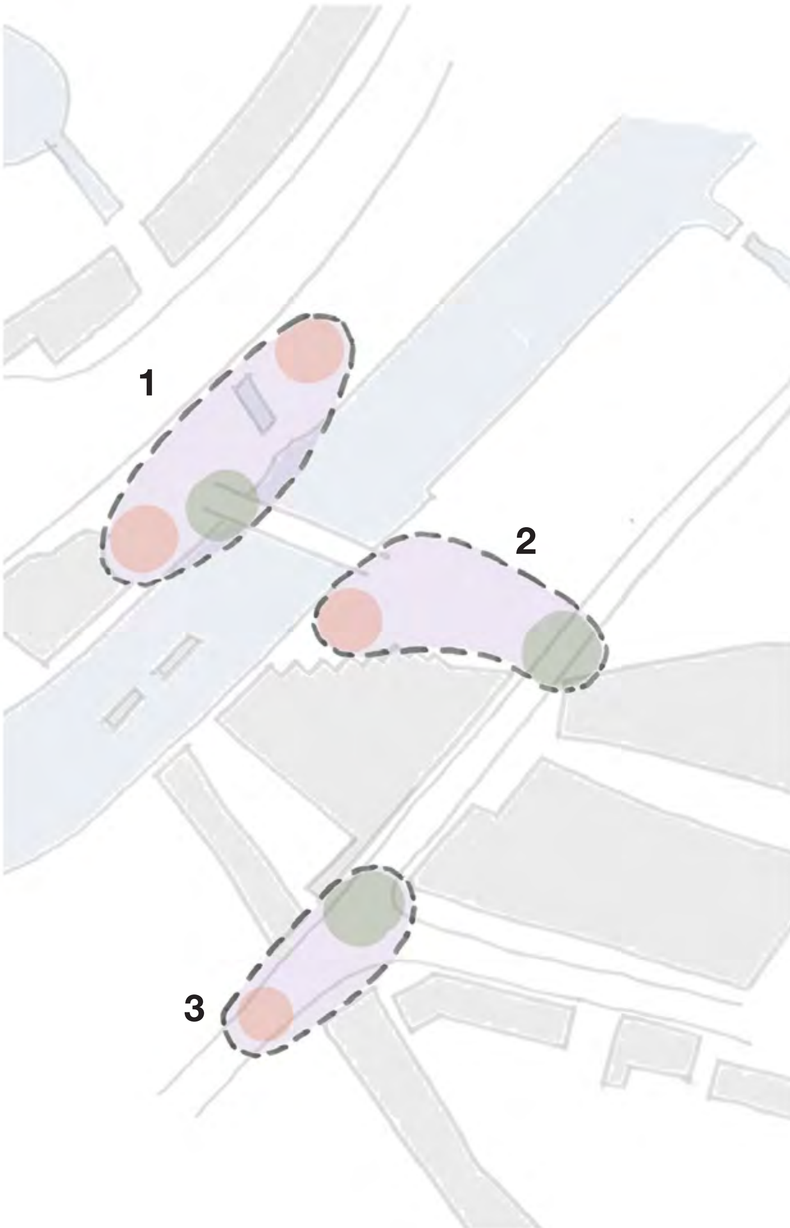


*fig. 2.2.iv Public realm spaces*



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# 2.0 Design considerations

Through consultation with neighbouring land-owners, developers and other stakeholders each area incorporates the flexibility to accommodate future change (figure 2.2.v); these include the potential for future connections should funding and legal agreements permit:

1. Access to Middlewood Locks canal basin
2. Towpath along ECF site
3. Connection to potential riverside boardwalk
4. Potential link to Manchester Quays site
5. Walkway along Manchester bank of river (fig. 2.2.vi)

As noted above, none of these works will be delivered as part of the Ordsall Chord works; however the proposals have been designed such that maximum flexibility has been integrated to enable the developers of adjacent sites to tie into these spaces with their schemes.

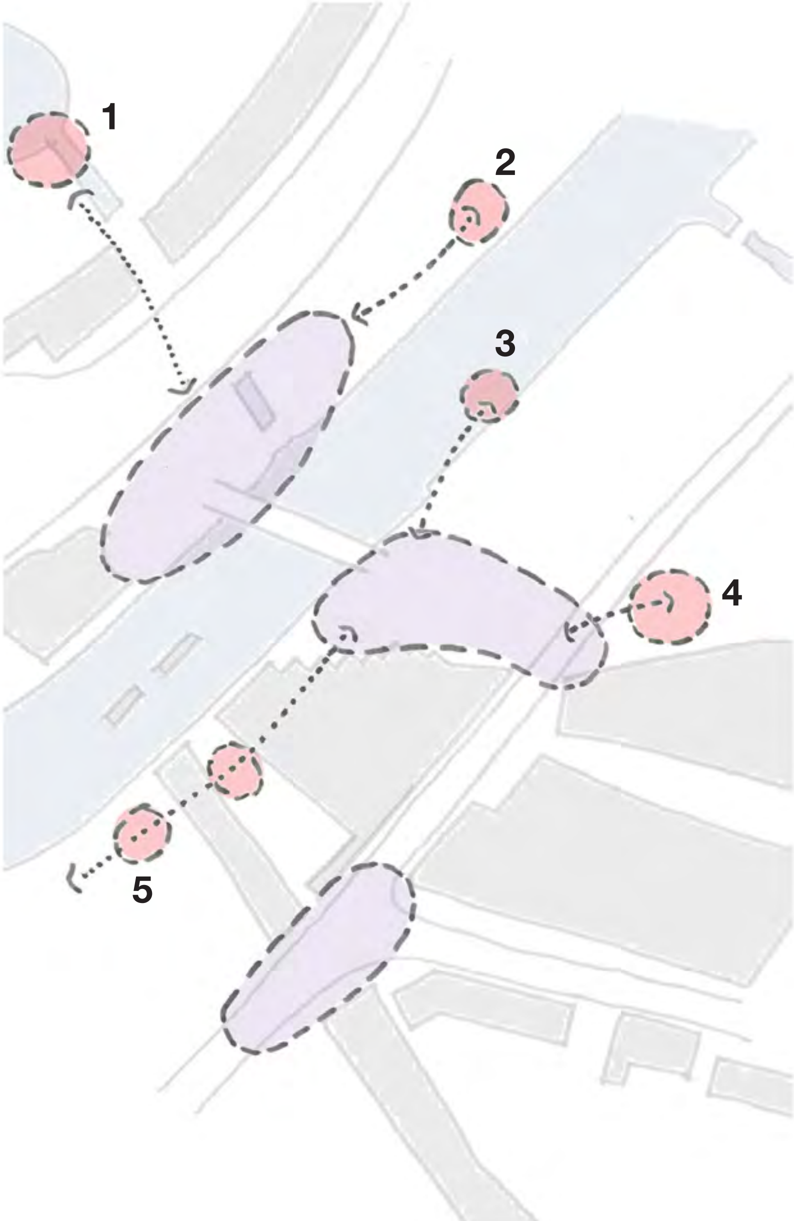


*fig. 2.2.v Accommodating future change*

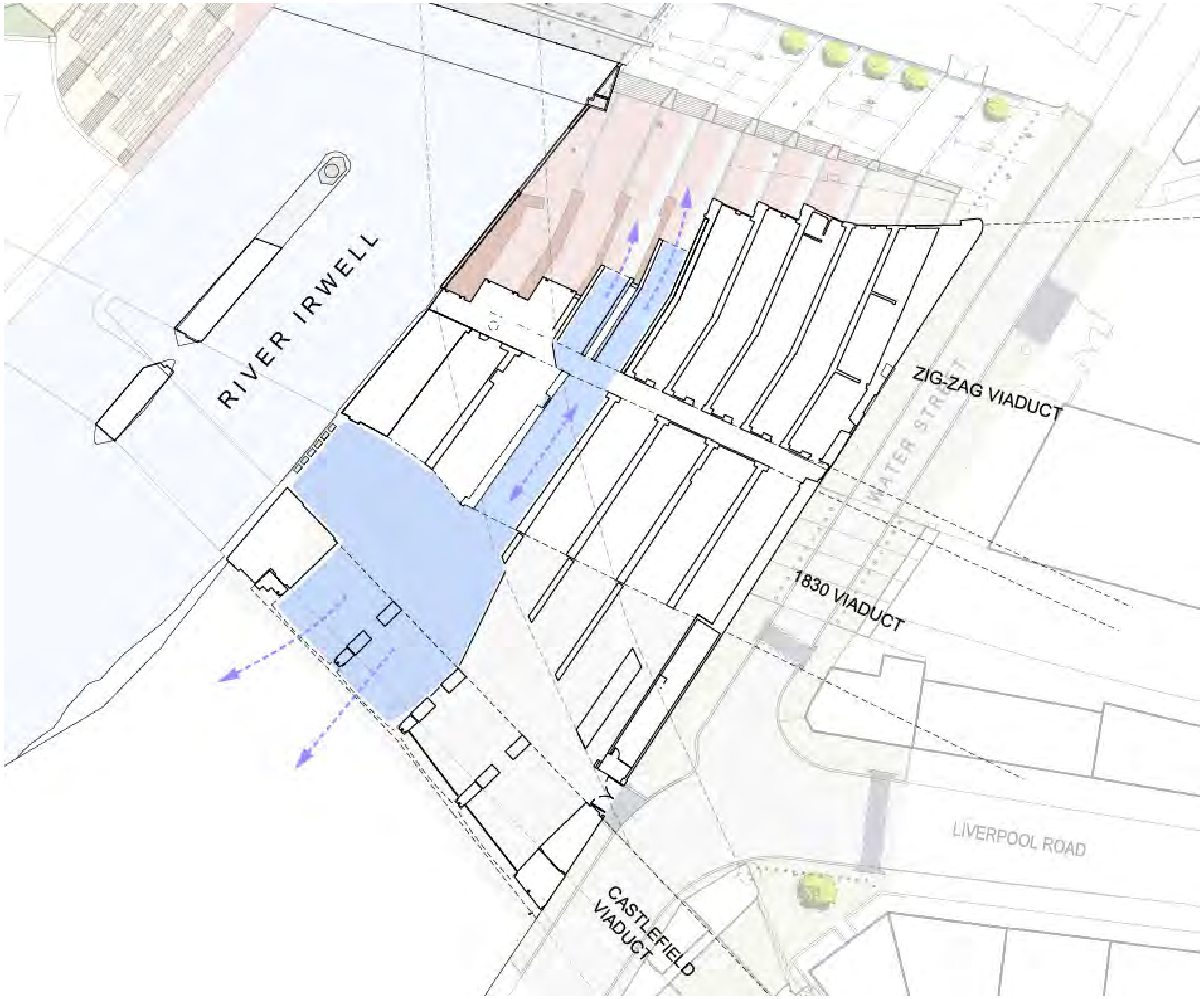


*fig. 2.2.vi Potential riverside walk*

# 2.0 Design considerations

## 2.3
## Rail infrastructure requirements

The Ordsall Chord will be elevated on either modified existing structures or new structures with associated overhead line equipment, plant, junction equipment and signalling. It will link two existing railway lines; the Bolton line (between Ordsall Lane junction and Castlefield junction) and the Chat Moss line (between Ordsall Lane junction and Deal Street junction). The Ordsall Chord will comprise 30mph twin tracks and the junctions at each end are designed to permit parallel movements.

## 2.4
## Integrated design

Considering the various factors listed above, a strategy following the tradition of railway engineering was chosen, with a design approach of robust and honestly expressed surfaces; the externally visible surfaces of the structure are the primary structural materials.

It was considered inappropriate to take a comparatively 'dishonest' approach to the proposed structures such as:

- Over-cladding with sheeting materials on subframe
- Applied finishes to the outside of structural supports
- Copying of historical forms directly without modern interpretation

The distinctive context of listed buildings and historic structures requires high standards of design quality for the proposals on the Ordsall Chord. This quality is inherent in all aspects of the design solutions from large-scale forms through to the material qualities and detailed interfaces. The best engineering solutions cannot be let down by uncoordinated clutter fixed to and around the structures. The design proposals look beyond the basic function of the structures, to be able to accommodate future change and adaptation.

The long term appearance and maintenance of the structures has been considered in the design process to ensure that structures retain their appearance.

## 2.5
## Accessibility (compliance with Equality Act) - Condition 5

The defining purpose of the Ordsall Chord is to improve access between the towns and cities of northern England; however, the structures that support the bridges and viaducts interface with the ground in various locations. Inevitably the public spaces around are influenced by the railway infrastructure. An important aim of the scheme design is to enhance the current experiences of rail users, pedestrians and cyclists.

The route of the proposed railway structure will weave tightly between various constraints to produce a design solution appropriate to an urban context. Much of the footprint of the proposed bridges is alongside or above existing structures, or positioned over the river or roads. This means that the Ordsall Chord has little adverse impact on the land available for redevelopment and pedestrian space.

A key to the design of the scheme has been an urge to facilitate a positive environment for public life, improve the character of the area and to add to the impetus to regenerate the area expressed in local planning policy.

The Ordsall Chord will cross through at high level, with an elegant and distinctive form which has been designed to be in sympathy with its neighbours To integrate with pedestrian and cycle routes, Prince's Bridge, which no longer serves its intended highway function and will be replaced with a new structure. The new pedestrian and cycle bridge addresses the needs of all pedestrians, cyclists and wheelchair users with improved connections to existing movement patterns.

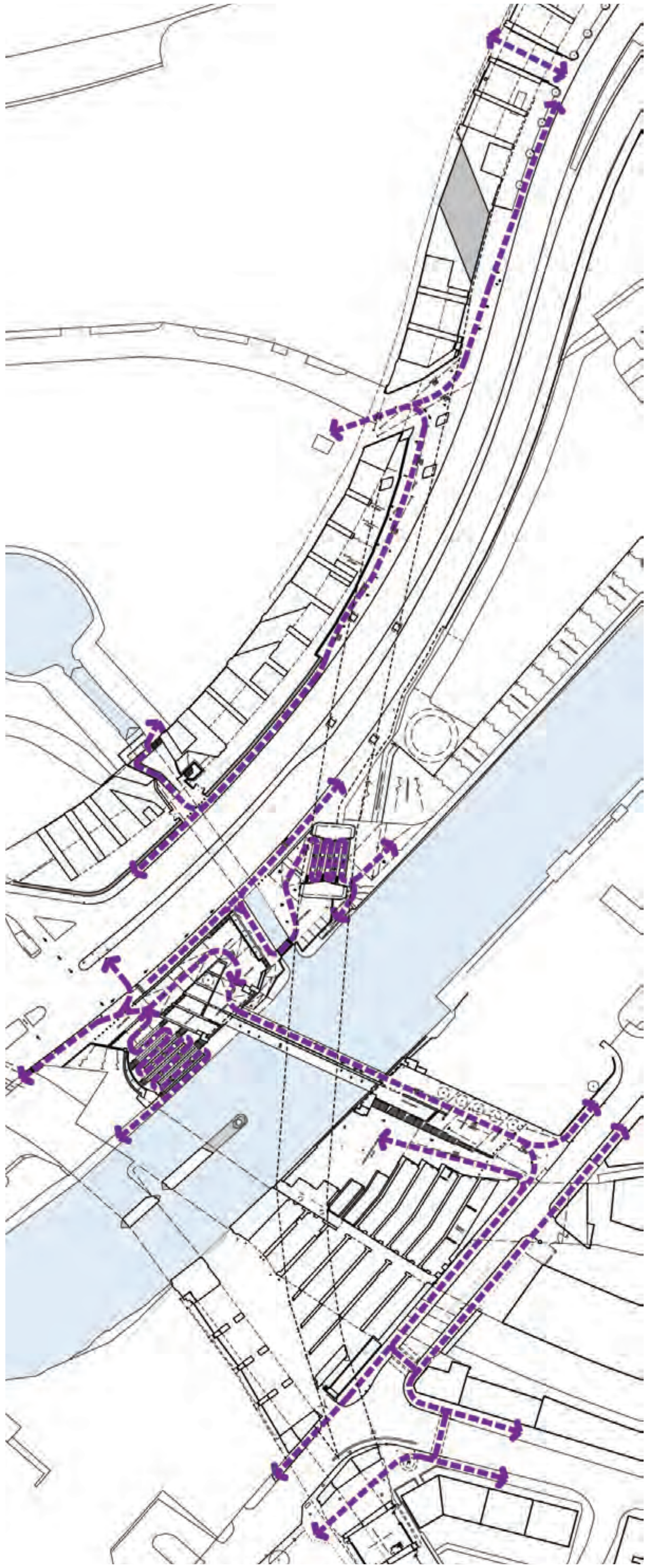

*fig. 2.5.i Wheelchair accessible routes*

# 2.0 Design considerations

The development will create a series of streets and plazas. To enhance the public realm, Stephenson's Bridge is to be exposed to view in a way that has not been possible for over a century. Further to this it is to be restored in a manner to befit this greater prominence. Former railway infrastructure will be taken out of private ownership, restored and brought into a greater level of long term maintenance. They will then play an active role in the surrounding streetscape. Presently unappealing and unattractive structures and spaces will be transformed through various means:

- Historic facades will be repaired, cleaned and lit improving visibility in the public realm
- Pavement surfaces will be replaced, re-graded and extended.
- New structures will be designed such that their appearance compliments the historic fabric.
- Pedestrian crossings will be introduced, along with new surfaced cycling routes.

There are issues relating to access in various areas. In certain places level constraints result in ramps which are steeper than recommended gradients, but these are mitigated by alternative routes provided in adjacent areas (see fig. 2.5.i). One example of this is the areas on the Salford bank of the river adjacent to the landings of the new utilities and foot / cycle bridges.

The authorised works will create a sequence of streets and plazas running around from the original Liverpool Road station around various structures, across the Irwell and the canal before ending at the south end of the English Cities Fund (ECF) development site. As a result of the Ordsall Chord there will be a series of high-quality, pedestrian-focussed spaces that connect Salford and Manchester, gaining benefit and character from the combination of the historic fabric and new insertions.

**2.6**
**Environmental**

As part of the submission to discharge planning conditions a number of environmental assessments have been produced for the proposals which have informed the design. These are:

- Archaeology: Written Scheme of Investigation - Condition 7
- Code of Construction Practice (CoCP) - Condition 8

This includes, the following addendum to the CoCP

- External Communications programme;
- Site Waste Management Plan;
- Pollution prevention and incident control plan;
- Traffic Management Plan;
- Nuisance Management Plan;
- Noise and Vibration management plan.

- Contaminated Land - Condition 9
- Ecology - Condition 10

**2.7**
**Crime Impact (Planning Condition 13)**

The design of the scheme has been appraised and a Crime Impact Assessment has been conducted by Greater Manchester Police. An accompanying process of consultation with the British Transport Police has also being undertaken in parallel.

The design for the following stages has reviewed the Crime Impact Assessment and stakeholder input (from BTP, the local authorities and MOSI) to address an outstanding issues, these include the introduction of gating / railings to deter anti social behavior, anti graffiti coatings to materials, fencing to arches and enhanced lighting to specific public realm spaces. The design measures taken within each stage of the project has been identified in each of the sections that follow.

Further works will continue to ensure the construction team will secure all materials during the build process.

Measures to mitigate concerns raised by Greater manchester police (GMP) in the Crime impact assessment (CIA) have been addressed in Section 3, to indvidual areas.

**2.8**
**Heritage Assets (Planning Condition 14)**

A detailed analysis and design of specific elements of proposals which affect listed building or their setting forms part of the Conversation management plan Secton 2.5.

# 2.0 Design considerations

### 2.9
### Selection and specification of materials -Condition 11

The Ordsall Chord project proposes a wide variety of materials across structural elements and public realm features. To assist with the process of discharging consent 11 (materials) a samples area has been set up at Water Street. This area incorporates numerous samples which are relevant to the proposals.

This sampling process also incorporates works to heritage structures, further detail of which is available in Appendix 3 (Specification for Fabric Repairs) of the Conservation Management Plan.

Some proposed materials are common to all stages of the works, and others are specific to specific areas. The former category are explained in further detail in the following text and images; the latter group of materials are covered in the specific stages in the latter sections of this report. Figure 2.8.i explains the layout of the samples area and cross-refers this to the relevant sections of the design guide.

The selection and assessment of materials has been undertaken in close conjunction with the project stakeholders to seek agreement on each individual specification.

The major structures will utilise steel and concrete in a variety of finishes. These two materials are focussed on in the following text and images.

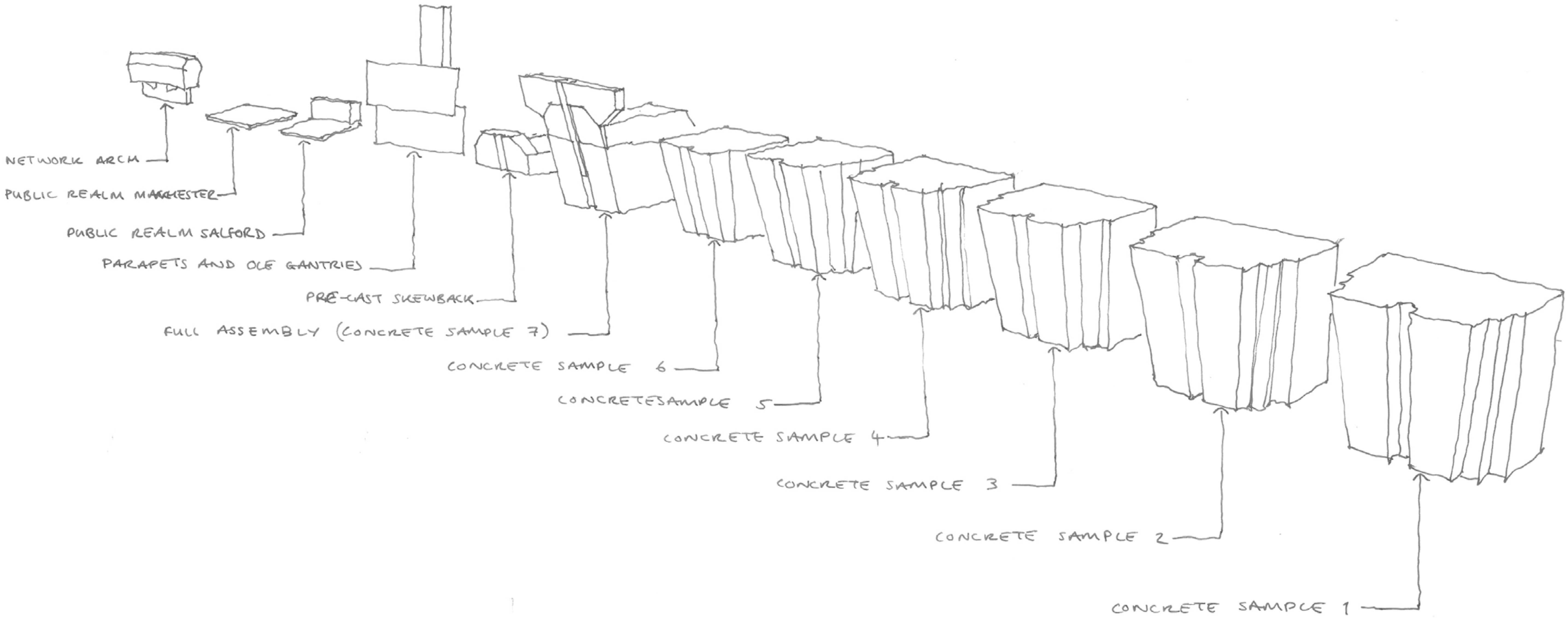


*fig. 2.9.i 3D sketch of samples area at Water Street compound*



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# 2.0 Design considerations

### 2.9.1
### Materials proposed - Steelwork

Steelwork visible in the public ream is proposed in two finishes, weathering steel and galvanised steel. The former will be utilised for the primary structural elements of the structure; the latter is proposed for use on secondary elements. Details of how, where and why each material was used is provided below in reference to each specific location.

This section of the document combines photographs of the samples that have been prepared alongside 3D diagrams which place them in context and explain how the elements will fit together.

A series of graffiti removal tests have been undertaken on the steel to ensure Network Rail have a process and maintainability which is achievable.

The welding of individual steel sheets to one another will be produced through the use of the same steel material as the adjacent sheets. This will gradually weather down to a similar colour across the whole assembly. During discussions with stakeholders about the network arch sample (fig. 2.9.ii - xi) the darkening effect of the rough weld surfaces was raised as a concern. However, a partial grinding of the weld is proposed to soften this visual affect. A short section of the weld on fig.2.9.xvii has been ground in this manner (visible at the centre of the image).

