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Job number  077954-31
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>1.1</td>
<td>Context</td>
</tr>
<tr>
<td>2</td>
<td>Structure of document</td>
</tr>
<tr>
<td>3</td>
<td>Site description</td>
</tr>
<tr>
<td>4</td>
<td>Design and Access</td>
</tr>
<tr>
<td>4.1</td>
<td>Design context</td>
</tr>
<tr>
<td>4.2</td>
<td>Temporary bridge installation design overview</td>
</tr>
<tr>
<td>4.3</td>
<td>Materials Used</td>
</tr>
<tr>
<td>4.4</td>
<td>Installation opening times and information</td>
</tr>
<tr>
<td>4.5</td>
<td>Pre-assembly works</td>
</tr>
<tr>
<td>4.6</td>
<td>Bridge assembly</td>
</tr>
<tr>
<td>5</td>
<td>Planning Policy Compliance</td>
</tr>
<tr>
<td>5.1</td>
<td>RBKC Consolidated Local Plan 2015</td>
</tr>
<tr>
<td>5.2</td>
<td>Other policy considerations</td>
</tr>
<tr>
<td>5.3</td>
<td>Summary</td>
</tr>
<tr>
<td>6</td>
<td>Heritage Statement</td>
</tr>
<tr>
<td>6.1</td>
<td>Context</td>
</tr>
<tr>
<td>6.2</td>
<td>Policy Compliance</td>
</tr>
<tr>
<td>6.3</td>
<td>Summary</td>
</tr>
<tr>
<td>7</td>
<td>Highway and construction issues</td>
</tr>
<tr>
<td>7.1</td>
<td>Overview</td>
</tr>
<tr>
<td>7.2</td>
<td>Hoardings</td>
</tr>
<tr>
<td>7.3</td>
<td>Transport and access</td>
</tr>
<tr>
<td>7.4</td>
<td>Logistics</td>
</tr>
<tr>
<td>7.5</td>
<td>Consultation</td>
</tr>
<tr>
<td>8</td>
<td>Construction Management Plan</td>
</tr>
<tr>
<td>8.1</td>
<td>Construction sequence development drivers</td>
</tr>
<tr>
<td>8.2</td>
<td>Construction sequence</td>
</tr>
<tr>
<td>8.3</td>
<td>Dis-assembly</td>
</tr>
<tr>
<td>8.4</td>
<td>Hoardings</td>
</tr>
<tr>
<td>8.5</td>
<td>Deliveries</td>
</tr>
<tr>
<td>9</td>
<td>Operational Management</td>
</tr>
<tr>
<td>9.1</td>
<td>Site Security</td>
</tr>
<tr>
<td>9.2</td>
<td>Public Safety</td>
</tr>
<tr>
<td>ISSUE</td>
<td>8 February 2016</td>
</tr>
<tr>
<td>-------</td>
<td>----------------</td>
</tr>
</tbody>
</table>

| 9.3   | Bridge Robustness | 32 |
| 9.4   | Emergency Evacuation | 33 |
| 9.5   | Way Finding and Information | 33 |
| 10    | Tree Survey        | 35 |
| 11    | Pre-application engagement and consultation | 37 |
| 12    | Other Licences     | 39 |
| 13    | Conclusions        | 40 |
**Figures**

Figure 1: Ove Arup and his first project at London Zoo ........................................5
Figure 2: An example of a B2P bridge in Rwanda ..................................................8
Figure 3: Illustrative sketch of the temporary bridge installation outside the V&A ..........................................................9
Figure 4: Western deadman anchor and tower pad indicative hoarding zone .....25
Figure 5: Indicative location of trees (T1 to T5) located adjacent to V&A main entrance ..........................................................35

**Tables**

Table 1: Deadman anchor options summary .........................................................24
Table 2: Tower pad option summary .....................................................................25
Table 3: Project Delivery Details ...........................................................................29
Table 4: Tree data collected by Barrel Tree Consultancy .....................................35

**Appendices**

Appendix A
Pre-Application Response from RBKC

Appendix B
Site Photograph

Appendix C
Bridges to Prosperity Day by Day Construction

Appendix D
Tree Survey

Appendix E
Construction Sequence

Appendix F
Deconstruction Sequence

Appendix G
Delivery Plan

Appendix H
Hoarding Zones for Bridge Construction

Appendix I
V&A Access and Security Statement

Appendix J
Construction Materials

Appendix K
V&A Letter of Support
Appendix L
Heritage Statement
1 Introduction

1.1 Context

Between June 18th and November 6th 2016, the Victoria and Albert (V&A) Museum is hosting an Engineering Season aiming to communicate the innovation and importance of engineering in our everyday lives, and its creativity beyond mere mathematics. The Engineering Season is a multi-part programme that will include an exhibition about the Anglo-Danish engineer Ove Arup (‘Engineering the World: Ove Arup and Philosophy of Total Design’) who was one of the most influential designers of the 20th century. Ove Arup was a pioneer of a multi-disciplinary approach that has shaped the approach and practice today, bringing in his philosophy origins and his imaginative sense of design.