It is not proposed to undertake a full grind of the welds to the point where they are flush with the adjacent steel. This process is considered to produce an inferior aesthetic appearance as it produces an inconsistent 'dishing' of the surface.

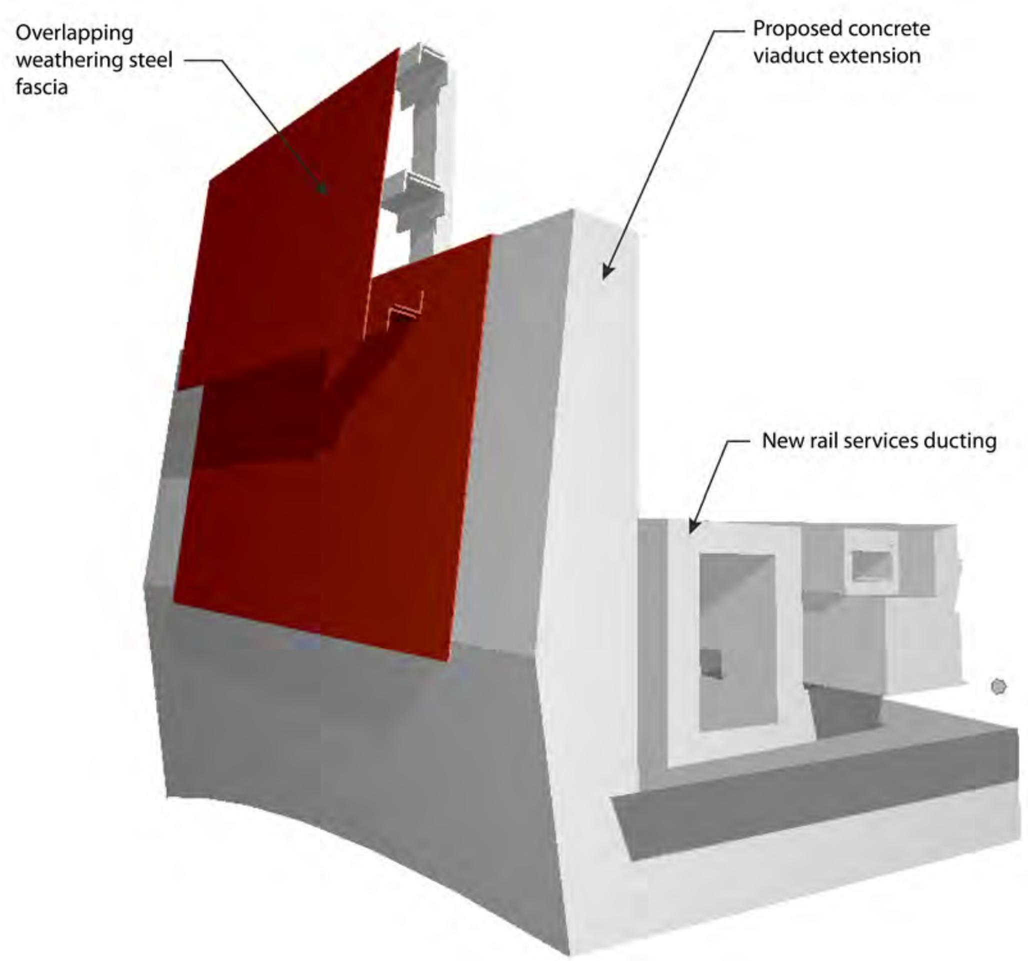


*fig. 2.9.ii 3D view of parapet detail (relevant to stages A and F)*

*fig. 2.9.iii photograph of parapet sample (relevant to stages A and F)*

# 2.0 Design considerations

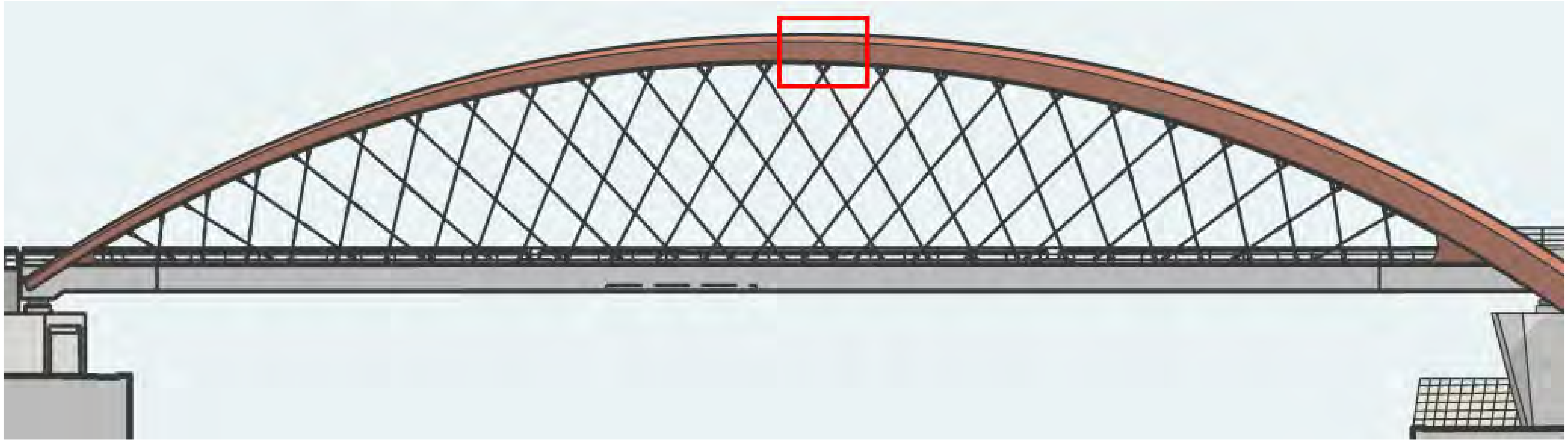

fig. 2.9.iv Visualisation of network arch crossing the River Irwell (relevant to stage E; section denoted in red has been prepared as a full size sample as shown in fig. xi - xvii)

fig. 2.9.v Sequential images to show development of patina on surface of weathering steel (19/11/14)

fig. 2.9vi Sequential images to show development of patina on surface of weathering steel (11/12/14)

fig. 2.9.vii Sequential images to show development of patina on surface of weathering steel (18/12/14)

# 2.0 Design considerations

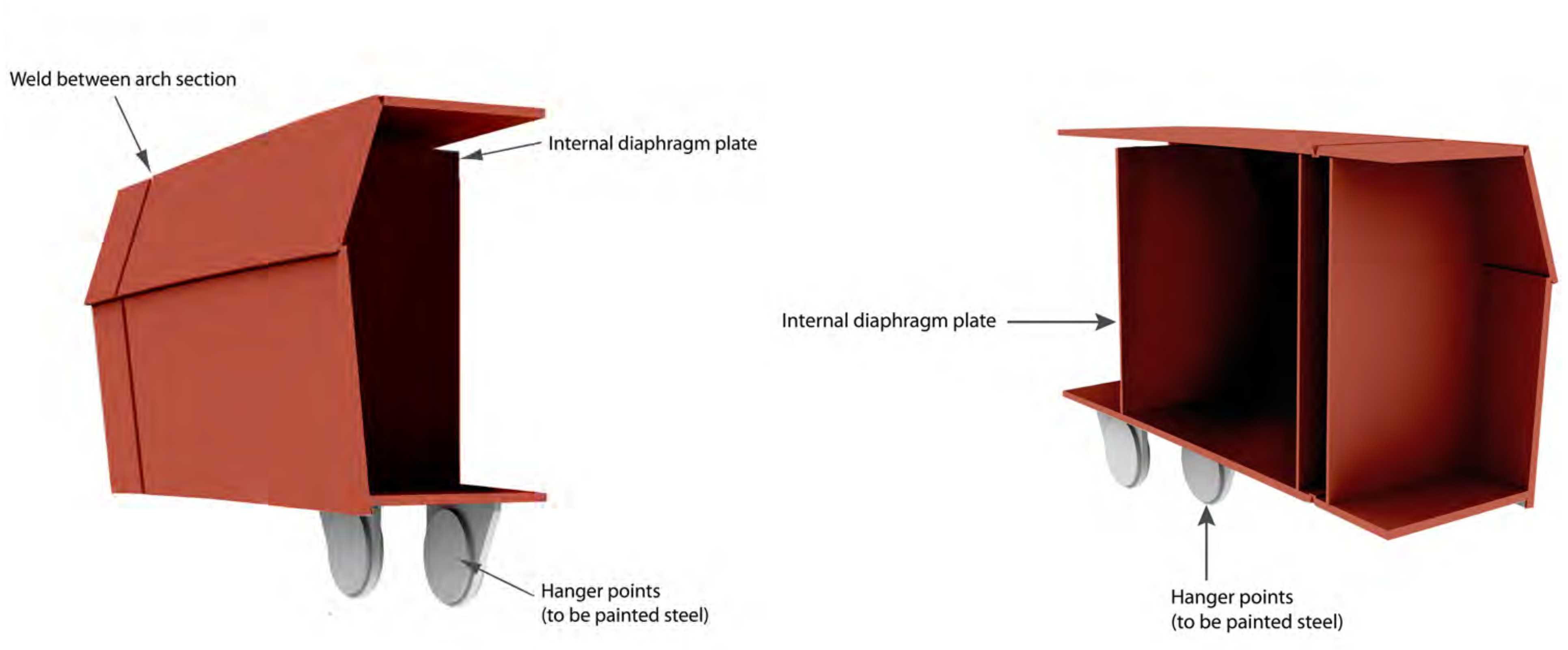


*fig. 2.9.viii Assembly of elements making up the sample arch section shown in photographs below. The arch will be made up of 3 sections welded together; this weld (visible on these images) is of the same steel specification as the arch sections, and hence will gradually weather to the same colour. Also visible on the photographs is an inconsistency of tone resulting from the internal diaphragm plates; this too is a temporary effect.*

*fig. 2.9.xi Partial grinding of welds (centre of image) to reduce 'shadowing' effect of rough surface*

*fig. 2.9.ix Sequential images to show development of patina on surface of weathering steel (19/05/15)*

*fig. 2.9.x Sequential images to show development of patina on surface of weathering steel (02/07/15)*

# 2.0 Design considerations

### 2.9.2 Materials proposed - Concrete

As with other elements of the work, an extensive series of large-scale material samples have been prepared to enable the project team (including stakeholders) to consider the visual, physical and constructability aspects of the proposals. The location of these is within a dedicated area off Water Street. The earlier section 2.9 described the principles of material and structure that are proposed.

*fig. 2.9.xii concrete samples*

*fig. 2.9.xiii concrete with acid etched and smooth finishes*

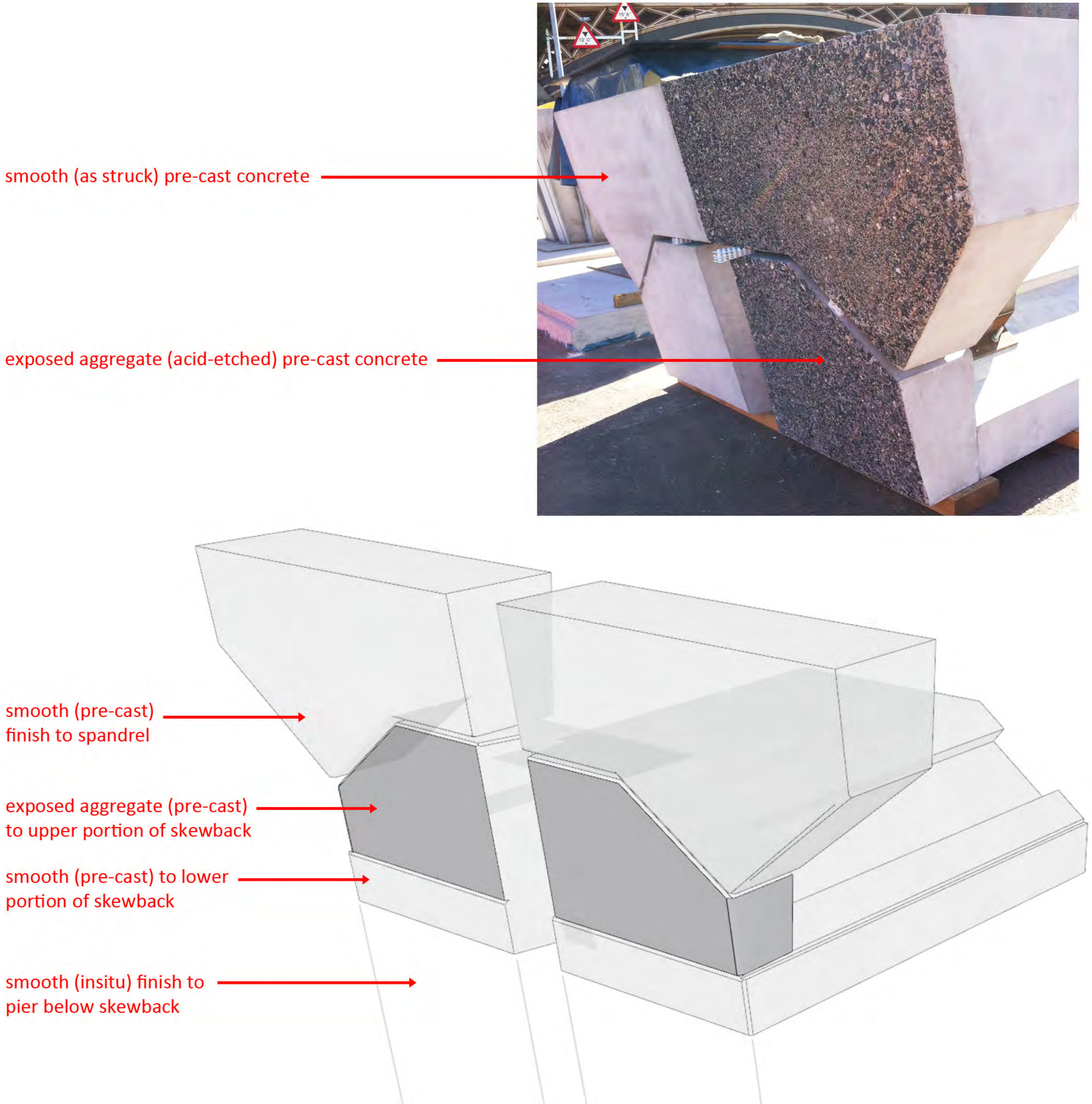


*fig. 2.9.xiv concrete finishes (lower image indicates final choice of surfaces across skewback and spandrel)*



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## 2.0 Design considerations

A variety of different pier and abutment forms will be formed from concrete (see figure 2.9.xv for a selection of these forms), and the designs have been developed to provide:

- An aesthetic language appropriate to the important urban facades created by the Northern Hub project
- Interface details that can smoothly incorporate variations in the width and alignment of the original viaducts, as well as the curve in plan of the existing structures
- Drainage pipes to feed water falling onto the track to be collected and subsequently down to street level
- Electrical cabling routes for highways and public realm lighting & telecoms
- The ability to disguise variations in colour, texture and surface variation between pre-cast and in-situ concrete

In stages A and F concrete and weathering steel are proposed as new structures which take the form of widening to the historic viaduct (with the concrete immediately adjacent to, but separated from the new structure). The principles above have been applied for the use of concrete and metal to the widening of the viaducts (see fig. 2.9.xvi and 2.9.xvii).

The supporting piers are to be formed from in situ concrete from below the ground up to the springing point of the arch (fig. 2.9.xviii and 2.9.xix). At the latter point the use of concrete changes from in-situ to precast, namely the outer spandrel wall (fig. 2.9.xx) above the arch and the underside of the arch vaults (also known as the intrados). Due to size constraints each vault will be formed from a series of separate concrete rings (see fig. 2.9.xix). Each precast arch section will sit into a 'skewback', which is in effect the springing point of each arch. For the Castlefield Viaduct (Stage A) the skewbacks will be pre-cast concrete elements sat on top of the in-situ piers (fig. 2.9.xxi; along the Middlewood Viaduct the skewbacks will be poured as insitu concrete as per the pier below.

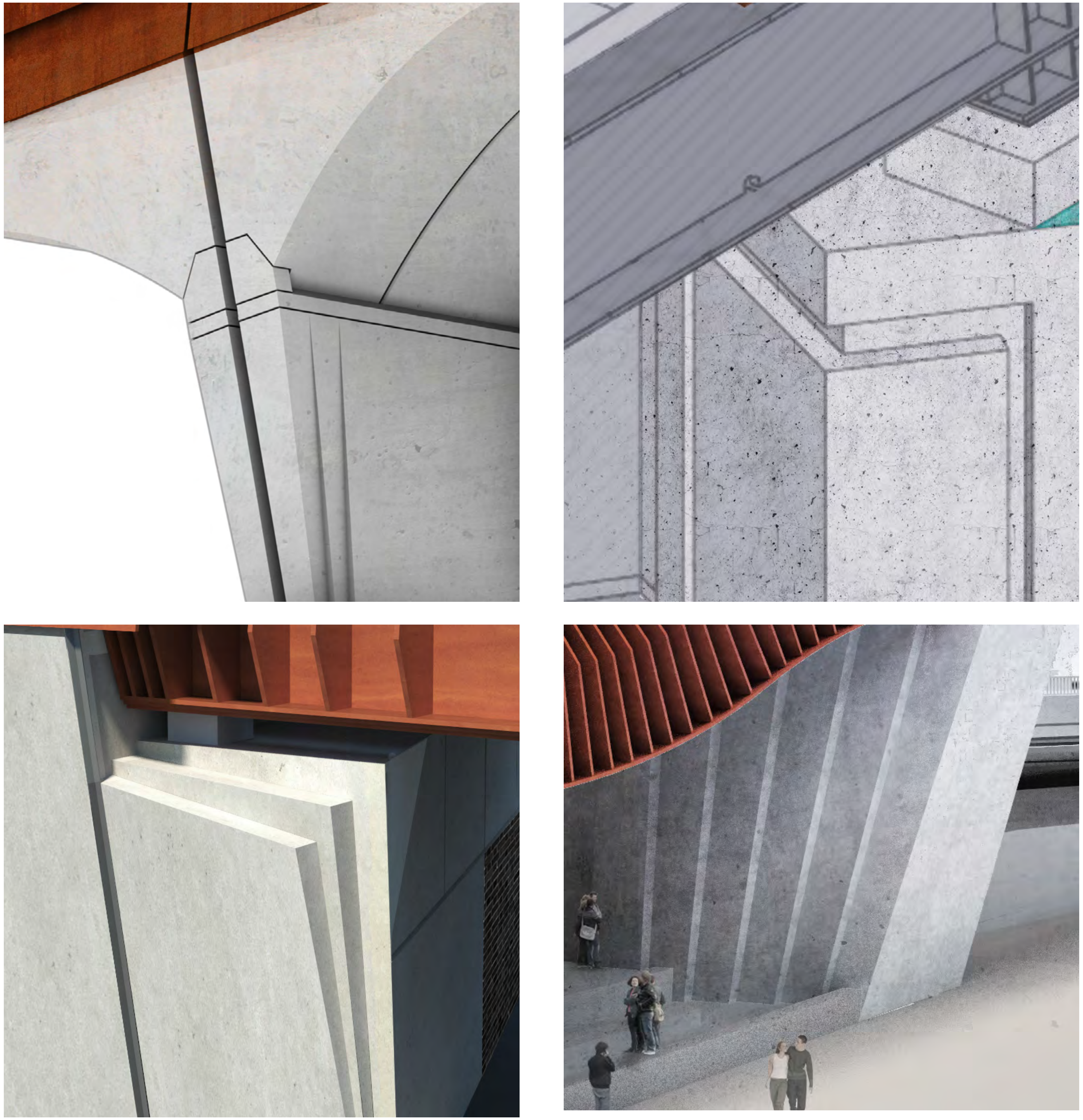

*fig. 2.9.xv various pier and abutment forms proposed for Ordsall Chord structures*



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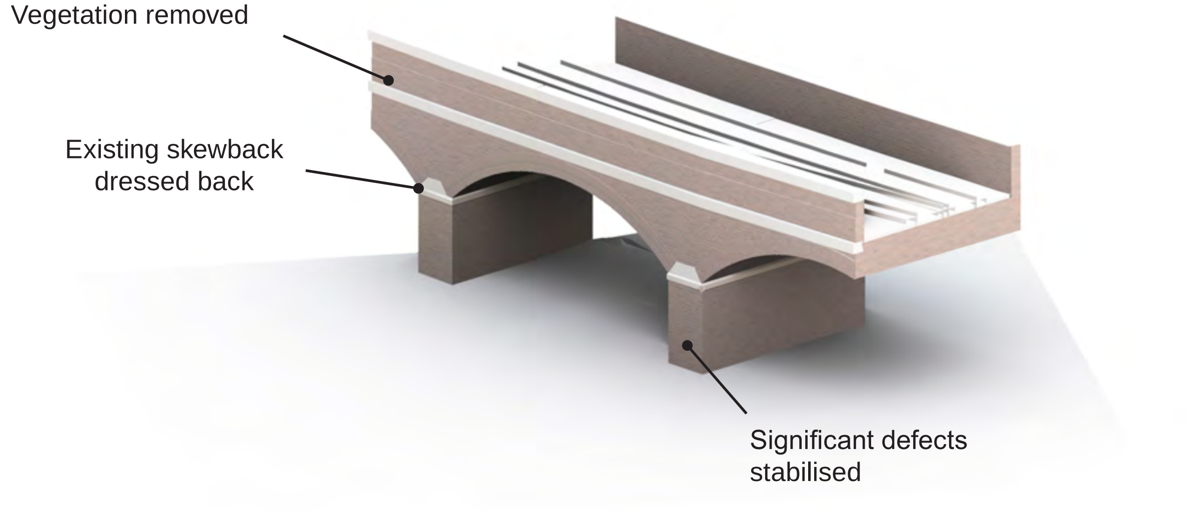
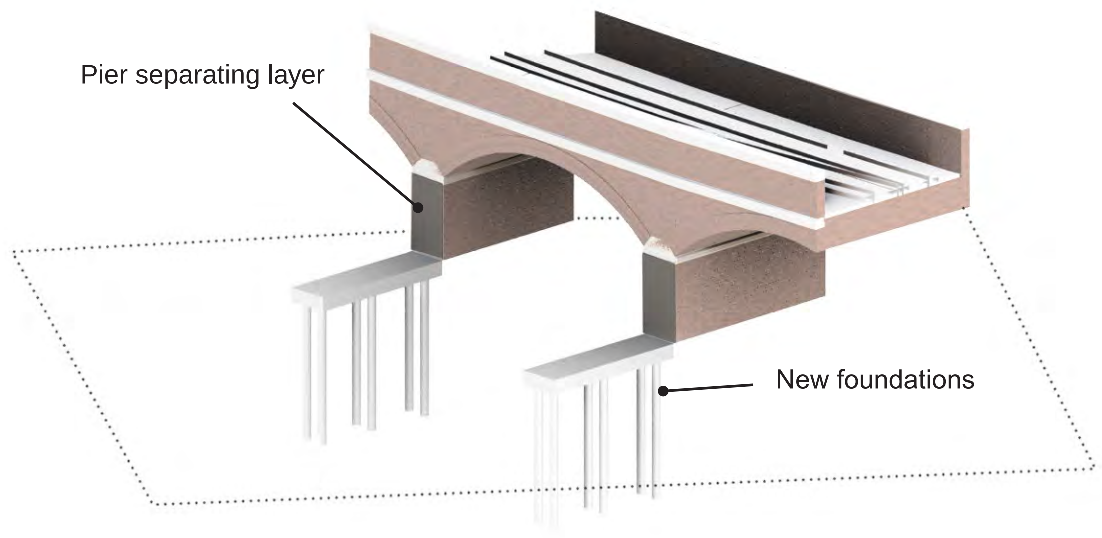
# 2.0 Design considerations

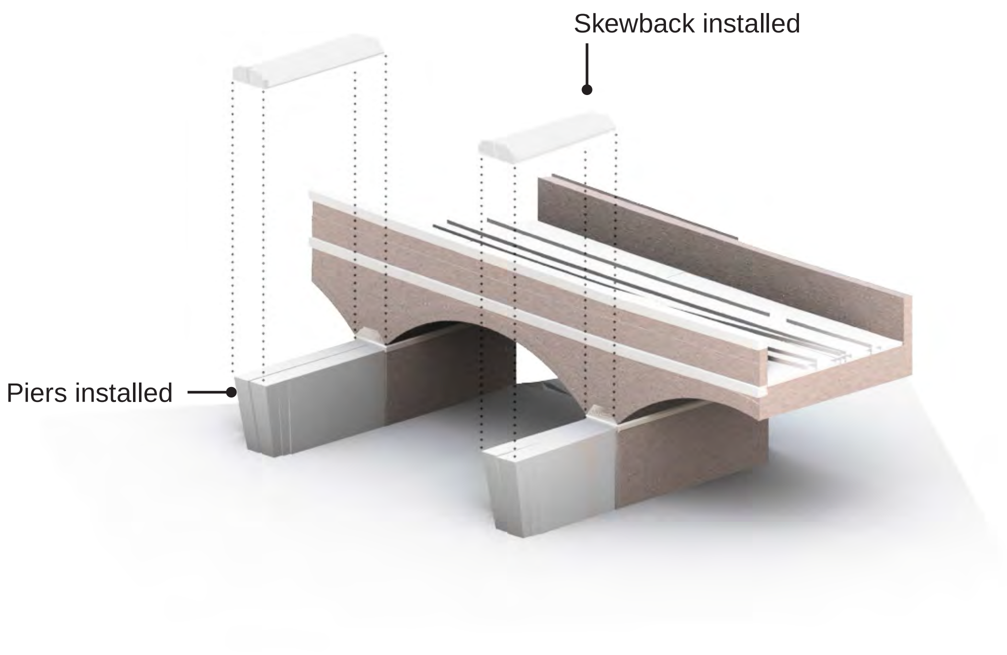
## 1. Repairs




## 2. Foundations




## 3. New piers




## 4. Precast concrete elements

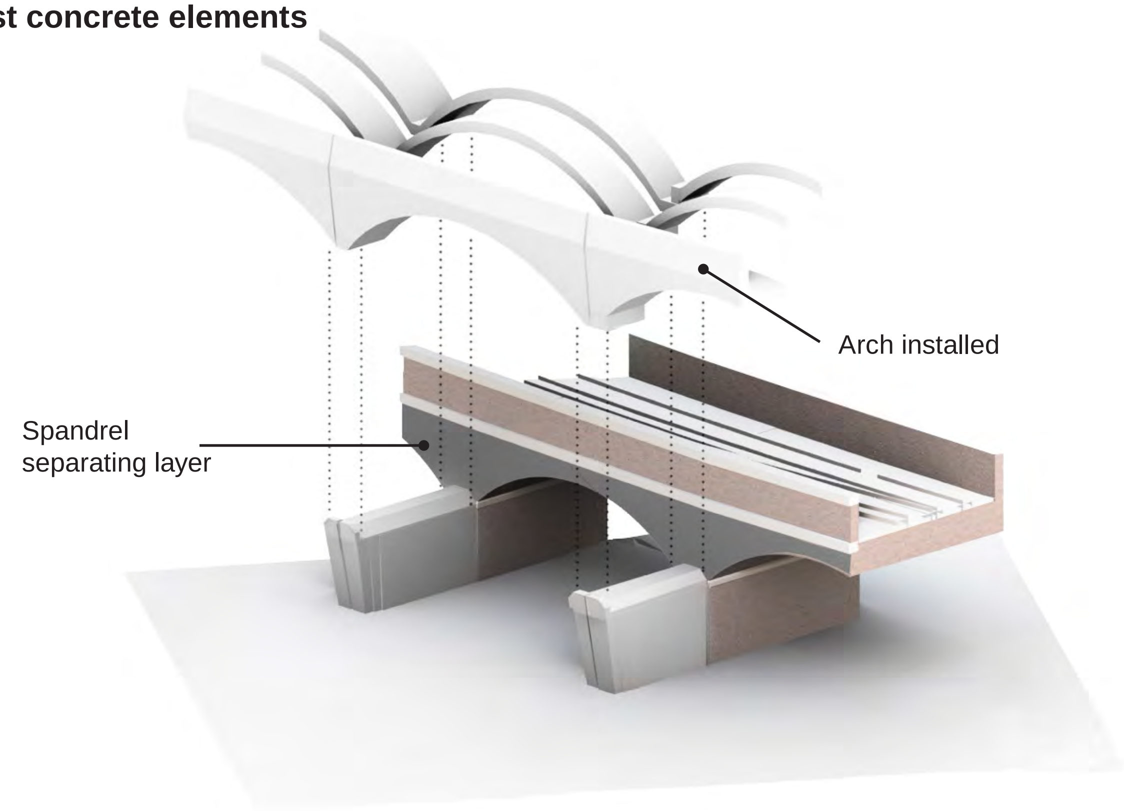



*fig 2.9.xvi sequential diagrams to illustrate the modification of existing structures, followed by the construction of concrete arch widening and laying of waterproofing slab with track on top*



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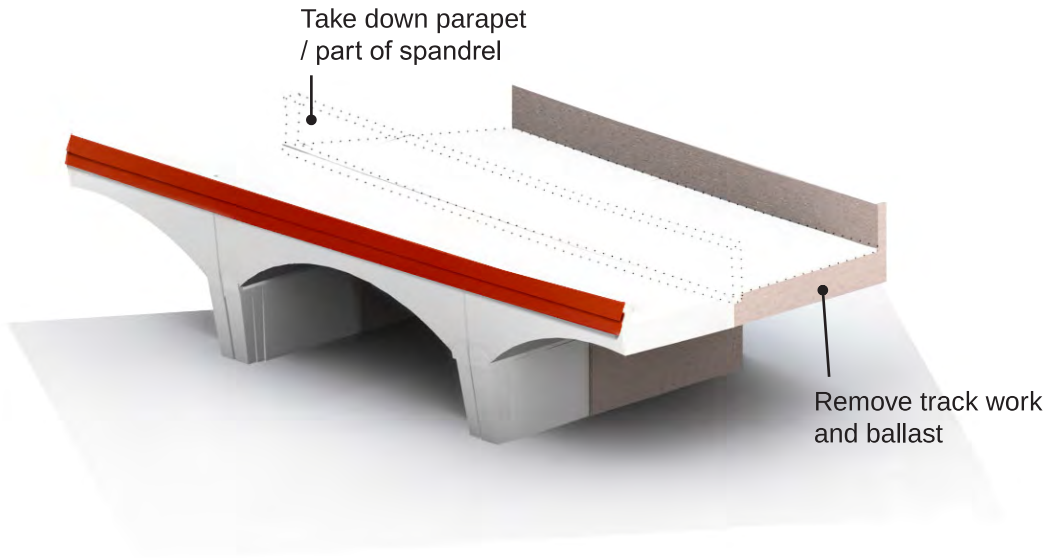
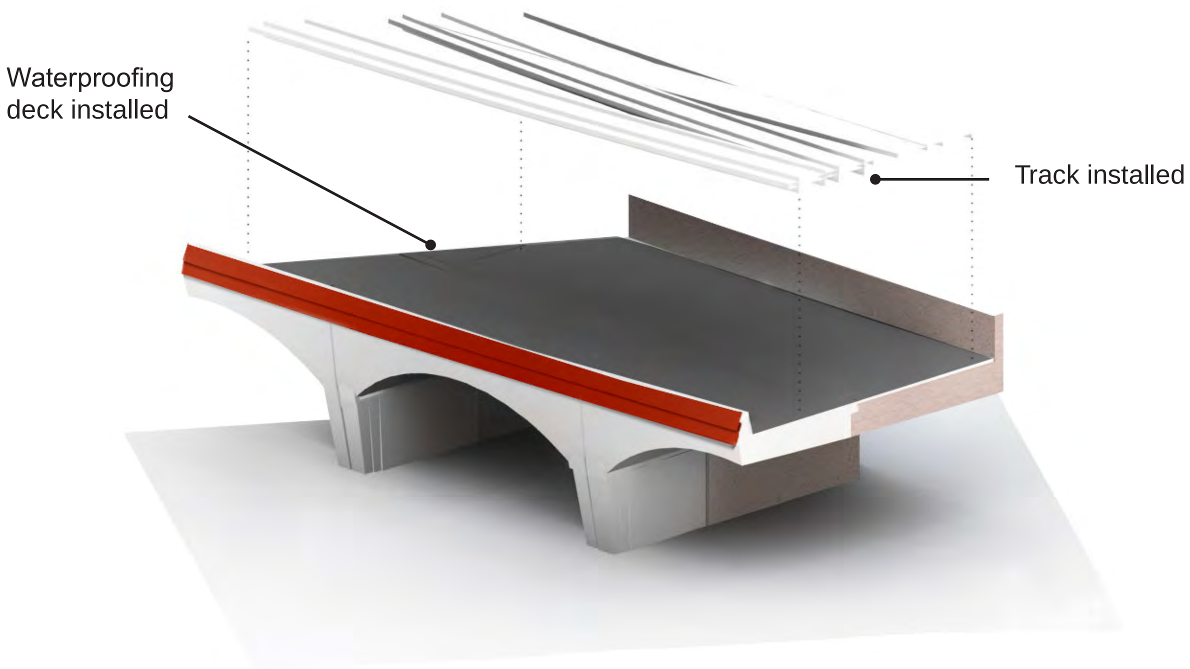
# 2.0 Design considerations

### 5. Insitu concrete


### 6. Parapet removal




### 7. Waterproofing




### 8. Finishing

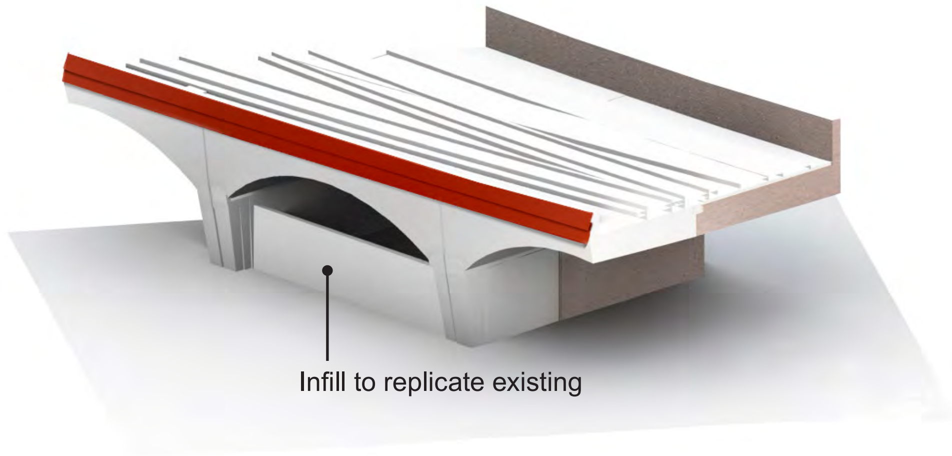



*fig 2.9.xvii sequential diagrams to illustrate the modification of existing structures, followed by the construction of concrete arch widening and laying of waterproofing slab with track on top*

# 2.0 Design considerations

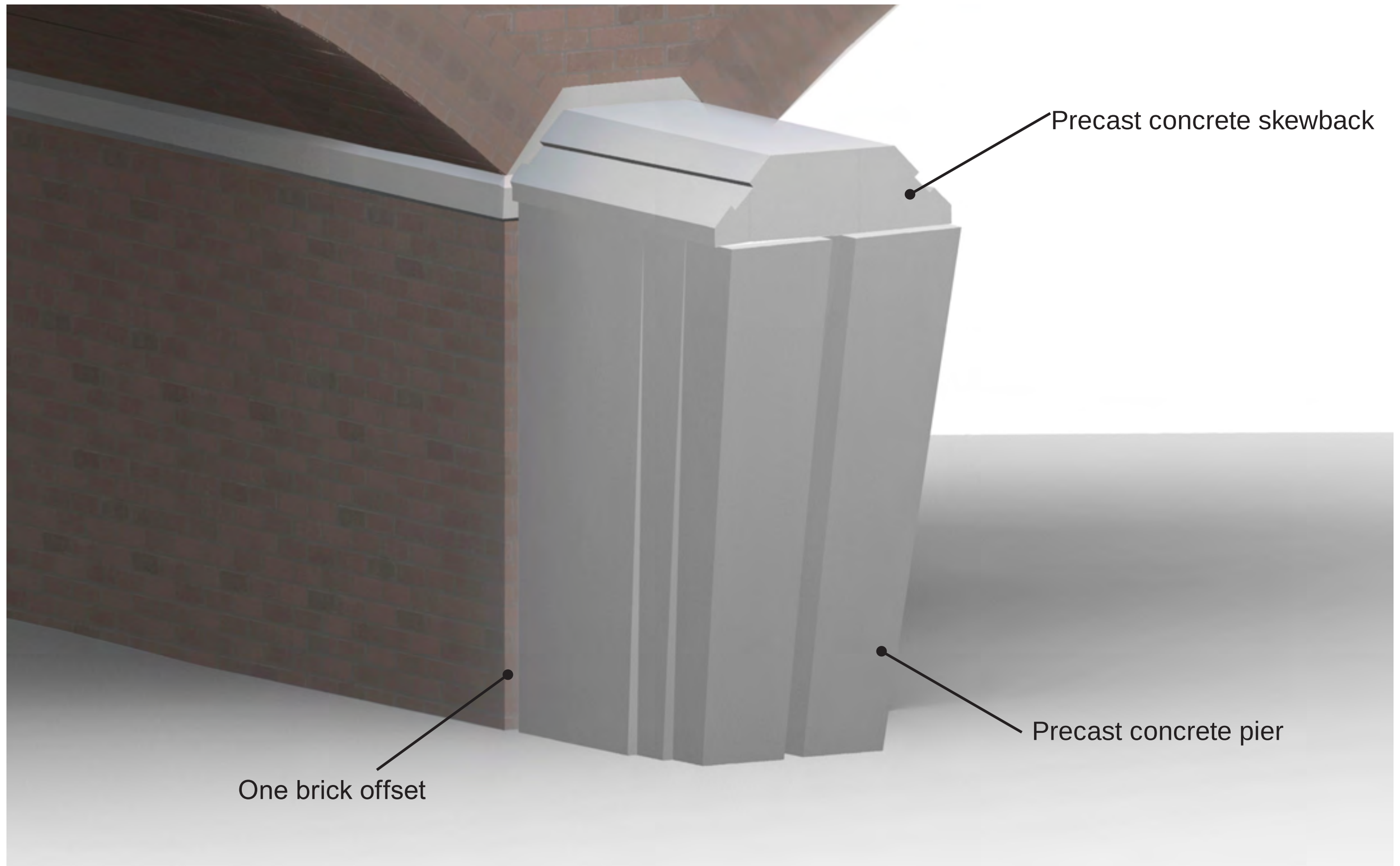



*fig 2.9.xviii insitu pier with pre-cast skewback (springing block) on top*

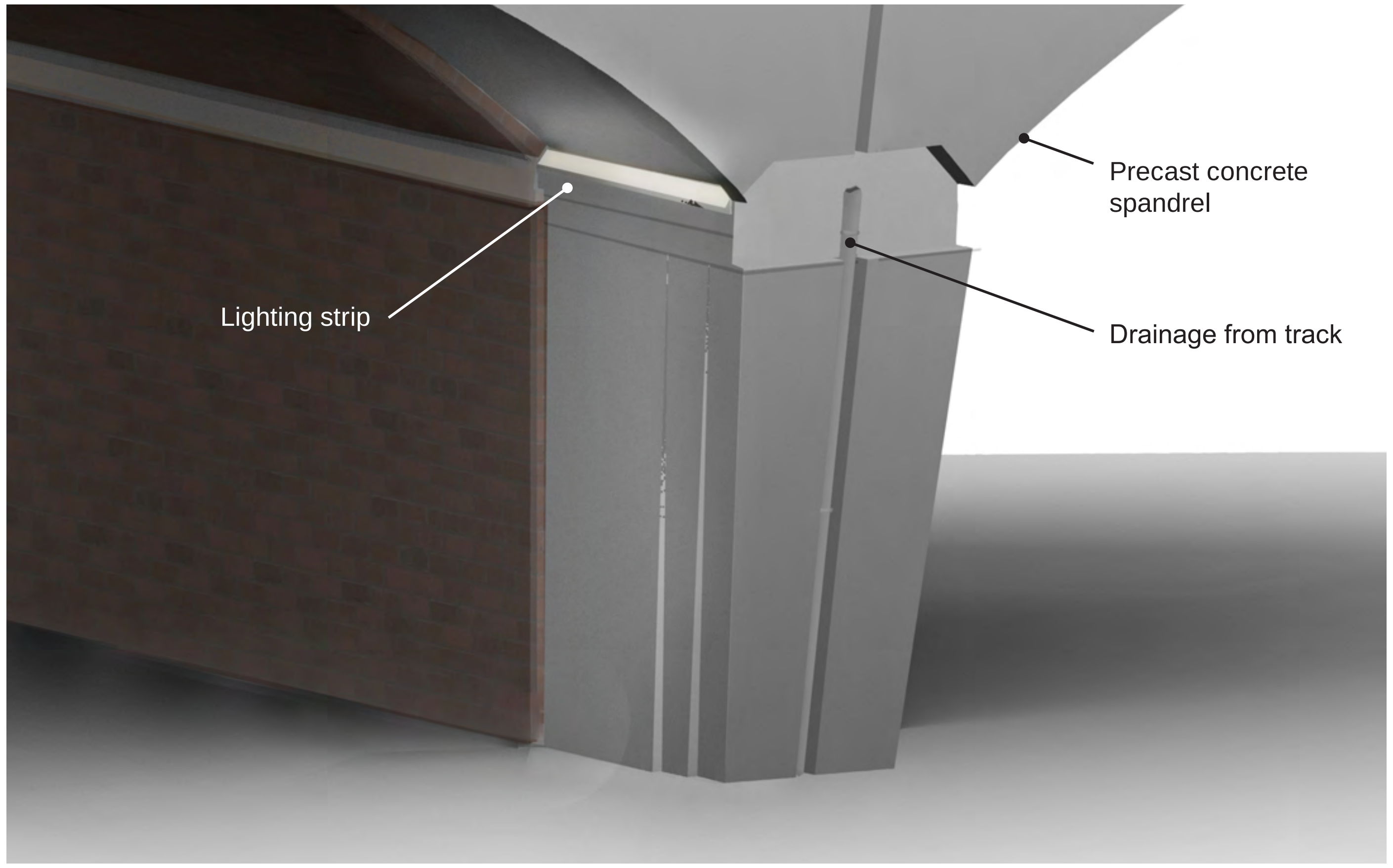



*fig 2.9.xx lighting strip and pre-cast concrete spandrel panel to outer elevation*

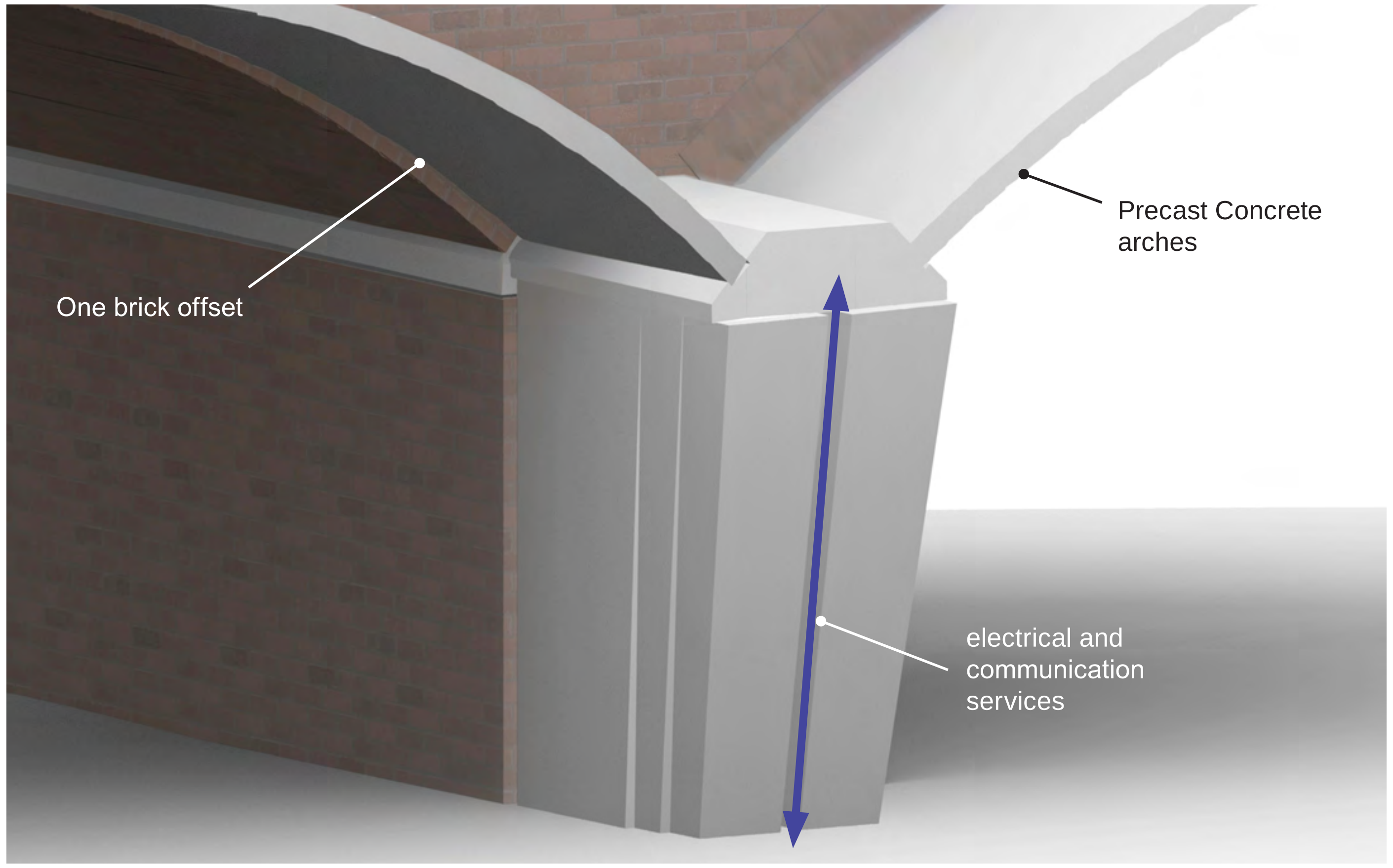



*fig 2.9.xix concrete arches spanning between skewbacks*

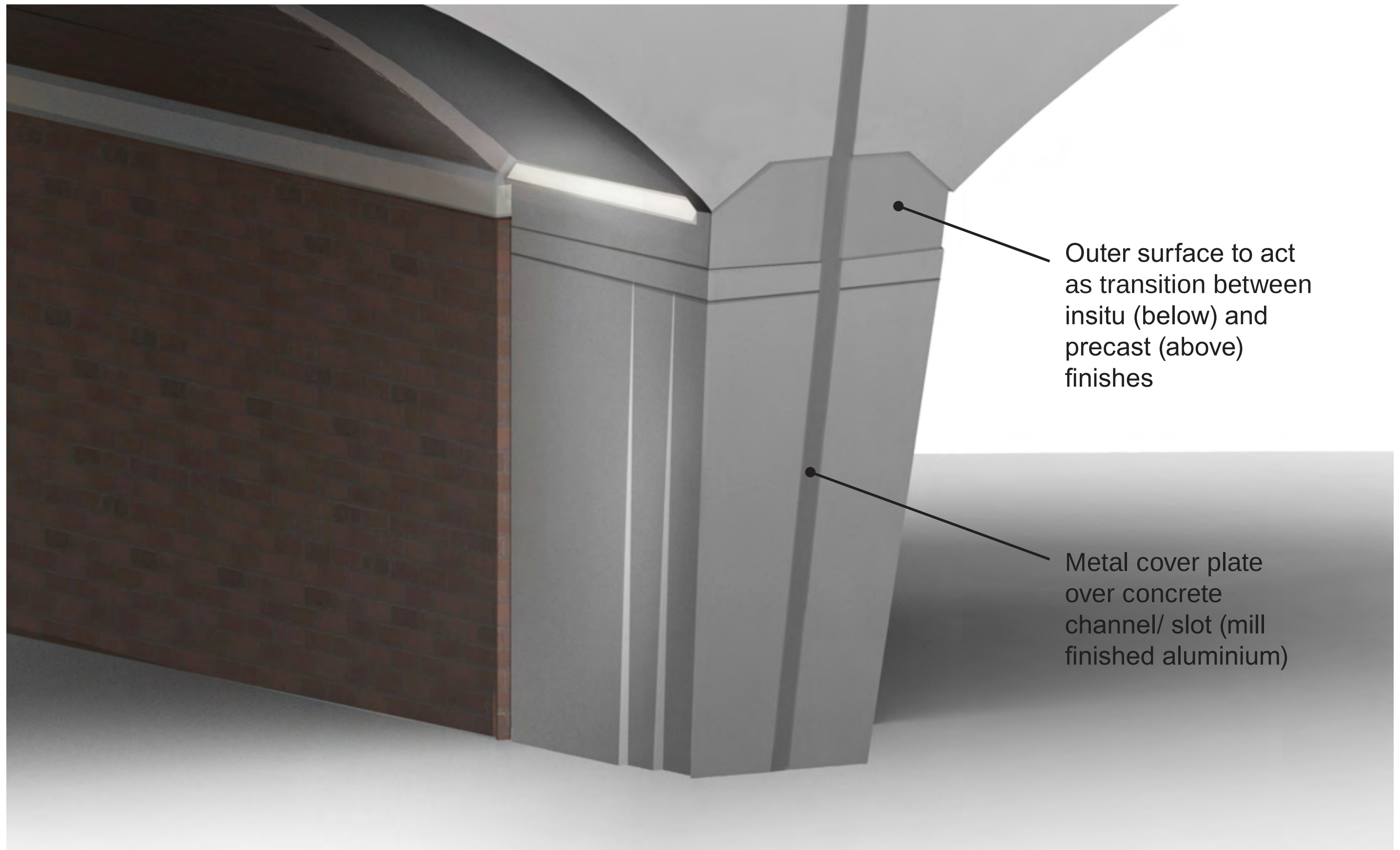



*fig 2.9.xxi external finishes to pier, skewback, spandrel and cover to inset services channel*

# 2.0 Design considerations

### Setting out principles and geometries

The external facade of the widened viaducts will be inclined by 11 degrees (from vertical) and the piers and arches will follow the shape and pattern of the existing brick viaduct piers and spandrels behind. However, the new arch spans will be situated approximately 100mm higher than the existing, resulting in visibility of the existing brick structure behind. A similar offset is proposed where the vertical concrete of the arch support piers addresses the existing brickwork. The outer corners of each pier are 'pleated' on plan, tapering the mass of the pier as it approaches the ground (see figure 2.9.xviii).