As an accompaniment to the Ove Arup exhibition, a temporary bridge installation outside of the Cromwell Road entrance to the V&A museum is proposed. The bridge installation would be erected for a four month period from July to October, with assembly and dis-assembly in June and November. The exhibition will demonstrate and celebrate engineering, Ove Arup’s collaborative Total Architecture ethos, and the charitable work that Arup undertakes with Bridges to Prosperity (B2P). The proposed bridge installation will offer an excellent visual and interactive component to showcase how low-technology structures for humanitarian uses can also be beautifully designed. Set against the impressive Grade I listed historic façade of the V&A, the temporary bridge will contrast to, but also complement, the historic features with modern materials. The proposed installation will replicate in true form the B2P bridges that are built over impassable areas to provide isolated rural communities with access to health care, education, and employment that would otherwise be unreachable.

Using appropriate technology, the proposed bridge installation uses similar cost-effective materials and equivalent designs to those used in-situ, and offers opportunities to visually and physically demonstrate the principles of engineering whilst intellectually connecting to the public. Visitors will be able to walk across the bridge for a complete experience before entering the V&A exhibition to learn more about engineering solutions for socially responsible schemes.

Figure 1: Ove Arup and his first project at London Zoo
2 Structure of document

This combined Planning, Design and Access Station and its appendices provide support to the planning application and explanation of the proposed development. The content address’s the key issues relevant to this development and reflects pre-application discussions with RBKC officers. The document is comprised of the following sections:

- Sections 1 and 2 - sets out the site context and description, and describes the proposed development;
- Sections 3 and 4 - details the planning policy considerations, and heritage context;
- Section 5 - discusses the installations construction methodology and potential effect on the public highway;
- Section 6 - provides details of the installations assembly and dis-assembly process;
- Section 7 - outlines the operational management of the installation, including the proposed site security, public safety, and way finding measures;
- Section 8 – sets out tree survey and protection measures proposed;
- Section 9 - details the consultation and community engagement undertaken;
- Section 10 - summarises the work licences required;
- Section 11- sets out conclusions on why the planning application should be granted permission.
3 Site description

As shown on Drawing SK05, the proposed temporary bridge installation will be located across the steps which provide the main entrance to the Museum fronting onto the north side of Cromwell Road in South Kensington. The location for the proposed bridge installation maintains access to the Museum, and will span the entrance steps and provide sufficient clearance (see Drawing SK01) to allow ongoing safe access, which will necessitate a short period during assembly and dis-assembly when either the eastern or western steps would be closed to allow for works (details are set out in Section 7).

The site is outside of the V&A’s demise and is understood to be an adopted highway maintained by Transport for London (TfL).

The V&A Museum is a Grade I listed building, located in the South Kensington Museums Conservation Area. The Museum is part of a significant cultural centre situated amongst other cultural institutions including the Natural History Museum, the Royal Albert Hall, and the Imperial College London. To the south of Cromwell Road is an area of housing.

Immediately adjacent to, but outside of, the application site are two Grade II listed K6 telephone boxes. There are also five London Plane trees on the pavement outside of the V&A Museum, none of the trees are within the application site, but two of the canopies overhang the site area.
4 Design and Access

4.1 Design context

The proposal has been informed and influenced by Arup’s experience with the charity B2P, which provides bridges to rurally isolated communities around the world in order to improve access to healthcare, education, economic opportunities and to other social groups. This assists in sustaining and growing communities and saving lives. Arup’s work with B2P has recently won awards with engineering institutions IStructE and ICE, and is driven by passionate and engaged engineers who recognise the value brought by the bridges to people’s lives.