Similar pleated details and inclined planes are common to other bridge- and viaduct-supporting piers and abutments (see figure 2.9.xv). In all locations the corners of the concrete are proposed to be finished with a 45-degree angled chamfer, to minimise the risk of inconsistent, cracked edges.

### Concrete finishes

As noted above, concrete is proposed to be cast in both in-situ (i.e. poured and cast on site) and pre-cast (i.e. manufactured in a factory and sent to the site as individual elements). These two methods can display visual inconsistencies when viewed alongside one another, and hence considerable work has been undertaken to consider how the concrete mix, formwork and finishes can manage differences between the two in an aesthetically appropriate manner.

Site samples (fig. 2.9.xii - xiv) have been produced to integrate construction, buildability and aesthetic judgements to ensure the required quality is achieved. To achieve this, multiple concrete sample have been poured utilising different mixes, formwork and techniques. This process has engaged client and stakeholders to provide input and preferences to the finishes. Whilst a range of different options have been explored, there are three principle approaches available:

- Smooth finishes: A series of samples with smooth finishes have been provided (see fig.2.9.xxii). These worked through different mixtures, formwork finishes and pouring techniques before self-compacting concrete was identified as the process which could provide the best balance of a smooth finish with minor surface imperfections which reflect the natural finishes of concrete. This is based on the minor colour variations inherent in concrete proposed as being appropriate to the wider design aesthetic of the Northern Hub and the context of existing masonry structures.
- Paint finishes: Different concentrations of mineral paint can be applied to concrete, from a light wash through to an even, consistent finish. This method of surface finishing can provide benefits as it can mitigate the negative effects of a cheaper concrete finish or a surface which has been subject to significant amounts of repair following the removal of formwork. One of the earlier concrete samples prepared on site (number 3 on fig.i) has been painted to display how a poor quality concrete can be masked (fig. 2.9.xxiii).
- Textured finishes: There are different means of achieving a textured finish in concrete, including formwork with a patterned liner, acid-etching (through the removal with acid of surface finishes following the removal of formwork) or retarded surfaces (where a liquid is applied to the inner faces of the formwork prior to the concrete being poured, as is shown on fig. 2.9.xxiv). Three samples have been prepared on site of this latter finish (one of which is sample 6). This could mitigate some variations in colour (between, for example, between insitu and precast concrete).

### Concrete Society report

Network Rail have commissioned an independent report from the Concrete Society to review the samples prepared on site. During the visit samples 4 and 7 were observed by the representative of the Concrete Society as being of anotably high quality. The report also incorporated recommendations to address colour inconsistencies in the repairs undertaken to (deliberately) damaged corners (see following text for details of subsequent samples undertaken).

*fig 2.9.xxii smooth concrete finishes*

*fig 2.9.xxiii painted concrete finishes*

*fig 2.9.xxiv textured concrete (on left)*

# 2.0 Design considerations

**Management of graffiti**

As concrete structural elements of the Ordsall Chord will be exposed at ground level, it is considered that some areas will be at risk of graffiti being applied. Some of the concrete elements will be coated with an anti-graffiti finish, as shown on fig. 2.9.xxv. A number of samples of different anti-graffiti surface treatments were undertaken to assist with the material to be used. This was one aspect of a number of 'post-finishing' works undertaken to explore (amongst others) the visual appearance of different concrete mixes and methods of repair to damaged surfaces. A summary of these processes is illustrated in fig. 2.9.xxvi.

The options for surface treatments which are intended to make the removal of graffiti simpler and more successful, and the use of painting to allow graffiti to be covered up without producing an obvious 'painted patch' has been investigated during the trials. A more detailed appraisal of the study is included as an appendix to this document; the following text is a summary of the main findings.

Two stages of graffiti treatment trials have been undertaken. The initial stage reviewed a wider range of treatments to identify a shortlist of four for the second stage. The main conclusions from this first stage were:

- The graffiti treatment regime should be based on practical and realistic initial application and removal techniques which do not require unduly onerous access requirements or difficult to source products
- Anti-graffiti treatments (such as wax-based finishes) that require re-application after removal of graffiti were not appropriate for use in the locations presented by this project

For the second stage of trials, the anti-graffiti treatments applied were:

- Epicuro Hydrophobic Bridgeguard (HB; fig.2.9.xxvii);
- Parex Paraguard (PP; fig.2.9.xxviii and xxxii);
- Keim MX Glaze (MX; fig.2.9.xxix), and;
- Richard's Paints Graffiti Stop (GS; fig.2.9.xxx).

All four products are 'permanent' treatments, which should withstand several (>10) cycles of graffiti application and removal. The first two (HB and PP) are considered to be surface impregnations as they do not lead to a significant change in the appearance of the concrete. The second pair (MX and GS) are considered to be coatings, as a clearly visible surface layer is applied which can detract from the overall aesthetic quality of the concrete.

Following consultation with the treatment manufacturers, graffiti removal has been attempted by water jetting, the use of a solvent based graffiti remover and scrubbing with hot soapy water. The most successful method of graffiti removal, on all treated substrates and untreated concrete, was the solvent based remover. In all cases it should be noted that whilst a partial cleaning of the graffiti can be achieved on untreated concrete surfaces this limited degree of removal is considered to be inadequate.

The surface impregnation treatments leave a certain amount of residual graffiti shadowing visible on the treated areas of concrete. There are marginal differences between the post-cleaning surfaces of the HB and PP products.

The coating products both enabled the graffiti to be more comprehensively removed. The graffiti applied to the MX was fully removed, although the MX itself significantly changes the appearance of the concrete which is not considered acceptable in this important location. Most of the graffiti was removed from the GS treated surface by scrubbing with soapy water, although some shadowing remained.

Painting of the concrete surface with Keim Concretal W has also been undertaken, followed by the application of graffiti and overpainting with further Concretal. The initial additional coat of paint failed to adequate disguise the graffiti and a subsequent coat produced a 'shadowing' and gave a slight inconsistency with the areas which has not had the additional coats of paint.

To enable a consideration of the effect of surface on the capability of graffiti to be removed a series of tests were taken on the three specifications / finishes (mass concrete, self-compacting and textured) produced during the concrete sampling process. The smoother, less porous surface of the self-compacting concrete performed slightly better than mass concrete in terms of graffiti removal. All three removal techniques (jet-wash, solvent and abrasive) were tried on the retarded surface and whilst some paint was removed a substantial amount remained in place within the voids and recesses of the finish.

Whilst these trials have not identified a treatment with a suitable aesthetic appearance which allows the applied graffiti to be simply and fully removed, it is felt that a surface impregnation gives the best combination of aesthetic appearance and capability for graffiti to be removed.

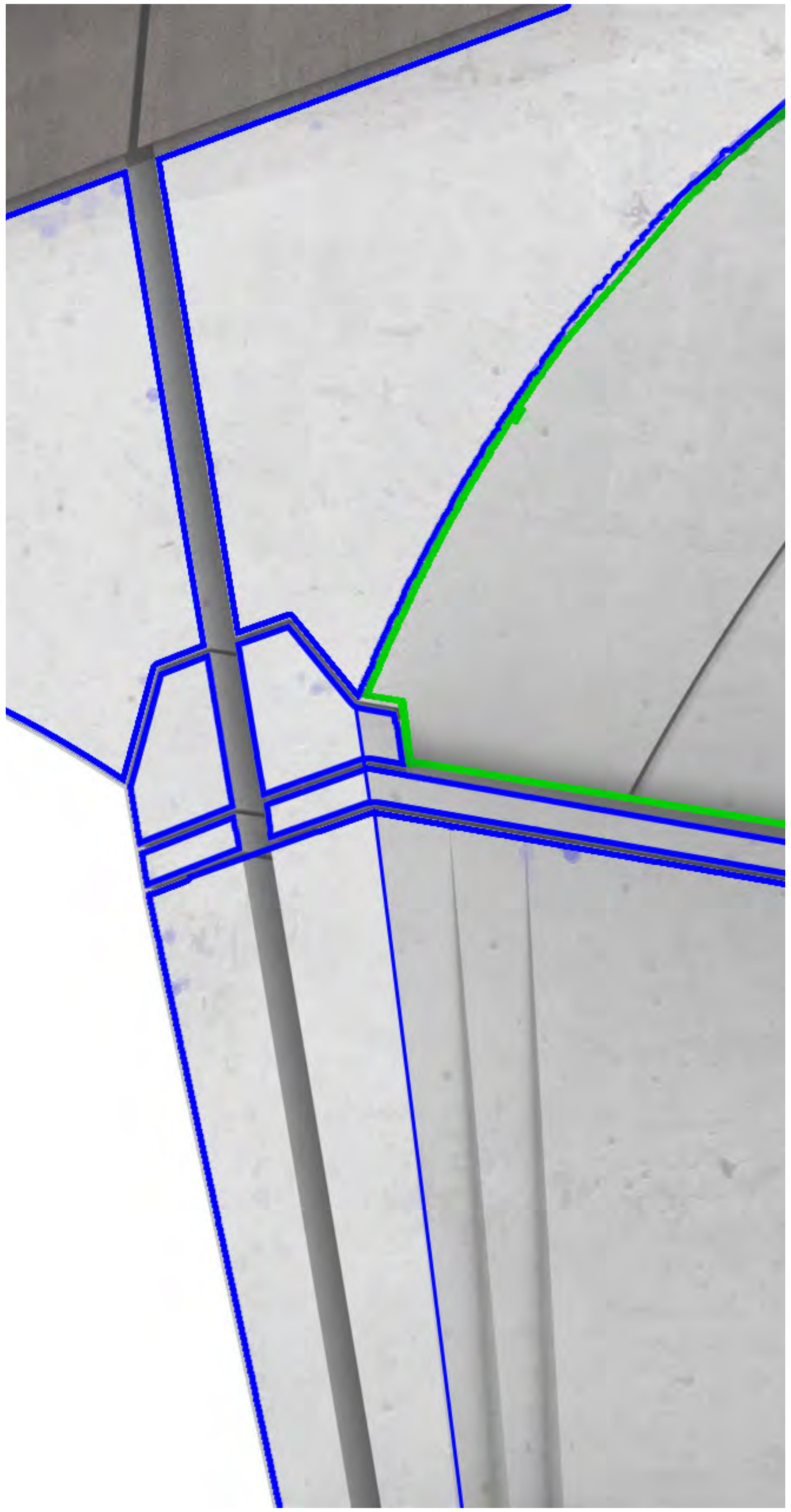


*fig. 2.9.xxv areas edged in blue to receive anti-grafitti coating, edged in green to be left unfinished*

# 2.0 Design considerations

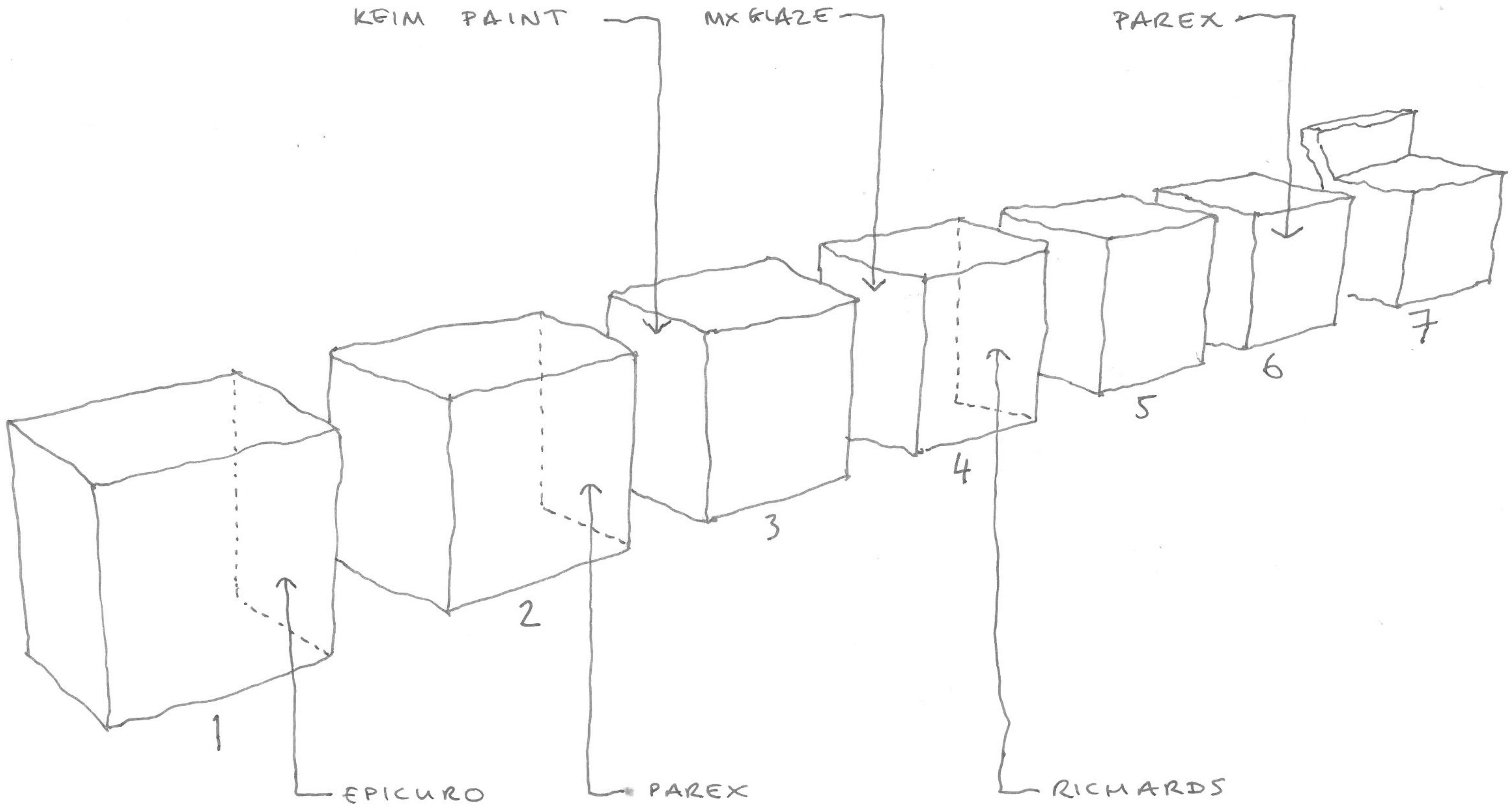



*fig. 2.9.xxvi* *protective coatings and cleaning of grafitti; products sampled*

# 2.0 Design considerations

fig. 2.9.xxvii *Epicuro Hydrophobic Bridgeguard (upper part of sample not treated with product and lower part has coating applied; area on left not cleaned and area on right subject to cleaning process as noted)*

fig. 2.9.xxviii *Parex Paraguard (upper part of sample not treated with product and lower part has coating applied; area on left not cleaned and area on right subject to cleaning process as noted)*

fig. 2.9.xxix *Keim MX Glaze (upper part of sample not treated with product and lower part has coating applied; area on left not cleaned and area on right subject to cleaning process as noted)*

fig. 2.9.xxx Richards Graffiti Stop
(upper part of sample not treated with product and lower part has coating applied; area on left not cleaned and area on right subject to cleaning process as noted)

fig. 2.9.xxxi Keim paint
(lower part of wall subject to multiple coats of same product to cover graffiti)

fig. 2.9.xxxii Parex Paraguard on a textured finish concrete
(full surface subject to cleaning process as noted)

# 2.0 Design considerations

### Interfaces and edges

As noted above, the trial sampling process has enabled the construction team to review strategies which will assist the delivery of the design which is approved through the discharge of conditions. This has enabled the evolution of details which will ensure that the natural variation produced between concrete elements will not be detrimental to the finished visual appearance. Critical to this are the corner details, both in themselves and also in relation to neighbouring structures.

### Rust-staining risks

Another factor that can affect the long-term appearance of the concrete is water run-off from the steel elements, in particular the rust-coloured rainwater from weathering steel. A number of measures are proposed to address client and stakeholder concerns in this regard, and a separate, specific document has been prepared on this subject (it is included as Appendix A to this design guide).

### Repair strategy

For the purposes of the sampling process, a number of areas were deliberately damaged and repaired. The repair entails the cutting back of the area around the damage to enable the effective introduction of an infill patch of concrete. When using smooth-finishes, with appropriate care a repair can accurately reproduce the geometry or surface consistency of surrounding areas (see figure 2.9.xxxiii). This infill material can be difficult to mix to a good colour match against the surrounding material as it will consist of different proportions of cement, aggregate and other constituent elements. To minimise these potential differences in colour, the finished repair can be tinted with a colour matched finish (see figure 2.9.xxxiv).

A similar process can be undertaken if considered necessary on other surfaces. The surface of a skewback was subject to this process, as shown on figure 2.9. xxxv and 2.9.xxxvi). This displays how specific surfaces can be brought to a similar colour and texture to adjacent areas.

*fig. 2.9.xxxiii example of non-colour matched repair*

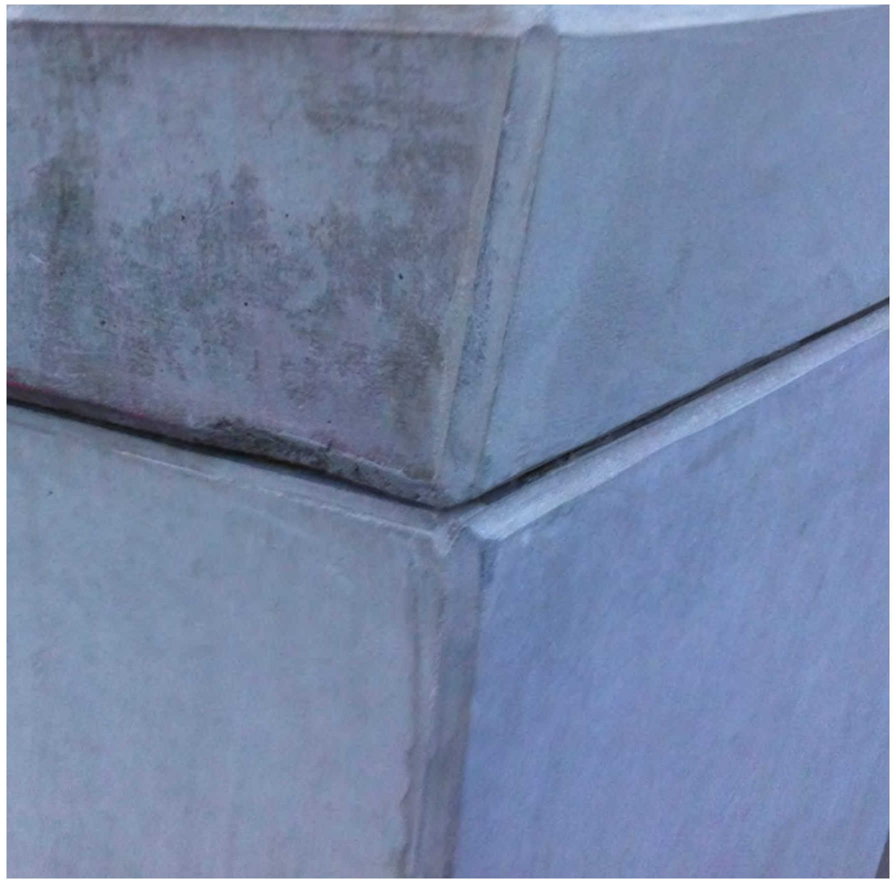


*fig. 2.9.xxxiv examples of damaged (left hand side of photograph) and repaired (right hand side) concrete finishes*

*fig. 2.9.xxxv damaged concrete surface to skewback*

*fig. 2.9.xxxvi repaired and colour matched concrete surface to skewback*

# 2.0 Design considerations

**Review of comparable structures**

*Recent TFGM stops (insitu concrete)*

A common approach utilised by TFGM is for the structures associated with Metrolink stops to be painted with a mineral paint. This can be seen at various locations on the recently constructed line to Manchester Airport, including St. Werburgh's Road (see figure xxxvii). Each of these (to a varying degree) exhibit the slightly 'deadening' effect of the paint which removes the true expression of variations in the concrete colour and texture. The strategy for managing graffiti principally involves repainting with the same colour; however whilst this is a theoretically sound approach it is dependent on the correct colour being applied (if this is not successful the patch of over-painting can be as obvious as the graffiti was (see figure xxxvi)ii). It should be noted that this strategy (based on painting) is of particular merit in areas 'off the beaten track' where access is possible for vandalism but there is no (or little) natural surveillance.

*fig. 2.9.xxxvii painted concrete finish*

*fig. 2.9.xxxviii graffiti over-painted*

*Deansgate Castlefield Metrolink (insitu concrete)*

This recently cast structure (see figure xxxix) does not appear to have been designed as concrete which is intended to be left unfinished and hence it is assumed that it is to be painted as per other Metrolink structures (see previous example). However, in its currently unfinished state it provides a useful reference of some of the problems (see figure xl) which arise from: surface repairs of an inconsistent colour; partial grinding of the finished surface (exposing aggregates in some areas and not others); and surface contaminants on the formwork (resulting in staining, often rust-coloured from degrading formwork).

*fig. 2.9.xxxix in-situ concrete*

*fig. 2.9.xl inconsistencies in visual appearance*

*One St. Peters Square (pre-cast concrete)*

In some ways this building is not an appropriate comparator for the Northern Hub structures as it is factory-formed cladding as the surface finish of the building rather than insitu concrete which is performing a structural role. However, it is particularly useful in illustrating the colour variation which is to be expected between pre-cast panels even if they are cast from the same sources of material (see figure xli). Various aspects of the surface finish are useful when considering the issues that will be addressed by the proposed use of self-compacting concrete for the Northern Hub. The cladding at One St. Peters Square has areas of hairline cracking (see figure xlii) which would be less likely to occur when self-compacting concrete is be used.

*fig. 2.9.xli variation in colour between adjacent pre-cast panels*

*fig. 2.9.xlii surface variation in concrete*

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# 2.0 Design considerations

*Piccadilly Gardens (insitu concrete)*

This project is a useful example of an exposed concrete finish that has been subject to over a decade of weathering (see figure xliii). It does not appear to be self-compacting concrete, with honey-combing evident and extensive staining and degradation visible towards the top of the walls. The latter effect is probably exacerbated by the lack of a flashing or coping at the top of the wall. It has been subject to various cleaning techniques which have exposed variations in the concrete mix and quality of formwork (see figure xliv).

*fig. 2.9.xliii in-situ concrete*

*fig. 2.9.xliv surface cracking and repairs*

*Victoria Station (insitu concrete)*

Another recent example of in-situ concrete is the buttress details which support the ends of main roof ribs at Victoria (see figure xlv). These were cast as mass concrete (i.e. not self-compacting) of an inconsistent quality of mix which was compounded with poor protection of formwork between cast individual buttresses. Problems arising from these were addressed with a 'bagged-up' finish (i.e. the application of a concrete render which fills cracks / voids and evens out colour variation). This post-finishing technique can address many problems but cannot conceal some major defects.

*fig. 2.9.xlv bagged-up concrete finish*

# 2.0 Design considerations

**Summary of options and identification of proposal**

The following notes summarise the key issues with each of the three primary surface finishes.

*Painted*

- Provides the highest degree of colour consistency
- With 'bagging up' and other repairs prior to painting it can achieve texture consistency
- When applied with even the weakest concentration there is a loss of a 'true' concrete aesthetic
- Whilst on paper this offers the ideal graffiti performance, it is not without risks in terms of consistency of reapplication
- Enables the use of basic concrete mixes as flaws can be more easily masked

*Textured*

- Variation of surface can remove any perceived risks of the ability to achieve a truly smooth finish
- Final colour has risk of unpredictability due to greater amount of aggregate which is exposed
- Limited ability to provide adequate graffiti removal (i.e. paint can remain 'ingrained' in the pitted surface)
- Repairs are difficult to achieve to a satisfactory colour and (in particularly) texture
- Allows basic concrete mixes to be used (assuming some enhanced variation of surface is acceptable)
- Consistency of texture on adjacent surfaces are sometimes more apparent than anticipated due to variations in etching or environmental conditions.

*As-struck*

- Reduction of surface blemishes creates a texture which honestly reflects the nature of concrete
- Choice of appropriate aggregates produces appearance expected of concrete in terms of slight variation in colour
- Graffiti removal with correct product can be more successful than other techniques
- Repairs can be colour matched if tinting is successful
- Requires consistent pours of an appropriate duration to mitigate risk of horizontal 'tide-marks'

It is for the reasons described above that as-struck, smooth self-compacting concrete with a surface impregnation anti-graffiti finish is proposed by Network Rail for the Northern Hub finishes. This is based on the minor colour variations inherent in concrete as being appropriate to the wider design aesthetic and the context of existing masonry structures.

*fig. 2.9.xlvi final sample with proposed finishes and details*



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# 2.0 Design considerations

**2.10. Specific project wide design elements -**
**2.10.1 Overhead Line Equipment (OLE) Gantries**

The TWA design proposals incorporated a number of 'bespoke' OLE and signal gantries designed specifically to respond to the context of the Ordsall Chord (see fig. 2.10.iii and iv). These were designed for particular sections of the proposed rail infrastructure, and have been designed such that they will smoothly integrate within the adjacent areas which utilise standard gantry designs (such as those illustrated in fig. 2.10.v).

Following discussions with stakholders, a variety of different options were reviewed for incorporating further bespoke OLE gantries into the proposals in addition to those proposed in the TWA application. These concentrated on producing logical groups of structures that would sit together in a considered and holistic manner. At the centre of each option was the TWAO proposal for 11 bespoke gantries on the new track areas between the Middlewood and Castlefield Viaducts (see fig. 2.10.i).

Two additional gantries (an OLE frame and an accompanying (similarly bespoke) signals gantry) have been incorporated into the proposals on the Salford bank of the river, continuing to the north to ensure that the predominant visual element of the scheme (the weathering steel 'ribbon' of the west elevation of the Irwell Bridge and Trinity Way crossing). This introduces as many bespoke structures as can be incorporated into the scheme before the existing and technically complex frames of the Middlewood Viaduct begin.

On the Manchester bank the three logical directions for extending the bespoke gantries are:

- to the north, onto the Middlewood Viaduct
- to the west along the existing Castlefield Viaduct
- to the south-east along the existing Castlefield Viaduct

For the first two options technical and constructability constraints quickly mean that only standard gantries can be provided, and therefore it is suggested that it is appropriate for the bespoke gantries to extend no further in those directions than the current proposal, to avoid incongruous changes between different structural forms.

The third option reviewed the possibility for bespoke gantries to continue as far as possible before existing / amended standard gantries are encountered. This change occurs close to the Youth Hostel building. However, construction constraints (in terms of phasing) mean that the OLE supports between COL 117 and 119A must be of a cantilever format (TTC - Twin track cantilever); rather than with legs on either side of the viaduct. These cantilever structures are visually quite different to both the standard and bespoke OLE portals. They therefore offer an ideal opportunity to act as a transition between standard and bespoke as the line progresses from south to north.

As a result of this there is a strong logic to change the design to utilise bespoke structures to the 3 gantries between COL 119A and 121. With the cantilever and bespoke structures to either side of these 3, the use of standard gantries would appear visually incongruous and hence the proposals have been amended to propose the use of bespoke gantries here (see fig. 2.10.ii for the resultant overall view).

Much of the visual appreciation of the Ordsall Chord structures will be from street level, and stopping the use of standard at the start of the concrete viaduct widening structures is an effective junction between new and old. From this point onwards, around the new railway bridges and then across the Irwell and Trinity Way, the use of bespoke designs is a logical visual series which ties the new structures to a unique structural form for these important elements of railway infrastructure.

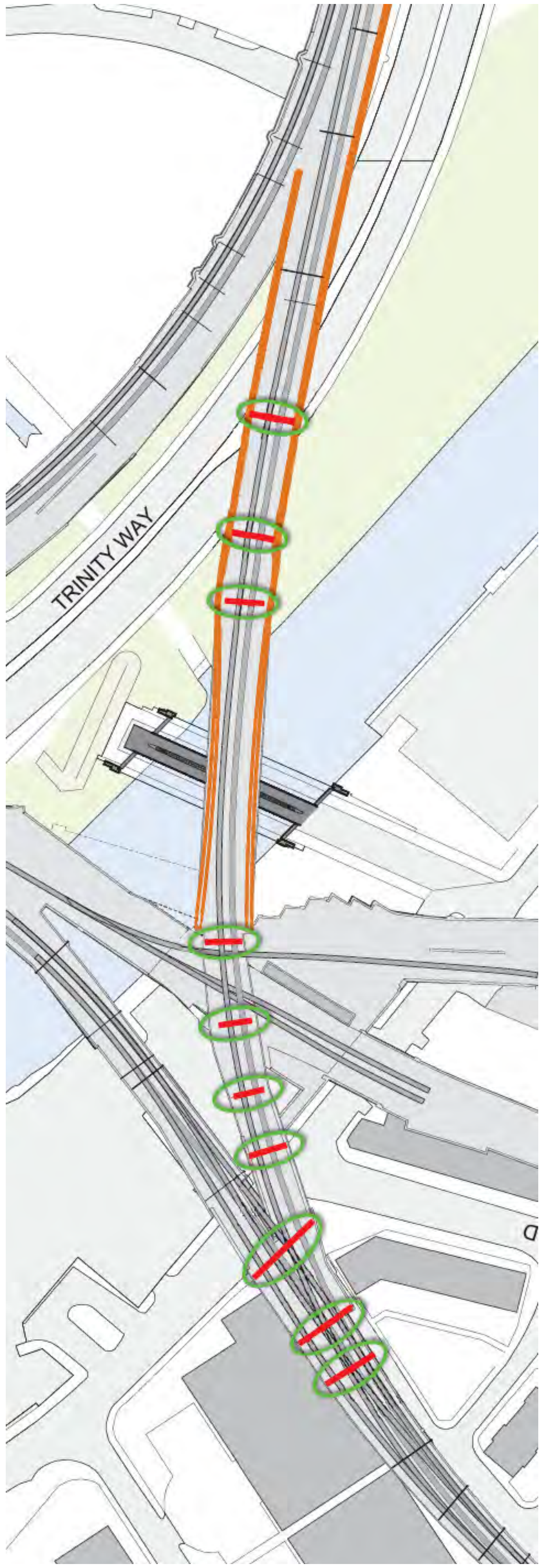



*fig. 2.10.i Bespoke OLE gantries as proposed in TWA application*

# 2.0 Design considerations

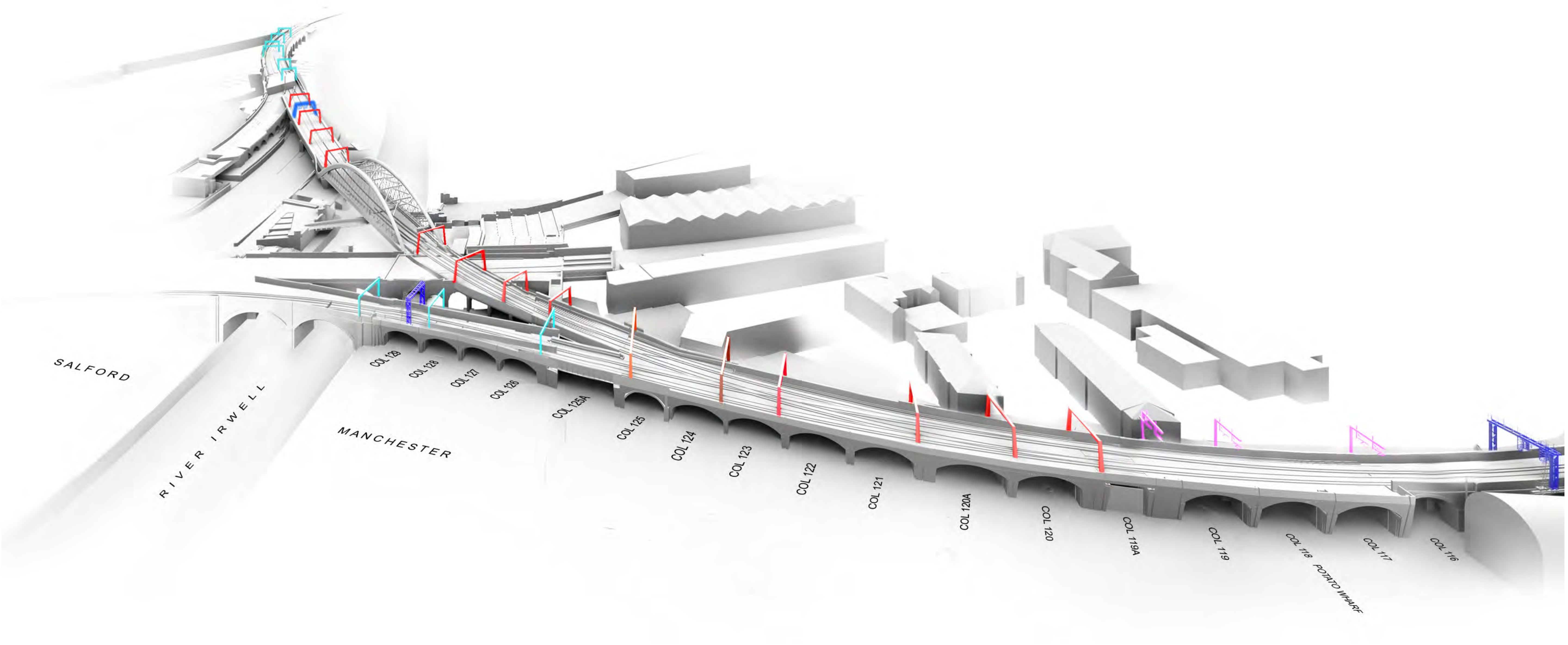
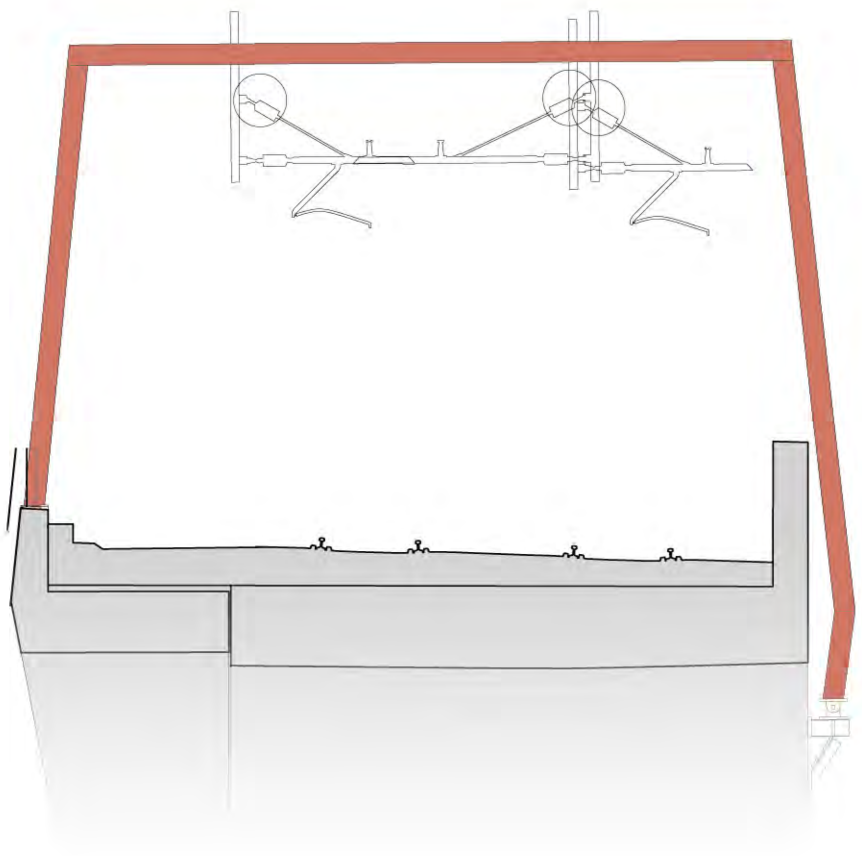


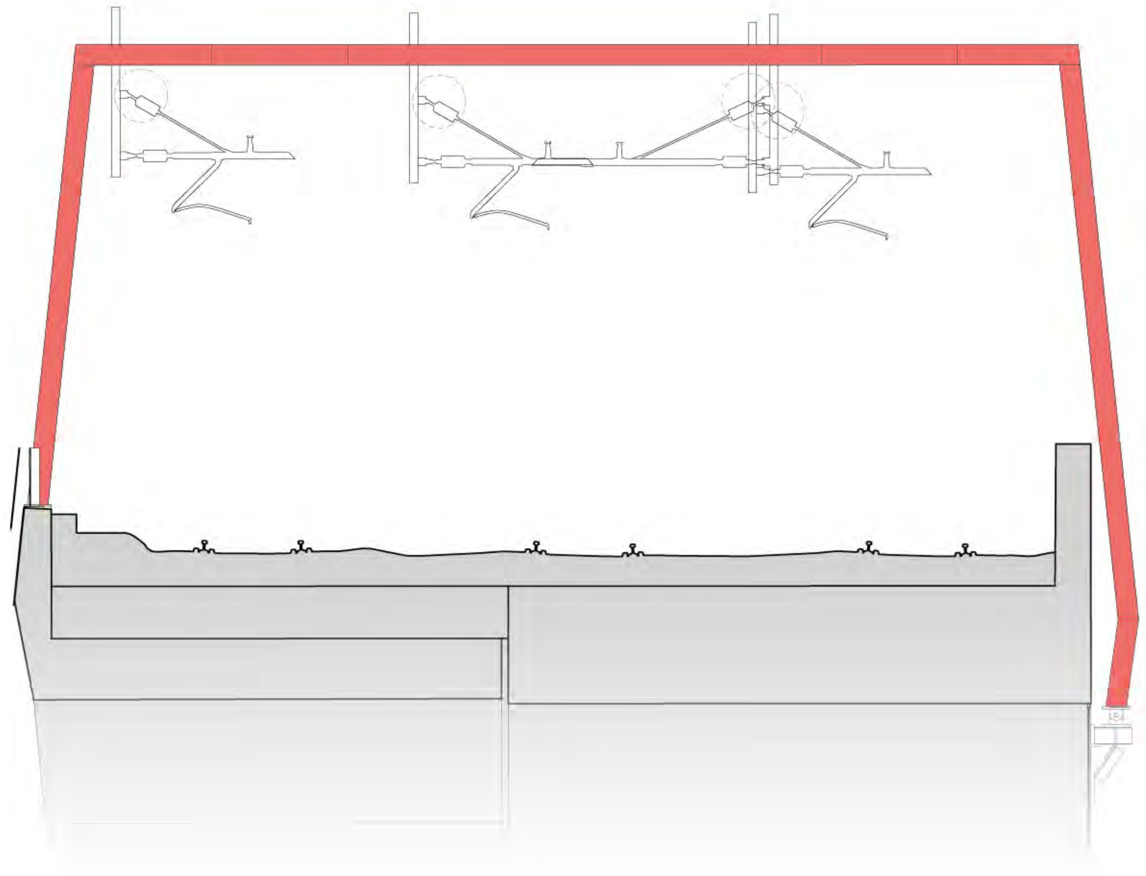

*fig. 2.10.ii* *Overhead Line Equipment gantries; 3D view identifying locations and diagrams to illustrate visual appearance*

***[for further details of this area refer to drawings 100380 - 100385 inclusive]***

# 2.0 Design considerations



■ BESPOKE PORTAL



■ 3-TRACK BESPOKE PORTAL

*fig. 2.10.iii bespoke gantries*

# 2.0 Design considerations

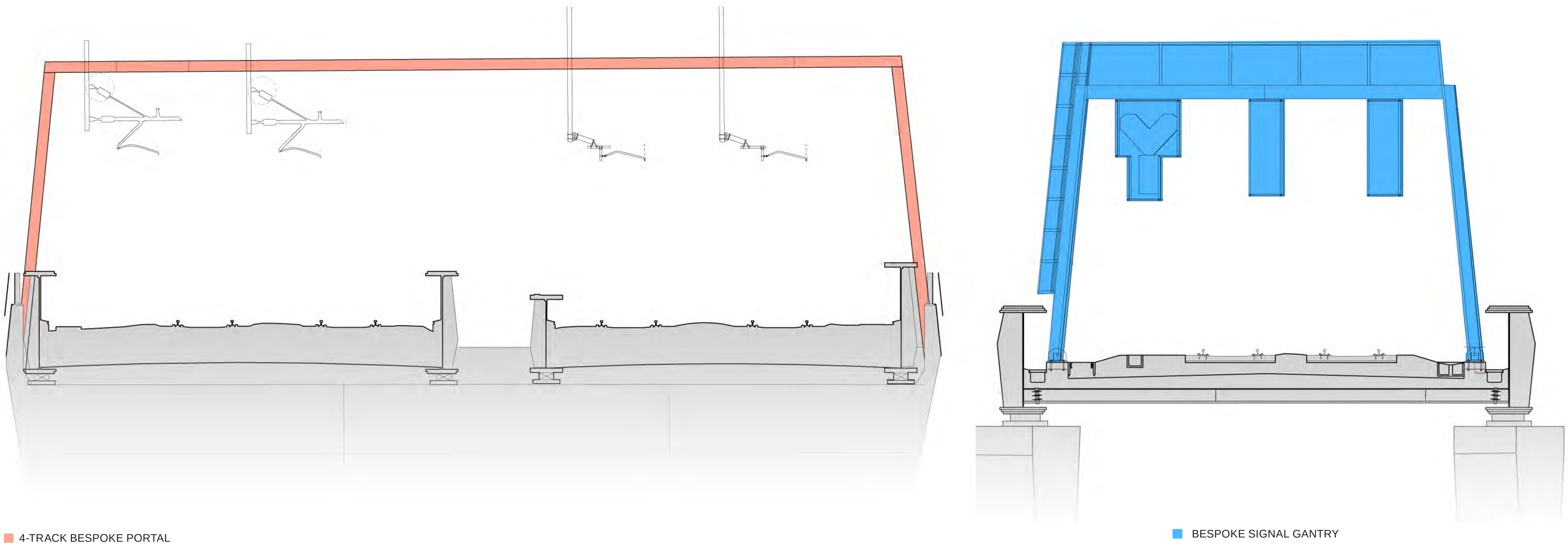



*fig. 2.10.iv* *bespoke gantries*

# 2.0 Design considerations

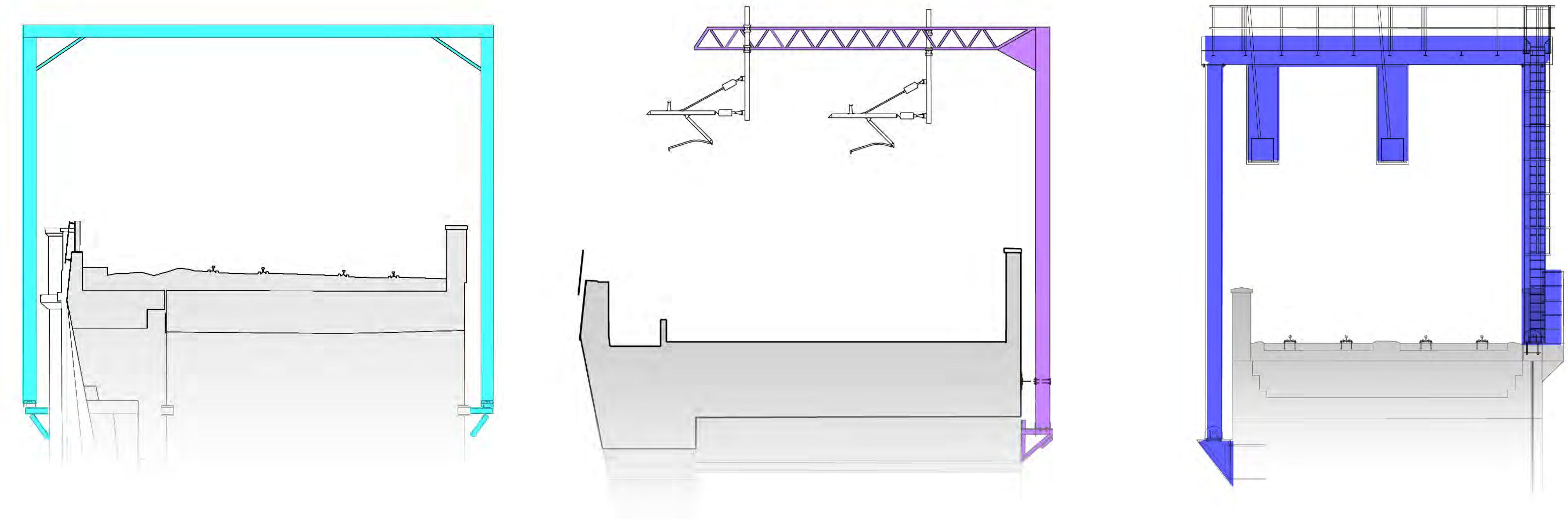



*fig. 2.10.v standard gantries*

# 2.0 Design considerations

### 2.10. Specific project wide design elements -
### 2.10.2 Bespoke OLE Bracket Cover Plate

The historic design evolution of typical OLE bracket and anchor arrangements has developed a number of highly efficient and economic solutions. As is described in section xxxx, for the specific historic and urban context of the Ordsall Chord the design development led to a “bespoke” OLE portal for the Ordsall Chord, it was considered most appropriate for the brackets supporting the bespoke OLE gantries to be consistent with the standard OLE portals alongside them.

Where the bespoke OLE gantries are mounted on proposed structures this use of standard (‘off-the-shelf’) solutions does not cause any visual issues as the gantry support is behind the parapet. However, where a bespoke gantry is fixed to an existing structure it was considered (through discussion with MCC) that a holistic design approach would be appropriate. This will incorporate a cover plate to visually screen the fixings brackets at the 4 locations where a bespoke OLE gantry is fixed to the side of the existing brick structure of the Castlefield Viaduct.

The following notes describe the design rationale for the brackets:

1. Due to the visually complex interface between the inclined OLE leg and the vertical brick face, the design intention here is to allow the last part of the leg to ‘kick’ back towards the viaduct. This ‘kick’ mimics the geometrical language used when the viaduct is being widened on the opposite side, reflecting the cantilevered steel off the viaduct below and reducing the size of the bracket.

2. The language of the proposed cover plate has a direction and visual connection to the language of the OLE leg ‘kick’. The cover plate folds back to conceal top edge of bracket, while the two sides are left open to provide for the necessary uninterrupted visual inspections.

3. On elevation, this proposal will provide a more slender shape. The sides of OLE leg have been pushed back in towards the centre to refer to angles of fixing bracket below

4. This strategy (3) then influences the overall shape of the cover plate when seen on elevation. The cover plate is tapered to reflect the tapered leg of the OLE above.