![Figure 2: An example of a B2P bridge in Rwanda](image)

4.2 Temporary bridge installation design overview

As shown on Drawing SK01 the proposed suspension bridge installation is 60m in length, plus steps measuring approximately 15m long either end for entry and exit, and has a width of 2.8m. The bridge is positioned over the steps leading into the Cromwell Road entrance of the V&A and maintains a minimum clearance height of 2.7m under the bridge to maintain full access to the entrance of the Museum. The distance between the centre of the walkway deck to the existing V&A façade varies between 2.8m at its closest point and 6.2m at the widest part. Please refer to SK02 for a cross-section of the bridge. The temporary bridge installation is not attached to the Grade I V&A façade at any point. A 4m clearance is maintained on the pavement between the road the hoarding when the bridge is being installed within hoardings.

The bridge is formed by two vertical steel towers, set on tower pad foundations, which support steel main cables spanning between the tower sections and secured
to deadman anchors at each end of the bridge. As is typical of suspension bridges some movement in operation is anticipated. However, because of the potentially wide range of users from all over the world who might want to cross the bridge, a stiffer deck than typically used in the field has been adopted. Hand rails are also in place on either side of the walkway to provide better stability for bridge users.

There will be hoarding under the stairs to protect the stair supports. This hoarding will have some presentation display material on to describe the temporary bridge installation and construction process. The existing V&A exhibtion boards will be used to promote the Engineering Season and bridge installation, and but will be no advertising outside of this. Additionally, there will be no extra lighting.

The temporary bridge installation is proposed to be erected for four months between July and October, which sits within the Engineering Season duration. Assembly of the temporary bridge installation will take one month in June, and dis-assembly will take two weeks in November. Managed access to the bridge will be provided with visitors able to walk over the bridge in a one-way regulated flow.

4.3 Materials Used

Against the historic façade of the V&A, modern and cost effective materials are proposed for the bridge installation. To reflect the materials used it real B2P projects, the supporting towers will be made of steel. Wide spiral strand steel cables will be used to link the two steel towers together and anchor the towers to the deadman anchors. The deadman anchors will be buried in the ground and therefore will not be visible. Timber decking is used across the suspension bridge walkway in conjunction with steel edge girders and cross members. Finally a metal hand rail and mesh side will be installed to prevent falling and to provide
support to visitors on the lively bridge. The limited range of materials used ensures a simple and minimal design which is central to the approach adopted for the many B2P bridges erected in the field.

By design, the bridge is simple and functional, yet architecturally elegant. Materials are largely lightweight but robust and reflect those that would be used on B2P projects globally. The use of basic materials stays close to the original ethos of a bridge that can be easily and simply erected in all environments. Its transparency is less visually intrusive and allows the V&A façade behind to be clearly seen, presenting contemporary and classic design together. The bridge is not attached to the V&A façade so creates some visual separation between the two.

The submitted drawing SKO6 (and attached also in Appendix J) shows further details of the materials used mapped against the design of the bridge.

4.4 Installation opening times and information

The bridge will be open for public use during V&A public opening times, and will be supervised at all times by V&A Gallery Assistants. Outside of these opening hours the bridge will be shut for use and locked by gates either end. The ambient street lighting is adequate to allow the bridge to be seen at night although its position close to the museum means it does not cause an obstruction to pedestrians on the pavement. There will be no additional freestanding advertising around the bridge other than the existing V&A boards either side of the entrance. Further information about the bridge construction and the B2P charity will be provided for within the museum as part of the exhibition. Further details of the operation management is in section 9.

4.5 Pre-assembly works

The tower pads and bridge anchors require ground excavation and reinstatement, and two options are proposed for the anchors which will affect the required excavation depth (options discussed further in 8.2.2). Planning permission is sought for both options so that the finding of the ground surveys can inform the approach to installing foundations. The details of the selected approach would be provided to RBKC.

Prior to commencement of erection of the installation a hoarding will be erected around the works area, as shown in Drawing SKO7. The construction of the west deadman anchor and tower pad will be completed before commencing with the east deadman anchor and tower pad foundation, limiting disruption to the pedestrian movement and V&A access. The hoarding will measure up to 2.2m x 1.0m, and all works will take place within this secured area. A 4m clearance along the pavement, except in one instance on the west side of the bridge where a tree will cause a minor pinch point during these temporary works. The construction on each tower pad is estimated to take 6 days (12 days in total).
4.6 Bridge assembly

The simplicity of the bridge construction is essential to this project, to show the key principles of bridge design and construction in individual components. Similar to the earthworks sequence, the eastern tower will be assembled and then the hoarding dismantled and re-erected around the western tower before works begins. A larger hoarding area is assembled measuring a total of approximately 44m x 10m, whilst maintaining an 8m entrance access into the V&A, also shown in Drawing SKO7.