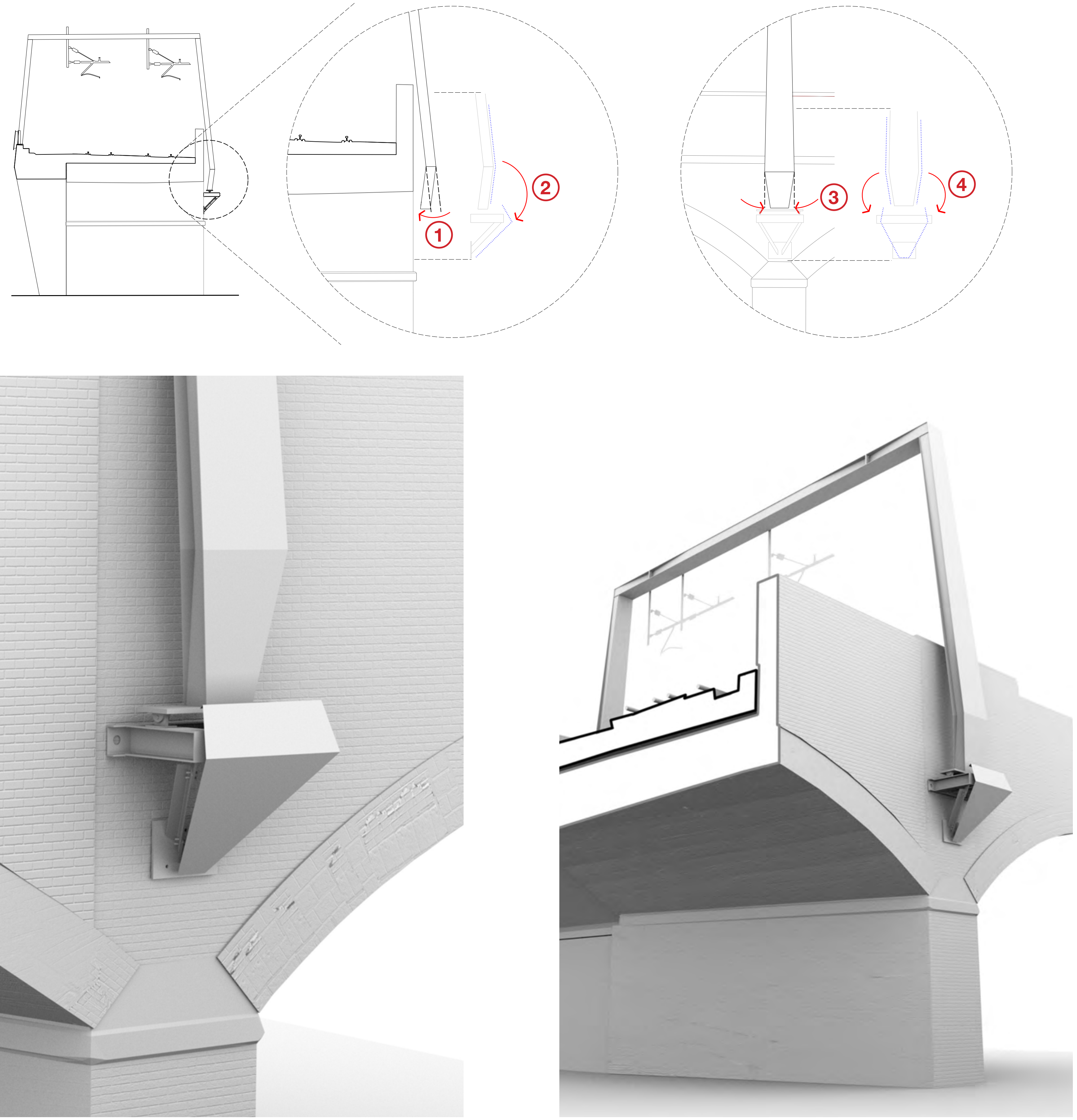



*fig 2.10.vi proposed cover plate*

# 2.0 Design considerations

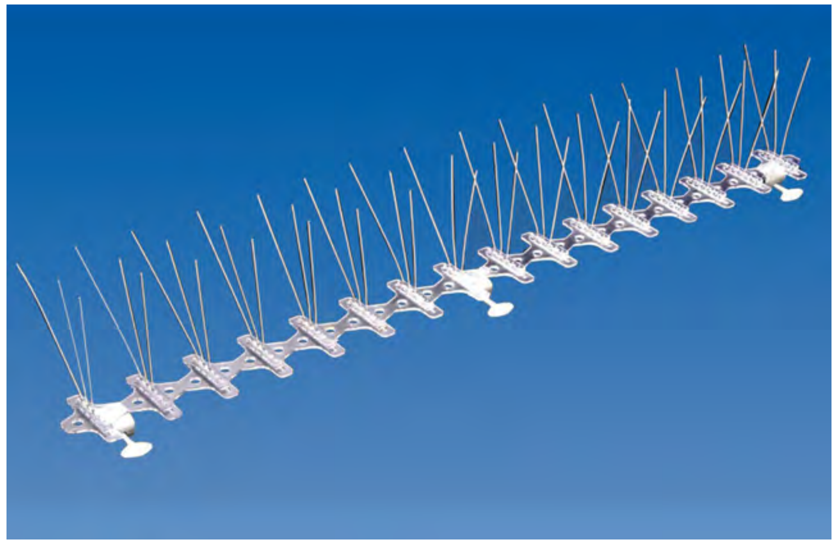
### 2.10. Specific project wide design elements -
### 2.10.2 Pigeon deterrant measures

A series of different issues have been considered to develop the proposed bird deterrence strategy:

- Protection of pedestrians on the pavements, public realm areas and the footbridge
- Protection of structures whose finishes would suffer from the presence of birds
- Visual impacts of different deterrent products
- Maintenance requirements (and hence access) of different deterrent products

A review of the structural forms proposed has enabled the identification of surfaces (ledges and plinths) that will present risks of bird perching and nesting. In certain locations the proposed structures have flat soffits (for example, the Middlewood Gateway) and hence no deterrent features are required.

The plan on fig. 2.10.vii indicates the areas where deterrant measures are propsed, and the plastic spikes themselves.



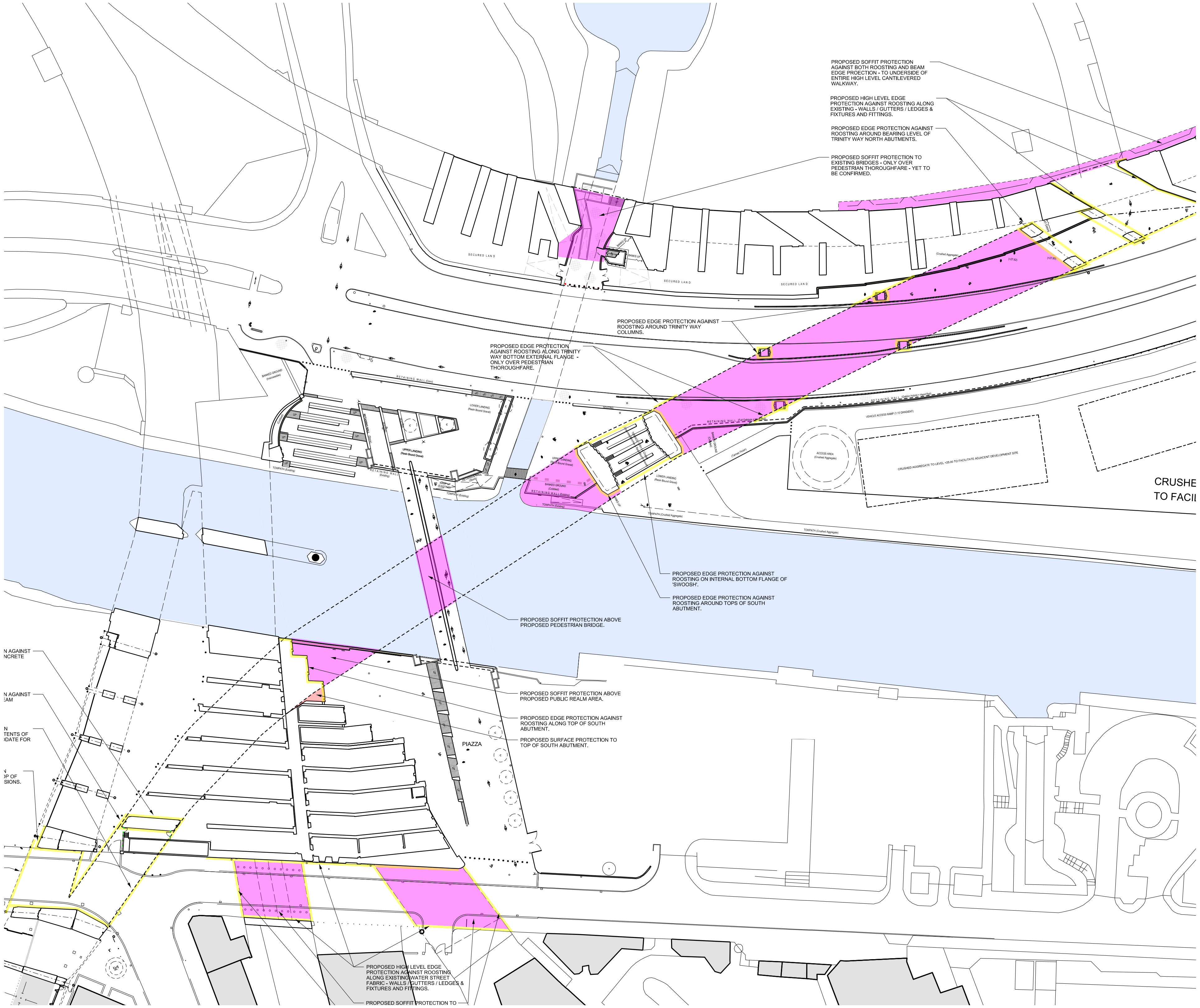



*fig. 2.10.vii* *locations of pigeon deterrant measures*

soffit protection
edge protection
surface protection

# 2.0 Design considerations

### 2.10. Specific project wide design elements -
### 2.10.3 Signage and Interpretation

Some existing pedestrian way-finding signage will be required to be relocated or replaced. This will align with the appropriate standards already defined in this area. The locations of these signs are indicated on the relevant plan drawings for this stage.

The existing streets and footpaths around the site feature a certain amount of wayfinding signage, which will be replaced (with appropriate adjustments where necessary). In addition to these basic requirements there will also be the provision of information relating to the historic structures. This produces a schedule of signage which can be summarised under three headings:

- Pedestrian / cyclist directional 'finger-post' signage (fig. 2.10.x)
- Plaques to provide short descriptions of historic structures (2.10. viii)
- Interpretation boards with more expansive information to provide context (fig. 2.10.ix)

[Not included in this design guide are elements of highways signage, which are covered by a separate document.]

Figure 2.10.xi provides an overview of signage positions across the site, with each category identified.

The proposed finger-post signs have been to match the requirements of the local authorities on both banks of the river. The locations and directions to be incorporated are shown on figure 2.10.xxvi.

The plaques and interpretive information compliment the Conservation Management Plan and the other mitigation works proposed (the specific details and wording of each plaque is identified in the CMP). The information to be incorporated onto the plaques has been drawn from research undertaken as part of the Heritage Assessment, and ongoing consultation with the Museum of Science Industry and Canal and River Trust has helped develop the materials for the interpretative elements.

In addition to way-finding signage, interpretation information is to be provided in the area of Water Street between the 1830 Viaduct and MOSI. Details of this are provided in section 3.1.18 below.


*fig. 2.10.viii* *commemorative plaques:*

1. *Castlefield (MSJ & AR) Viaduct*
2. *Cattle Ramp*
3. *Water St Bridge Colonnade*
4. *Arrivals Station*
5. *Zigzag Viaduct*
6. *Girder Bridge*
7. *Stephensons Bridge*

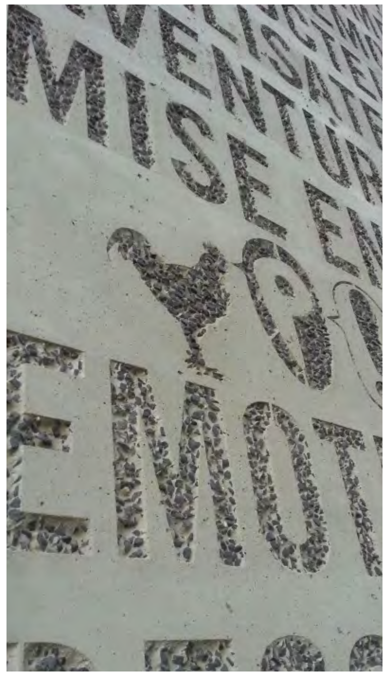
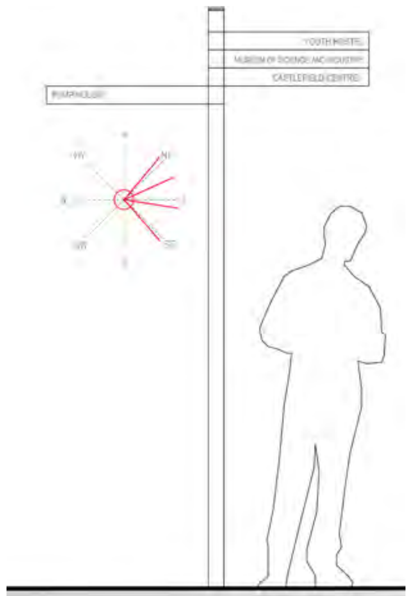


*fig. 2.10.ix* *interpretation panels (see CMP for detail)*

INT



**TYPE 1**


**TYPE 1**


**TYPE 2**

*fig. 2.10.x* *way-finding posts*
*type 1: inger post to public realm areas*

WFP

*type 2: standard white on blue in locations dictated by highways engineer*
*Please refer to drawing:*
*NHE_127523-2405-OCD-WPA-DDR-D-000028*



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# 2.0 Design considerations

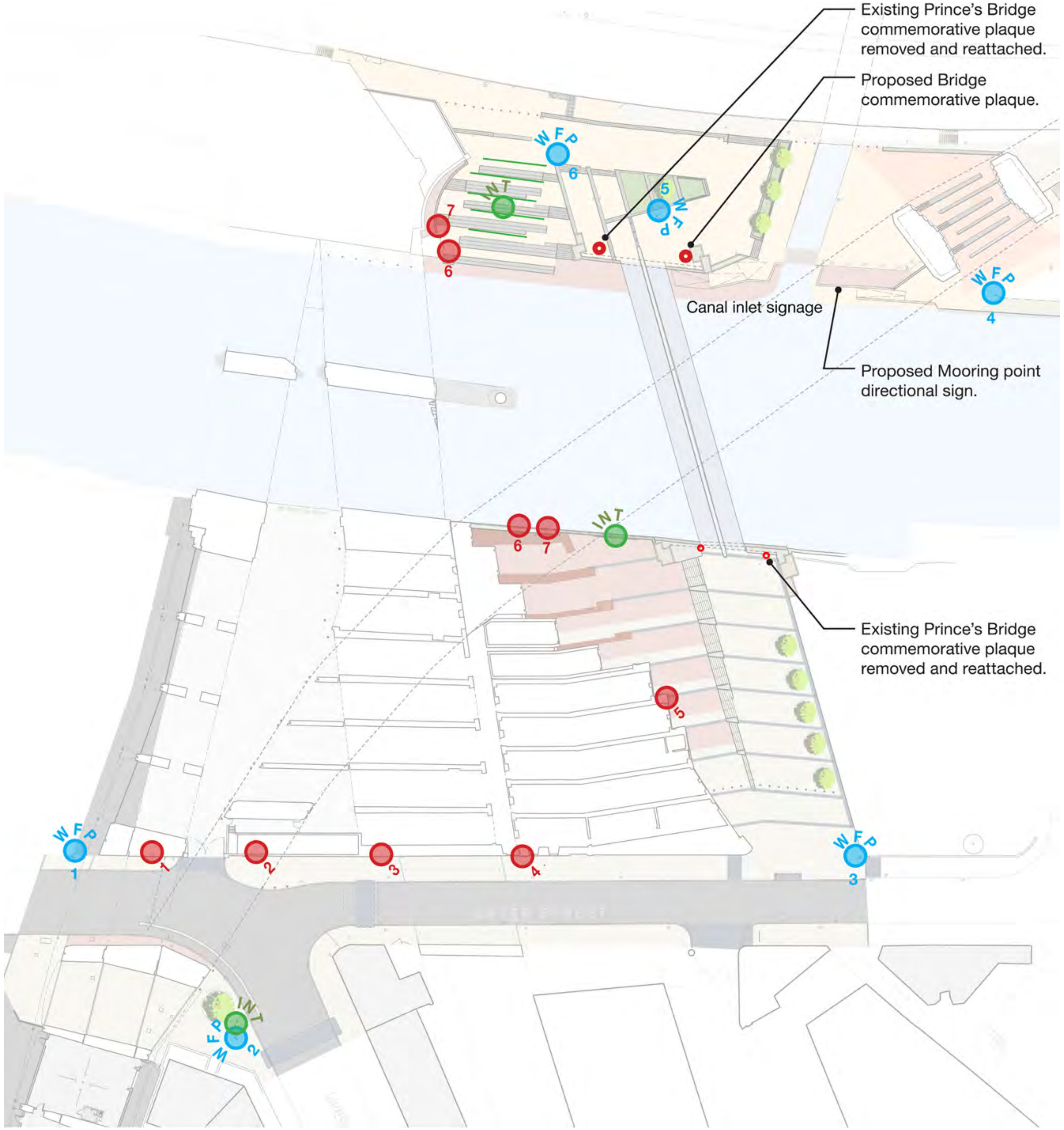


*fig. 2.10.xi* *locations of signage, plaques and interpretation boards*

**Directional Signage:**

**1:** **[relocation of existing sign; refer to highways proposals]**

**2:** **[relocation of existing sign; refer to highways proposals]**

**3:** **[relocation of existing sign; refer to highways proposals]**

**4:** **Manchester**
**Tow Path**
**Middlewood Viaduct**
**Spinningfield Peoples History Museum**
**Mueum of Science & Industry**

**5:** **Manchester**
**Peoples History Museum**
**Mueum of Science & Industry**
**Salford Central**
**River Park City**

**6:** **Manchester**
**Spinningfield**
**Peoples History Museum**
**Mueum of Science & Industry**
**Ordsall Hall**
**River Park Central**
**River Park Quays**
**Cornbrook**

### 2.10. Specific project wide design elements -
### 2.10.4 Trees (Condition 4)

Trees are proposed as part of the proposals, in part as replacement for those which are required to be felled for the construction of the railway bridges, but primarily for the definition of particular spaces and as a compliment to the concrete and steel structures around.

Species have been chosen as appropriate to their urban and waterside setting; these are illustrated and specified on the following page (fig. xxvii).



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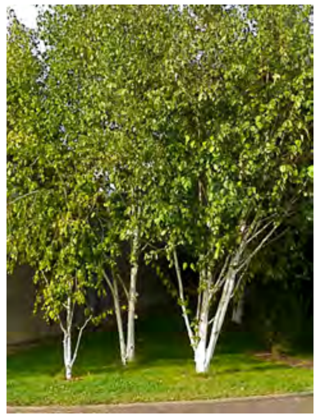
# 2.0 Design considerations



**1) American Sweetgum (Liquidambar styraciflua)**

Magnificent, medium-sized tree with a straight leading stem, conical when young, later more rounded and in maturity with an open crown with several strong, spreading main branches. Slow growing when juvenile.

Size when planted: Specimen tree, 35-40cm girth, 5 x transplanted, 6-7m height, 2m clear stem
Potential growth: 10 to 20 (up to 30) m in height and 6 to 12m in spread. Annual growth is 35 cm in height, 20 cm spread, on deep soils often much more.

Characteristics: Regenerates well. Tree should not be planted on too nutrient-rich and wet sites. Prefers warm positions, only limited tolerance of urban sites, requires large area of open soil for root development. Should only be planted in spring because of possible frost damage (failure in young plants).

**2) Common Alder (Alnus glutinosa)**

Large tree with pyramidal, open crown and picturesquely hanging branches when old, generally with a straight single leading stem, but also often multi-stemmed.

Size when planted: Specimen tree, 30-35cm girth, 4 x transplanted, 5-7m height, 2m clear stem
Potential growth: 10 to 20 (up to 25) m in height and 8 to 12 (14) m in spread. Annual growth is 30 to 40 cm in height, 20 cm spread.

Characteristics: A first class pioneer tree, colonises sterile sands along with Salix caprea, high tolerance of flooding and winds, good soil amelioration, does not require much warmth, nitrogen fixing. The leaves rot rapidly making good humus. Long lived (up to 150 years).

**3) West Himalayan Birch (Betula utilis jacquemontii)**

Deciduous medium-sized ornamental tree or decorative shrub that makes an excellent multi-stemmed specimen. The ascending branches form a static, formal, upright habit with a denser crown. The thin, papery bark is very shiny, reddish brown, reddish white, then shimmering white and peeling.

Size when planted: Specimen tree, 4 x transplanted, 4-5m height, multi-stemmed
Potential growth: 10 to 18m in height and 6 to 10 m in spread.

Characteristics: Robust shallow rooting tree that prefers moist, well-drained soil. It will thrive in full sun or light, dappled shade.

**4) Pin Oak (Quercus palustris)**

Medium-sized to large tree with a conical crown and mostly a straight leading stem, branches are horizontal and wide spreading, in maturity branches in the lower crown hang increasingly. The development of nest-like sections of dry branches is typical. Slow glowing.

Size when planted: Specimen tree, 40-45cm girth, 6 x transplanted, 7-9m height, 2m clear stem
Potential growth:15 to 20 (up to 25)m in height, sometimes higher and 8 to 15 (up to 20) in spread. Annual growth is ca. 25cm.

Characteristics: Frost tolerant, suitable for urban sites, especially tolerant of sulphur oxide (DIRR), has a tendency to develop sections of dry branches (also has this tendency in its native environment).

**Tree pit sizes**
- Specimen tree (35-40 & 40-45cm girth) with 1700mm x 1700mm x 1500mm tree pit
- Specimen tree (Multi-stemmed & 30-35cm girth) with 1500mm x 1500mm x 1300mm

All tree planting to include underground guying support, irrigation & aeration pipe around root ball system appropriate to tree girth, mulch, drainage layer, root barrier protection

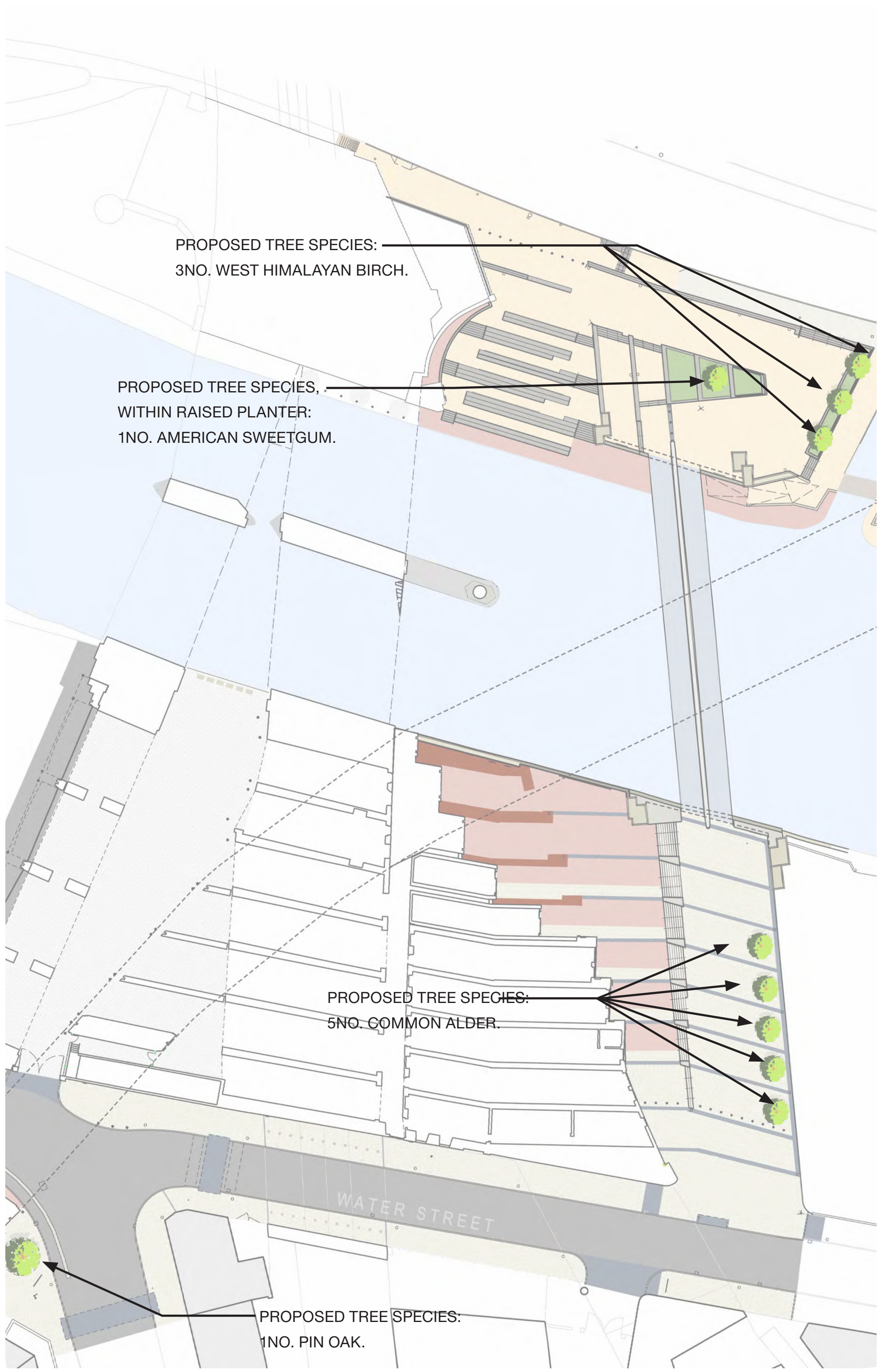



*fig. 2.10.xii illustrations, specifications and locations of trees*

# 2.0 Design considerations

**2.11**
**Stages Plan - Condition 2**

This section of the Design Guide looks at each area of the proposals in turn, running in sequence from south to north. Each sub-section begins with a list of the relevant TWA and condition discharge drawings. This is followed by notes that provide context across the particular area. There then follows a design narrative and illustrations for specific elements of the proposals.

The TWAO application included 16 planning conditions. The ten listed building consent (LBC) applications each included 5 conditions.

The final list of planning conditions was finalised by the Secretary of State. A number of the conditions attached to the Ordsall Chord Order must be discharged prior to any works taking place.

Early engagement with the LPAs and other key stakeholders influenced development of the design and construction methodology to meet their requirements/aspirations as necessary or appropriate.

This is inline with engagement with Historic England (HE) which will be required for the heritage related TWAO Conditions and the Listed Building Consent (LBC) conditions

Conditions to be discharged by design guide and drawings

Planning Condition 2 – Stages of Development
Planning Condition 3 – In accordance with the planning drawings
Planning Condition 4 – Landscaping & Lighting
Planning Condition 5 – Paving and Surfacing
Planning Condition 11 – Details of the Materials, Colour Scheme & Finishes
Planning Condition 13– Crime Reduction
Planning Condition 14 – Heritage Assets
Planning Condition 15 – Stephenson's Bridge
Planning Condition 16 – Approval and implementation under these conditions

Conditions to be discharged by Conservation management plan and schedule of works

Listed Building Consent Condition 2 – Schedule of works and plans
Listed Building Consent Condition 3 – Conservation Management Plan (CMP)
Listed Building Consent Condition 5 – In accordance with the approved plans

Conditions to be discharged by seperate documents

Planning Condition 7 - Archaeology
Planning Condition 8 – Code of Construction Practice (CoCP)
This includes, the following addendum to the CoCP
- External Communications programme;
- Site Waste Management Plan;
- Pollution prevention and incident control plan;
- Traffic Management Plan;
- Nuisance Management Plan;
- Noise and Vibration management plan.

Planning Condition 9 – Contaminated Land
Planning Condition 10 - Ecology
Planning Condition 12– Contract for Works

Conditions that need to be adhered to

Planning Condition 1 – Timescale
Planning Condition 6– Implementation and maintenance of landscaping

The construction works have been programmed in Stages, or areas of work see 2.11.xxviii and drawing NHE_127523-BDP-OCD-WPA-DDR-A-000001 Stages Overview Plan. Division of design guide and drawing into individual stages. The planning submissions will be made in packages that will align with these Stages and therefore the construction programme sequence.



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# 2.0 Design considerations

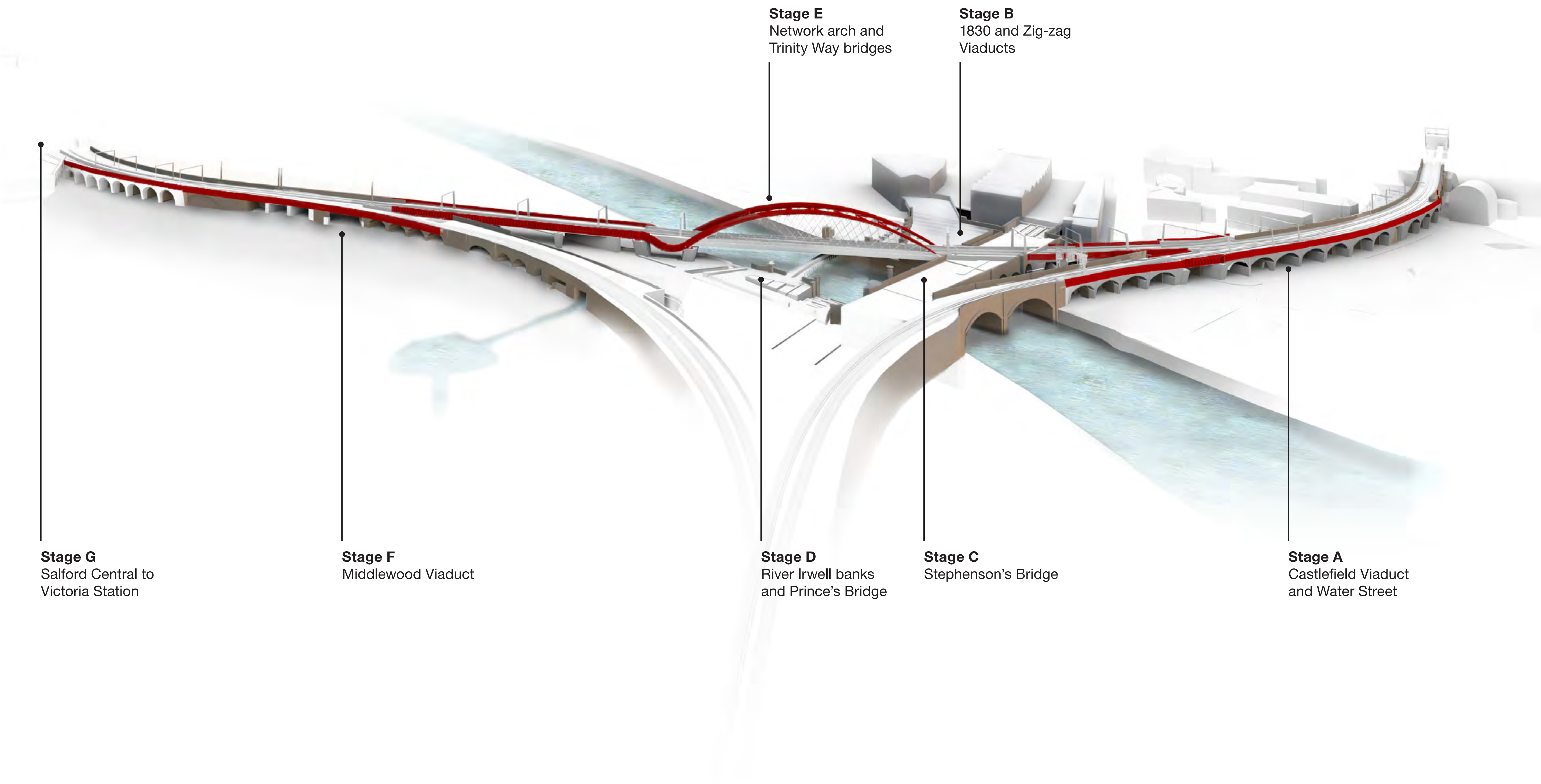


*fig. 2.11.i Division of design guide and drawing into individual stages*

# 2.0 Design considerations

## 2.12
## Ordsall Chord Glossary and Terminology

### Stakeholders

**DfT** Department for Transport
**ECF** English Cities Fund
**HE** Historic England
**MCC** Manchester City Council
**MoSI** Museum of Science and Industry
**NE** Natural England
**SCC** Salford City Council
**TfGM** Transport for Greater Manchester

### Existing Railway Assets

**COL** COL refers to the Bolton Railway line between Ordsall Land junction and Castlefield junction
**DSE** DSE refers to the Chat Moss Railway line between Ordsall Land junction and Deal Street junction.
**L & MR** Liverpool and Manchester Railway
**MSJ & AR** Manchester, South Junction and Altrincham Railway

### Terminology

**Abutments** Structure which supports the ends of a bridge.
**Arch** A curved structure usually in a vertical plane, that by its shape spans an opening and carries load principally by transmitting a compressive thrust to foundations
**Arch tie bars / Tie bars** A device for holding components together in tension. A tie bar is a member carrying a tension force. A tied arch is one where the joints between the arch and the foundations are joined by a tie to resist horizontal thrust.
**Ballast** Stone material which forms the trackbed of a railway line.
**Cess** The area alongside and below the level of a railway track into which rainwater is drained.
**Chord** A line which joins two points.
**Culvert** Small bridge or pipe carrying a stream under a railway or road.
**Gantry** Overhead frame from which various structures can be mounted.
**GRIP** Guide to Railway Investment Projects
**NPPf** National Planning Policy Framework
**OLE** Overhead Line Equipment
**Pier** A column, either structural or decorative, in a wall at regular intervals to strengthen it, A load bearing wall between openings.
**PWAY** Permanent Way
**Skewback** The sloping face of the abutment on which an extremity of an arch rests.
**Signal Gantry** A framework suspended across several train tracks, and upon which many signals may be mounted.
**Soffit** Underside of a bridge / element.
**Spandrel** The area between the outer curve of an arch and the horizontal line at the upper edge / parapet
**TTC** Twin Track Cantilever - a form of OLE structure with one post and carrying two sets of catenary from one cantilevered boom.
**TWAO** Transport and Works Act Order
**UDP** Unitary Development Plan

### Proposed Structures Categorisation

**OCD1** Proposed Water Street Bridge
**OCD2** Proposed Water Street Bridge and abutments located within Nikal Car Park. Manchester.
**OCD3** Proposed track support structure across 1830 Viaduct
**OCD4** Proposed River Irwell / Network Arch Bridge.
**OCD5** Proposed Ordsall Chord North-West Bank Abutment Structure. Salford Bank. Connects the proposed River Irwell / Network Arch Bridge to the proposed Trinity Way bridge. Salford
**OCD6** Proposed Trinity Way Bridge and associated carriageway abutments. Salford
**OCD7** Proposed Abutment connecting Trinity Way Bridge to Middlewood / DSE Viaduct. Salford

# 3.1 Stage A: Castlefield Viaduct and Water Street

TWA application documents relevant to Stage A:

| *Drawing / doc. no.* | *Description* |
|---|---|
| TWA-3-1-100 | Castlefield MSJ&AR Viaduct & Cast Iron Bridge & 1845 Viaduct Site Edge Red Plan |
| TWA-3-1-101 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Plan |
| TWA-3-1-102 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Elevation A |
| TWA-3-1-103 | Castlefield (MSJ&AR) Viaduct - Section 01 Heritage Elevation A |
| TWA-3-1-104 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Elevation B |
| TWA-3-1-105 | Castlefield (MSJ&AR) Viaduct - Section 01 Heritage Elevation B |
| TWA-3-1-106 | Castlefield (MSJ&AR) Viaduct - Section 01 Existing & Proposed Reflective View |
| TWA-3-1-201 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Plan |
| TWA-3-1-202 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Elevation A |
| TWA-3-1-203 | Castlefield (MSJ&AR) Viaduct - Section 02 Heritage Elevation A |
| TWA-3-1-204 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Elevation B |
| TWA-3-1-205 | Castlefield (MSJ&AR) Viaduct - Section 02 Heritage Elevation B |
| TWA-3-1-206 | Castlefield (MSJ&AR) Viaduct - Section 02 Existing & Proposed Reflective View |
| TWA-3-1-301 | Castlefield (MSJ&AR) Viaduct - Part 1 Section 03 Existing & Proposed Plan |
| TWA-3-1-302 | Castlefield (MSJ&AR) Viaduct Section 03 Existing & Proposed Elevation A |
| TWA-3-1-303 | Castlefield (MSJ&AR) Viaduct - Part 1 Section 03 Existing & Proposed Plan |
| TWA-3-1-304 | Castlefield (MSJ&AR) Viaduct Section 03 Existing & Proposed Elevation B |
| TWA-3-1-305 | Castlefield (MSJ&AR) Viaduct - Section 03 Heritage Elevation B |
| TWA-3-1-306 | Castlefield (MSJ&AR) Viaduct - Section 03 Reflective View |
| TWA-3-1-401 | Castlefield (MSJ&AR) Viaduct - Section 04 Existing & Proposed Plan |
| TWA-3-1-402 | Castlefield (MSJ&AR) Viaduct - Section 04 Existing & Proposed Elevation A |
| TWA-3-1-403 | Castlefield (MSJ&AR) Viaduct - Section 04 Heritage Elevation A |
| TWA-3-1-404 | Castlefield (MSJ&AR) Viaduct Section 04 Existing & Proposed Elevation B |
| TWA-3-1-405 | Castlefield (MSJ&AR) Viaduct - Section 04 Heritage Elevation B |
| TWA-3-1-406 | Castlefield (MSJ&AR) Viaduct - Section 04 Reflective View |

LBC application documents relevant to Stage A:

| *Drawing / doc no.* | *Description* |
|---|---|
| TWA-3-0-001 | Heritage Drawing - Overview Key Plan |
| TWA-3-1-100 | Castlefield MSJ&AR Viaduct & Cast Iron Bridge & 1845 Viaduct Site Edge Red Plan |
| TWA-3-1-101 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Plan |
| TWA-3-1-102 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Elevation A |
| TWA-3-1-103 | Castlefield (MSJ&AR) Viaduct - Section 01 Heritage Elevation A |
| TWA-3-1-104 | Castlefield (MSJ&AR) Viaduct - Section 01 Proposed & Existing Elevation B |
| TWA-3-1-105 | Castlefield (MSJ&AR) Viaduct - Section 01 Heritage Elevation B |
| TWA-3-1-106 | Castlefield (MSJ&AR) Viaduct - Section 01 Existing & Proposed Reflective View |
| TWA-3-1-201 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Plan |
| TWA-3-1-202 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Elevation A |
| TWA-3-1-203 | Castlefield (MSJ&AR) Viaduct - Section 02 Heritage Elevation A |
| TWA-3-1-204 | Castlefield (MSJ&AR) Viaduct - Section 02 Proposed & Existing Elevation B |
| TWA-3-1-205 | Castlefield (MSJ&AR) Viaduct - Section 02 Heritage Elevation B |
| TWA-3-1-206 | Castlefield (MSJ&AR) Viaduct - Section 02 Existing & Proposed Reflective View |
| TWA-3-1-301 | Castlefield (MSJ&AR) Viaduct - Part 1 Section 03 Existing & Proposed Plan |
| TWA-3-1-302 | Castlefield (MSJ&AR) Viaduct Section 03 Existing & Proposed Elevation A |
| TWA-3-1-303 | Castlefield (MSJ&AR) Viaduct - Part 1 Section 03 Existing & Proposed Plan |
| TWA-3-1-304 | Castlefield (MSJ&AR) Viaduct Section 03 Existing & Proposed Elevation B |
| TWA-3-1-305 | Castlefield (MSJ&AR) Viaduct - Section 03 Heritage Elevation B |
| TWA-3-1-306 | Castlefield (MSJ&AR) Viaduct - Section 03 Reflective View |
| TWA-3-1-401 | Castlefield (MSJ&AR) Viaduct - Section 04 Existing & Proposed Plan |
| TWA-3-1-402 | Castlefield (MSJ&AR) Viaduct - Section 04 Existing & Proposed Elevation A |
| TWA-3-1-403 | Castlefield (MSJ&AR) Viaduct - Section 04 Heritage Elevation A |
| TWA-3-1-404 | Castlefield (MSJ&AR) Viaduct Section 04 Existing & Proposed Elevation B |
| TWA-3-1-405 | Castlefield (MSJ&AR) Viaduct - Section 04 Heritage Elevation B |
| TWA-3-1-406 | Castlefield (MSJ&AR) Viaduct - Section 04 Reflective View |

# 3.1 Stage A: Castlefield Viaduct and Water Street

**Planning Condition 3 - in accordance with planning drawings**

**Additional supporting information (relevant to Stage A) prepared for the discharge of conditions:**

| *drawing / doc. no.* | *rev.* | *description* |
|---|---|---|
| NHE_127523-BDP-OCD-WPA-DDR-A-000001 | P03 | Stages Overview Plan |
| NHE_127523-BDP-OCD-WPA-DDR-A-100001 | P02 | Stage A: Key Plan: Part 1 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100002 | P03 | Stage A: Key Plan: Part 2 |
| NHE_127523-5804-OCD-WPA-DDR-A-000201 | P01 | Accessibility Strategy |
| NHE_127523-BDP-OCD-WPA-DDR-A-100101 | P03 | Stage A: Proposed Street Plan: Section 1 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100102 | P03 | Stage A: Proposed Street Plan: Section 2 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100103 | P03 | Stage A: Proposed Street Plan: Section 3 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100104 | P04 | Stage A: Proposed Street Plan: Section 4 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100105 | P03 | Stage A: Proposed Street Plan: Section 5 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100110 | P03 | Stage A: New Elm Road Buildings – Existing Plan |
| NHE_127523-BDP-OCD-WPA-DDR-A-100111 | P02 | Stage A: New Elm Road Buildings - Existing Eles |
| NHE_127523-BDP-OCD-WPA-DDR-A-100121 | P03 | Stage A: New Elm Road Buildings - Prop. Plan A |
| NHE_127523-BDP-OCD-WPA-DDR-A-100122 | P03 | Stage A: New Elm Road Buildings - Prop. Ele A |
| NHE_127523-BDP-OCD-WPA-DDR-A-100125 | P03 | Stage A: New Elm Road Buildings - Prop. Plan B |
| NHE_127523-BDP-OCD-WPA-DDR-A-100126 | P02 | Stage A: New Elm Road Buildings - Prop. Ele B |
| NHE_127523-BDP-OCD-WPA-DDR-A-100130 | P04 | Stage A: Coordinated Urban Realm - Manchester |
| NHE_127523-BDP-OCD-WPA-DDR-A-100131 | P04 | Stage A: Coordinated Urban Realm - Salford |
| NHE_127523-BDP-OCD-WPA-DDR-A-100151 | P03 | Stage A: Proposed Parapet Plan: Section 1 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100152 | P03 | Stage A: Proposed Parapet Plan: Section 2 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100153 | P03 | Stage A: Proposed Parapet Plan: Section 3 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100154 | P03 | Stage A: Proposed Parapet Plan: Section 4 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100155 | P03 | Stage A: Proposed Parapet Plan: Section 5 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100160 | P01 | Stage A: LBD Boundaries |
| NHE_127523-BDP-OCD-WPA-DDR-A-100165 | P02 | Fabric Repair Scope. Stages A, B & C |
| NHE_127523-BDP-OCD-WPA-DDR-A-100201 | P03 | Stage A: Repairs to Existing Fabric – Ele Section 1 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100202 | P03 | Stage A: Repairs to Existing Fabric – Ele Section 2 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100203 | P03 | Stage A: Repairs to Existing Fabric – Ele Section 3 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100204 | P03 | Stage A: Repairs to Existing Fabric – Ele Section 4 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100210 | P02 | Stage A: COL112 REB Plans |
| NHE_127523-BDP-OCD-WPA-DDR-A-100211 | P02 | Stage A: COL112 REB Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100212 | P02 | Stage A: COL117 REB Plans |
| NHE_127523-BDP-OCD-WPA-DDR-A-100213 | P02 | Stage A: COL117 REB Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100301 | P03 | Stage A: COL117 Prop. Plan , Elevation & Section |
| NHE_127523-BDP-OCD-WPA-DDR-A-100305 | P03 | Stage A: COL119a Existing Plan (Demolition) |
| NHE_127523-BDP-OCD-WPA-DDR-A-100306 | P03 | Stage A: COL119a Elevation / Section (Demolitions) |
| NHE_127523-BDP-OCD-WPA-DDR-A-100307 | P03 | Stage A: COL119a Proposed Plan |
| NHE_127523-BDP-OCD-WPA-DDR-A-100308 | P03 | Stage A: COL119a Proposed Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100309 | P03 | Stage A: COL119a Proposed Sections |
| NHE_127523-BDP-OCD-WPA-DDR-A-100315 | P03 | Stage A: COL123 Prop. Plan, Elevation & Section |

| *drawing / doc. no.* | *rev.* | *description* |
|---|---|---|
| NHE_127523-BDP-OCD-WPA-DDR-A-100316 | P02 | Stage A: COL121-124 - East Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100317 | P02 | Stage A: COL121-124 - West Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100318 | P02 | Stage A: COL121-124 – Plans |
| NHE_127523-BDP-OCD-WPA-DDR-A-100320 | P03 | Stage A: COL125a Existing Plan (Demo.) |
| NHE_127523-BDP-OCD-WPA-DDR-A-100321 | P03 | Stage A: COL125a Existing Eles. (Demo.) |
| NHE_127523-BDP-OCD-WPA-DDR-A-100322 | P03 | Stage A: COL125a Existing Section (Demo.) |
| NHE_127523-BDP-OCD-WPA-DDR-A-100323 | P04 | Stage A: COL125a Proposed Plan |
| NHE_127523-BDP-OCD-WPA-DDR-A-100324 | P02 | Stage A: COL125a Proposed Sections |
| NHE_127523-BDP-OCD-WPA-DDR-A-100327 | P03 | Stage A: COL125a Proposed Elevations |
| NHE_127523-BDP-OCD-WPA-DDR-A-100330 | P03 | Stage A: COL129 Prop. Plan, Ele. &Section |
| NHE_127523-BDP-OCD-WPA-DDR-A-100350 | P04 | Stage A: Landscape Plan/ Highways – Pt. 1 |
| NHE_127523-BDP-OCD-WPA-DDR-A-100351 | P04 | Stage A: Landscape Plan/ Highways – Pt. 2 |
| NHE_127523-5804-OCD-WPA-DDR-A-100380 | P03 | Stage A: Bespoke OLE 2 Track |
| NHE_127523-5804-OCD-WPA-DDR-A-100381 | P03 | Stage A: Bespoke OLE 3 Track: Part 1 |
| NHE_127523-5804-OCD-WPA-DDR-A-100382 | P03 | Stage A: Bespoke OLE 3 Track: Part 2 |
| NHE_127523-5804-OCD-WPA-DDR-A-100383 | P03 | Stage A: Bespoke OLE 4 Track |
| NHE_127523-5804-OCD-WPA-DDR-A-100384 | P01 | Stage A: Bespoke OLE 3 Track COL124 |
| NHE_127523-5804-OCD-WPA-DDR-A-100385 | P03 | Stage A: Bespoke OLE OCD2 |
| NHE_127523-5804-OCD-WPA-DDR-A-100386 | P02 | Stage A: COL129 Prop Signal Gantry |
| NHE_127523-5804-OCD-WPA-DDR-A-100387 | P02 | Stage A: TTC Section and Elevation |

# 3.1 Stage A: Castlefield Viaduct and Water Street

**Planning Condition 3 - in accordance with planning drawings**

**Additional supporting information (relevant to Stage A) prepared for the discharge of conditions:**

| *Drawing / doc. no.* | *rev.* | *Description* |
|---|---|---|
| NHE-127523-2405-COL-WPA-DDR-C-005001 | *P01* | COL 106 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005002 | *P01* | COL 106 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005010 | *P01* | COL 107 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005011 | *P01* | COL 107 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005020 | *P02* | COL 108 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005021 | *P01* | COL 108 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005030 | *P01* | COL 109 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005031 | *P01* | COL 109 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005040 | *P01* | COL 110 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005041 | *P01* | COL 110 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005050 | *P01* | COL 111 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005051 | *P01* | COL 111 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005060 | *P01* | COL 112 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005061 | *P01* | COL 112 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005070 | *P02* | COL 112A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005071 | *P01* | COL 112A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005080 | *P02* | COL 113 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005081 | *P01* | COL 113 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005082 | *P01* | COL 113 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 3 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005090 | *P02* | COL 113A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005091 | *P01* | COL 113A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005100 | *P01* | COL 114 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005101 | *P02* | COL 114 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005110 | *P01* | COL 115 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005111 | *P01* | COL 115 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005120 | *P01* | COL 116 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005121 | *P01* | COL 116 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005122 | *P01* | COL 116 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 3 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005130 | *P01* | COL 117 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005131 | *P01* | COL 117 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005140 | *P01* | COL 118 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005141 | *P01* | COL 118 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005150 | *P01* | COL 119 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005151 | *P01* | COL 119 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005160 | *P02* | COL 119A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005161 | *P01* | COL 119A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005170 | *P02* | COL 120 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005171 | *P01* | COL 120 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005180 | *P02* | COL 120A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005181 | *P01* | COL 120A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005190 | *P01* | COL 121 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005191 | *P01* | COL 121 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005200 | *P02* | COL 122 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005201 | *P01* | COL 122 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005210 | *P02* | COL 123 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |

# 3.1 Stage A: Castlefield Viaduct and Water Street

**Planning Condition 3 - in accordance with planning drawings**

**Additional supporting information (relevant to Stage A) prepared for the discharge of conditions:**

| *Drawing / doc. no.* | *rev.* | *Description* |
|---|---|---|
| NHE-127523-2405-COL-WPA-DDR-C-005211 | P01 | COL 123 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005220 | P01 | COL 124 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005221 | P01 | COL 124 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005230 | P01 | COL 125 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005231 | P01 | COL 125 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005240 | P01 | COL 125A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005241 | P02 | COL 125A Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005250 | P02 | COL 126 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005251 | P01 | COL 126 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005252 | P02 | COL 126 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 3 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005260 | P01 | COL 127 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005261 | P01 | COL 127 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005270 | P02 | COL 128 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005271 | P01 | COL 128 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005280 | P01 | COL 129 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005281 | P01 | COL 129 Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 2 |
| NHE-127523-2405-COL-WPA-DDR-C-005290 | P02 | COL 130(1) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005291 | P01 | COL 130(1) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005292 | P01 | COL 130(1) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 3 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005300 | P01 | COL 130(2) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 1 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005301 | P01 | COL 130(2) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 2 of 3 |
| NHE-127523-2405-COL-WPA-DDR-C-005302 | P01 | COL 130(2) Castlefield Viaduct Planning Stage A Masonry Arch Remedial Works Sheet 3 of 3 |

# 3.1 Stage A: Castlefield Viaduct and Water Street

**Planning Condition 3 - in accordance with planning drawings**

**Additional supporting information (relevant to Stage A) prepared for the discharge of conditions:**

| *Drawing / doc. no.* | *rev.* | *Description* |
|---|---|---|
| NHE_127523-2405-000-WPA-DDR-C-000500 | *P01* | Masonry Repairs - Specification for the Works |
| NHE_127523-2405-000-WPA-DDR-C-000501 | *P01* | Masonry Repairs - Specification for the Works |
| NHE_127523-2405-000-WPA-DDR-C-000502 | *P01* | Masonry Repairs - Specification for the Cleaning Works |
| NHE_127523-2405-000-WPA-DDR-C-000503 | *P01* | Masonry Repairs - Standard Brickwork Bonds |
| NHE_127523-2405-000-WPA-DDR-C-000504 | *P03* | Masonry Repairs - Recasing of Defective Brickwork in Arches Greater than 4 Rings |
| NHE_127523-2405-000-WPA-DDR-C-000505 | *P03* | Masonry Repairs - Recasing of Defective Brickwork in Arches up to 4 Rings |
| NHE_127523-2405-000-WPA-DDR-C-000506 | *P03* | Masonry Repairs - Single Ring Re-casing of Defective Brickwork in Arches up to 4 Rings |
| NHE_127523-2405-000-WPA-DDR-C-000507 | *P01* | Masonry Repairs - Brick Arch Ring Cross Pinning and Grouting System |
| NHE_127523-2405-000-WPA-DDR-C-000508 | *P03* | Masonry Repairs - Stitching of Longitudinal Cracks in Arches Between Voissoir & Barrel |
| NHE_127523-2405-000-WPA-DDR-C-000509 | *P01* | Masonry Repairs - Stitching Transverse (Rotational) Arch Barrel Cracks |
| NHE_127523-2405-000-WPA-DDR-C-000510 | *P01* | Masonry Repairs - Stitching Longitudinal (Shear) Arch Barrel Cracks |
| NHE_127523-2405-000-WPA-DDR-C-000511 | *P01* | Masonry Repairs - Stitching of Longitudinal Cracks in Brickwork |
| NHE_127523-2405-000-WPA-DDR-C-000512 | *P01* | Masonry Repairs - Spot Replacement of Bricks |
| NHE_127523-2405-000-WPA-DDR-C-000513 | *P01* | Masonry Repairs - Temporary Works Arrangements |
| NHE_127523-2405-000-WPA-DDR-C-000514 | *P01* | Masonry Repairs - Stone Masonry Refurbishment |
| NHE_127523-2405-000-WPA-DDR-C-000515 | *P01* | Masonry Repairs - Recasing Vertical Walls |

# 3.1 Stage A: Castlefield Viaduct and Water Street

### 3.1.1
### Outline description

The existing Castlefield Viaduct is an almost continuous sequence of masonry structures in brick (fig. 3.1.i and 3.1.ii), broken in certain locations by iron or steel bridges. It is grade-II listed for its length from the River Irwell to Piccadilly Station. One of the interruptions to the viaduct is the Water Street bridge (fig. 3.1.iii), which is attractively detailed, although it does have functional restrictions (the height presents constraints to vehicular movements). Liverpool Road terminates against Water Street at a junction adjacent to this bridge; the grade-I listed station building overlooks this traffic junction. Water Street is a relatively quiet route; until the construction of Trinity Way it carried significantly more traffic.

### 3.1.2
### Existing structures

The majority of the viaduct is red brick vaulted arches, of similar (but not identical) structural spans. The structure curves on plan, with the space between piers varying accordingly. Water Street bridge is constructed from a series of decorated arched ribs which extend vertically on either elevation as parapets. Various bridges cross Water Street and they are in varying conditions of repair and cleanliness.

### 3.1.3
### Existing ground surfaces

The existing pavements at the junction of Liverpool Road and Water Street are paved in various materials; the majority are large stone paving flags with a 'riven' finish. The surface finishes to the north are of less value, and the roadway is conventional tarmac and white-lining.

Areas to the north and south of the Castlefield Viaduct are predominantly in private control, and are finished in utilitarian materials such as tarmac and gravel.

### 3.1.4
### Other elements

Some of the street furniture including street lilghting columns could be described as being of a heritage / pastiche style, and there are a variety of different signage styles.

*fig 3.1.i Woolam Place*

*fig 3.1.ii canal basin*

*fig 3.1.iii Water Street bridge*

# 3.1 Stage A: Castlefield Viaduct and Water Street

### 3.1.5
### Constraints and opportunities

The existing bridge on Water Street forms the gateway to Liverpool Road Station and beyond this to Spinningfields and the Manchester Quays regeneration site to the north. The new structures should continue to perform this role. Along the south side of the existing viaduct arch widenings will create a new façade facing into the regeneration site on this side, and hence they form a potential street frontage for commercial activities.

As a continuation of the issues raised in section 2.2, Stage A includes the first elements of the inter-connecting route from the south to the north. Since the construction of Trinity Way the traffic loads on Water Street have reduced and hence there is an opportunity to give this area a pedestrian- and cyclist-focussed character.

### 3.1.6
### Rail infrastructure works

To bring the tracks into the necessary position to thread the Chord between Woolam Place and Stephenson's Bridge it is necessary for the viaduct to be widened to the south. In addition to this, the altered geometry of the tracks requires the removal of the existing Water Street arched bridge.

The first components of the Ordsall Chord development consist of new signal and overhead line gantries and track realignment situated on top of the existing Castlefield (MSJ&AR) Viaduct. This viaduct carries the Bolton lines, a double rail track.

The arches beneath the viaduct are each numbered for reference purposes (referred to as COL); these are identified on the drawings which accompany this document.

At COL 117, the south west side of the viaduct will be widened between the Castlefield Basin and the River Irwell. This widened section will be constructed adjacent to the existing brick viaduct masonry arches and will accommodate the realigned Bolton lines, the turn off of the new Ordsall Chord lines and their associated (700mm wide) maintenance walkways. The new structures will consist of insitu reinforced concrete piers with a pre-cast concrete arch and spandrel above.

The existing brick parapets of the Castlefield Viaduct will be partially removed to accommodate the new track alignments and associated ballast. The replacement parapet (inclined at 6 degrees) will be faced with a weathered steel plate. Following specialist input the widenings are completely independent of the existing brick viaduct due to the nature of the two structures moving differently.

Figure 3.1.iv summarises through a series of diagrams the process of demolition, repair and extension that will be undertaken for the widening of the viaduct.

The existing Grade II listed Cast Iron Bridge (located at COL 125A on Water Street) which is listed with the Castlefield Viaduct, will be removed and replaced by two new metal 'half through' bridge structures, each separately spanning Water Street. The southern bridge will carry the new realigned Bolton lines which continue on the Castlefield Viaduct, and the northern bridge the Ordsall Chord lines. Minimum headroom to the Water Street carriageway will be maintained under both bridge structures.

### 3.1.7
### Priorities

The façade created by the arch widening should recognise the role it will potentially provide as the elevation to one side of a pedestrian street featuring commercial activities such as retail / food / drink. As a result, the materials and detailing are of an appropriate standard. To align with heritage standards each concrete arch profile will match the existing masonry behind, slightly offset to achieve a visual break between the two.

The effects of the Ordsall Chord on the surrounding ground should be of a sufficiently high quality to reflect the importance of the heritage fabric and the aspirations of the city council and the developers of adjacent sites. The space at the junction of Water Street and Liverpool Road will be improved in terms of the setting of the Liverpool Road Station, to mitigate the heritage impacts of the new Chord structure opposite.

***[for further details of this area refer to drawings 100001, 100002 and 100151 - 155 inclusive]***

# 3.1 Stage A: Castlefield Viaduct and Water Street

### 3.1.8
### Proposed materials and details (Condition 11)

Due to the nature of the skewback / pier relationship a small ledge will be created; where appropriate this will feature a continuous LED light fitting (fig. 3.1.vii) to provide illuminance to the soffit above and reflected light down to pedestrian level. This will be connected down to street level via conduits recessed into the concrete. The outer face of the skewback is to be finished differently (fig. 3.1.viii) to provide a visual break between the pre-cast and in-situ concrete surfaces of the spandrel and pier respectively.

To integrate drainage and power feeds into the piers it is proposed for each concrete element to have a recessed channel set into the front of the pier. This will run up the face of the piers and continue to the parapet above, dividing the spandrels. The open face of the channel will be closed off to access through the use of a demountable infill metal plate.

### 3.1.8.1
### Paving and surfacing - Planning condition 5 & condition 11

Paving materials (fig. 3.1.ix - 3.1.xiv) have been selected as appropriate to the surrounding context in terms of the historic and townscape values of the area. This has resulted in a palette focussed around high-quality stone finishes, chosen to sit alongside elements of the existing pavements which are to be lifted and re-laid.

The predominant new paving material in stage A is diamond sawn Yorkstone. To delineate the difference between this and other materials, narrow strips of diamond-sawn granite setts are proposed. Replacement highway surfaces will tie into the existing to adjacent areas.

To Liverpool Road there are large areas of existing historic paving stones, it is proposed to lift these existing stone flags, clean and re-lay them in relation to the new layout and structures. As we move from Liverpool Road to Water Street, yorkstone is to laid in replacement of the existing concrete paving slabs. To key thresholds and existing entrances the surface is to be laid with diamond-sawn granite setts. It is proposed to continue the concrete kerbs that will provide a robust detail with a surface finish appropriate to the adjacent stone.

The junction of Water Street and Liverpool Road is proposed to become a priority junction with the macadam surface finish reinstated to the new configuration.

### 3.1.8.2
### Street Furniture (Planning Condition 4)

This stage of the works does not propose the introduction of new benches or similar specific elements. New railings, gates and fences are to be to a similar design and colour scheme to the existing metalwork in arches to the Castlefield Viaduct.

An existing tree to Water Street / Liverpool Road junction, is currently located where the pier widening is to be placed; it is proposed to replace the existing tree with another in a new location 2m away on the junction (fig. 2.8.6). This is also the case with a postbox to the south east of Water Street which is to be located to a near location following consultation with the necessary parties.

### 3.1.8.3
### Lighting (Planning Condition 4)

There are three key bridges over Water Street that will be lit; COL 125A and Hobson's Arch, the MOSI bridge and the Pineapple Line Bridge. These bridges have been selected for a lighting treatment which will highlight them as key objects in the streetscape at night and reduce the 'tunnel effect' of the bridges forming a canopy over the street.

Starting at the western end of the street, COL 125A is the largest of the bridges to be lit. The design intent is to wash light onto the underside of the bridge structure from either side of the street. Luminaires will be mounted to the structural walls at high level to provide a glare free, low maintenance solution. Cool colour temperature light shall be used to augment the colour of the new paint finish to the underside of the bridge deck (Lux level: N/A. Highways lighting shall be provided for road users).

The adjacent 'Hobson's Arch', COL 125 will be used as a pedestrian and cycle route. The ambient lighting to this space will be provided via linear LED luminaires mounted at the base of the barrel vault on either side and provide a uniform uplight effect to the arch. This approach practical and provides a pleasing aesthetic solution which also highlights the form of the vault (Lux level: 50lx average, 25lx minimum).

The primary route between Liverpool Road and Water Street South has been designed to allow buses to pass at the corner and provides advisory cycle routes of 1.5m wide eastbound and 2.0m wide southbound. The turning into Water Street North is designed for light vehicles and private cars with occasional use by HGVs to service potential future developments on Water Street.

The route road between Liverpool Road and Princes' bridge forms part of National Cycle Network Route 6 and is well used by cyclists. Increased pedestrian numbers are anticipated due to proposed developments in this area. The Greater Manchester Cycling Design Guidance outlines requirements for sharing space between pedestrians, cyclist and vehicles. Through discussion with Manchester City Council it was confirmed that it is appropriate to class Water Street as a "Quiet Street" due to the predicted high levels of pedestrians and cyclists and low traffic volume. Water Street is not wide enough to accommodate both on-carriageway cycle lanes and the proposed wide pedestrian footways. Shared footway / cycleways can lead to conflict and is only appropriate in areas of low pedestrian and cycle demand. The "Quiet Street" environment allows free movement of pedestrians on the footways and provides continuity of provision for cycles.

***[for further details of this area refer to drawings 100102 - 105 inclusive]***

# 3.1 Stage A: Castlefield Viaduct and Water Street

Moving north along the street is MOSI bridge. The intention here is not to highlight the bridge itself but the historic colonnade which used to form part of the structure beneath the original bridge in this location (see section 3.1.18 for description). Lighting, in conjunction with the paving treatment in this area, has been used to create a specific character to this area with downlight luminaires with very narrow beam optics to spotlight the ground. The intention is to create high contrast pools of light on the pavement surface (Lux level: N/A. Highways lighting shall be provided for road users).

The third of the three bridges is the Pineapple Line bridge and the approach here is similar to the design used for COL125A. Luminaires will be positioned at high level either side of the road to wash light across the underside of the bridge deck (Lux level: N/A. Highways lighting shall be provided for road users).

**3.1.8.4**
**Highways (Planning Conditions 5 and 14)**

An alternative design proposal to that shown in the TWAO application has been developed through discussions with Manchester City Council and Allied London. This has been developed to support the goals outlines in section 3.1.5. The long-term ambitions for the Manchester Quays site intend for Water Street to become a high-quality public realm space with vehicles being given lower priority than cyclists and pedestrians. Whilst the development of that project is on a longer timescale than the Northern Hub works it is the intended that the Ordsall Chord project can provide the first steps in developing this strategy and set the agenda for the future.

Two main design principles underpin the proposal for the junction:
- Changing the primary emphasis of the junction so that the primary route connects the south of Water Street to Liverpool Road (rather than being north of Water Street to the south of Water Street)
- Changing the currently signalised junction (with traffic light control) to a priority junction (with give-way lines)

These changes are intended to give this area (in particular from the junction northwards) a calmer character focussed on pedestrians and cyclists. By changing the emphasis the route to the north for vehicles will become less attractive to vehicles, and the removal of street furniture associated with signalised junctions (traffic lights, etc.) is intended to give the atmosphere more akin to a public square.

***[for further details of this area refer to drawing 100130]***

*fig 3.1.ix Macadam*

*fig 3.1.x Yorkstone*

*fig 3.1.xi Granite setts*

*fig 3.1.xii Proposed Kerb*

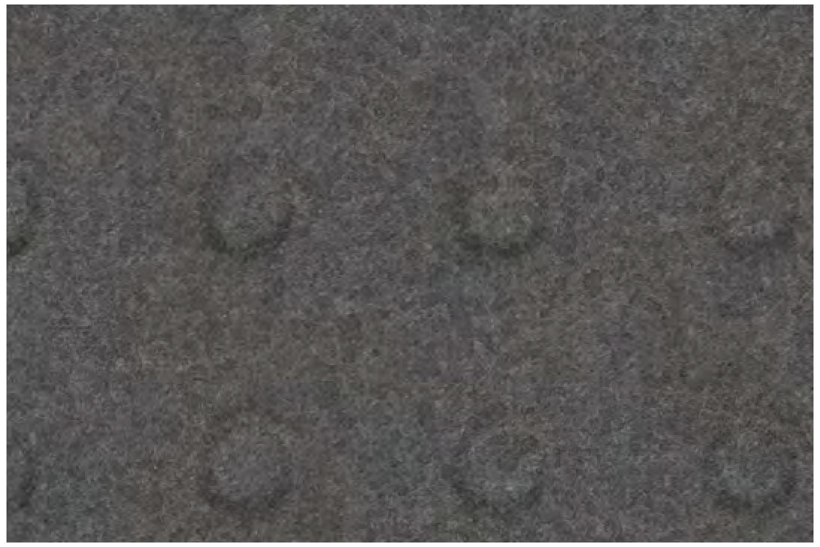

*fig 3.1.xiii Blister tactile - granite*

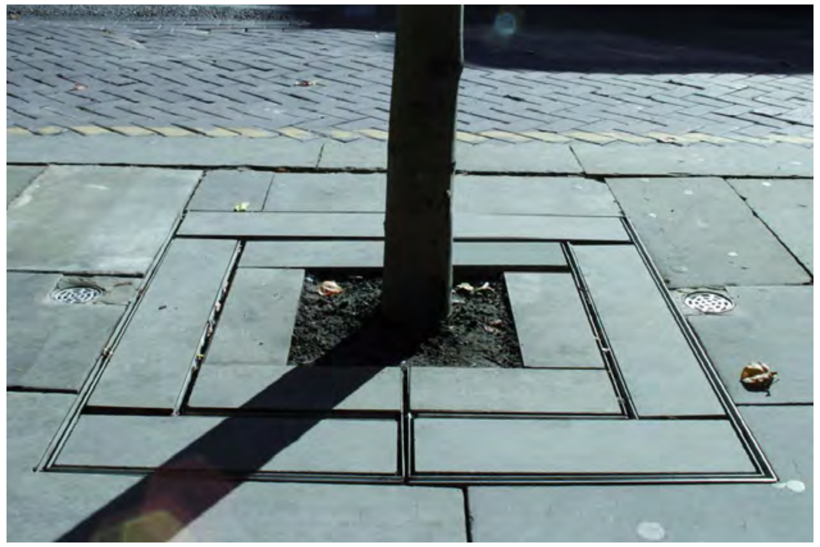

*fig 3.1.xiv Tree grille inlaid with paving*

# 3.1 Stage A: Castlefield Viaduct and Water Street

**3.1.8.5**
**Infill methods to to arches**

As with other similar structures, the Castlefield Viaduct houses various functions inside the vaulted spaces beneath the railway. In the area of the Ordsall Chord these include enclosed spaces (with infill facades to both sides), privately controlled open arches (secured with railings) and public routes (roads and pavements).

The majority of uses are to remain as per the existing viaduct, however the widening does change the configuration of certain areas. As a general rule, the current defining edges of the vaults (i.e. infilled, fenced or open) will retain a similar detail following the construction of the new structures; i.e. where an existing solid wall sits in the south elevation of the viaduct, it will be demolished and replaced with a new infill wall to the arch widening which has effectively lengthened the internal space created.

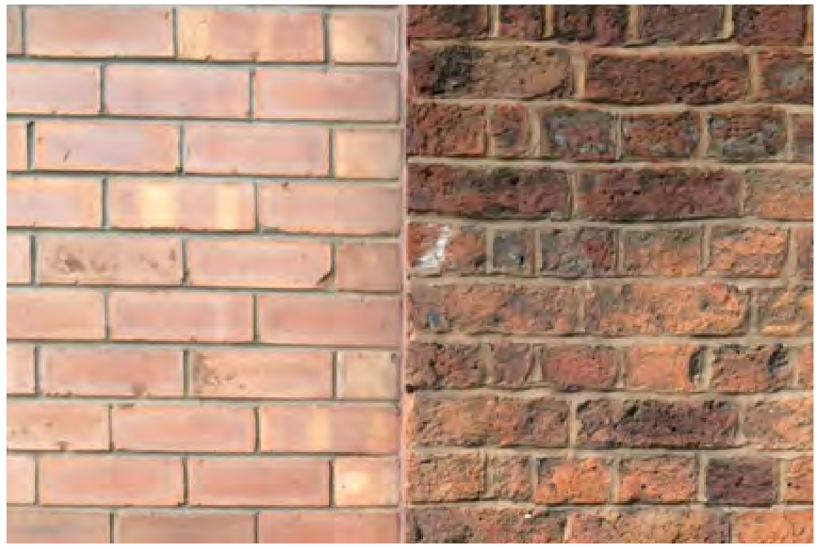

*fig 3.1.xix Site photograph of existing brick infill against original COL brickwork*

*fig 3.1.xx Proposed brickwork infill to sit adjacent to widened viaduct*

*fig 3.1.xix Proposed brickwork infill to sit adjacent to existing brick viaduct*

*fig 3.1.xv Site photograph of existing COL railing infill*

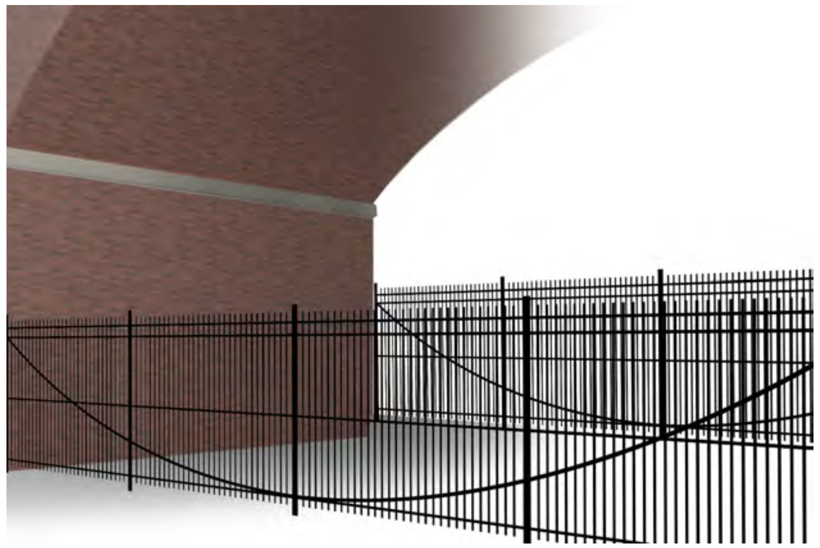

*fig 3.1.xvi Visual of proposed railing infill*

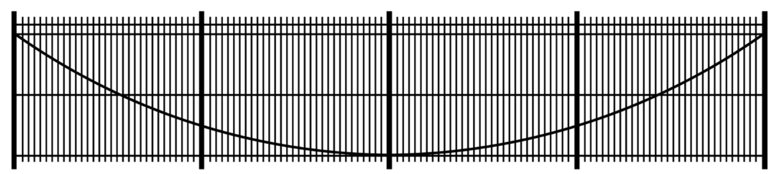

*fig 3.1.xvii Diagram of proposed COL railing infill*