At points a 2m ramp for disabled access will be provided as the side ramps will be inaccessible for this short period. The steel bridge tower section is assembled horizontally (on the pavement) and then lifted and fixed into position with a spider crane or A-frame lifting apparatus, within the hoardings. The hoarding is then removed before beginning the same process on the western tower. The construction, lifting and fixing of the bridge tower sections, including material delivery and temporary ramp construction will in total take eight days. To allow normal pedestrian movement along Crowell Road during all these stages, a 4m pavement walkway is maintained between the bridge and the road.

The main cables are then lifted into position out of museum opening hours; this is to maintain access to the V&A and to prevent risks to public due to works overhead. A hoarding will be temporarily erected around the bridge installation site including both western and eastern deadman anchors, before laying the main cables and connecting the suspenders. The spider crane or manual winching will raise the main cable into place. This will be repeated for the second cable. Once the main cables are in position the landing frame and scaffolding staircase will be built to enable bridge decking to commence. Bridge decking will be carried out from each bridge end during the day within hoarded work areas taking two days. The middle decking section is completed out of hours as the main entrance will have to be closed.

Further information on the assembly of the temporary bridge installation is in Section 8. Appendix C shows a B2P Daily Progress presentation of the bridge construction.
5 Planning Policy Compliance

5.1 RBKC Consolidated Local Plan 2015

The main planning considerations applying to the site and the associated policies from the RBKC Consolidated Local Plan July 2015 have been identified through pre-application discussions. The temporary bridge installation complies with these policy considerations in the following ways.

**Conservation Area: CL3 Conservation Areas and Historic Spaces**

The Council will require development to preserve and to take opportunities to enhance the cherished and familiar local scene.

The V&A is a key cultural institution within ‘Albertopolis’ with the founding principle to make design and education available to all. As a large-scale public installation designed to show-case engineering ingenuity, the bridge compliments the V&A Engineering Season, and adds attractiveness and interest to the Museum’s public spaces and increases the number of visitors to this cultural quarter. The large-scale installation reinstates the importance of the V&A as a key historical and educational centre, set in an area of high quality architecture and next to a Grade I listed building.

The bridge installation is not attached to the Grade I listed façade and is temporary, thus the local scene will be restored to its original character and no material harm will be caused to the building.

There are two listed phone boxes on the pavement outside of the V&A entrance, however both sit outside of our construction area.

Arup are applying for full planning application for the temporary bridge installation.

**Conservation Area: CL4 Listed Buildings, Scheduled Ancient Monuments and Archaeology**

The Council will require development to protect the heritage significance of listed buildings, scheduled ancient and sites of archaeological interest.

The proposed bridge installation is situated next to the entrance to the Grade I listed V&A building. It is not attached to the façade and will cause no material damage to the building. Desk based assessments of ground work conclude that vibrations will be limited, but will be continued to be monitored throughout the build. Due to the utilitarian design, the original historical embellishments on the V&A façade will be visible behind. The bridge is temporary and the building will be restored to its original heritage significance once disassembled.
Conservation Area: CL11 Views

The Council will require all development to protect and enhance views, vistas, gaps and the skyline that contribute to the character and quality of the area.

The proposed development will impact on the residential and public views across Cromwell Road entrance to the V&A. This is a temporary visual intrusion to the lower third of the V&A which will be restored after the installation is deconstructed. By allowing visitors to walk over the bridge, new sightlines across the area will be created and opportunities for close up views of the original building features opened up.

The surrounding residents and community groups from the Exhibition Road Cultural Group have been consulted on the plans and their concerns and recommendations considered in this planning application.

General Townscape: CL2 Design Quality

The Council will require all development to be of the highest architectural and urban design and quality, taking opportunities to improve the quality and character of buildings and the area and the way it functions.

The proposed bridge is of high design quality and robustness, both in appearance and use, and will offer a striking composition between the historic façade of the V&A and the modern materials used. By the allowing visitors to walk over the bridge adds a functional aspect to the design which also aids engagement and interaction. The site specific installation is of attractive design whilst also being inclusive and informative about engineering to visitors. It is proposed that the materials used will be reused on other projects, contributing to the sustainable use of resources.

Living Conditions: CL5 Living Conditions

The Council will require all development ensures good living conditions for occupants of new, existing and neighbouring buildings.

There will be minimal disruption to the access to the V&A for staff and visitors and working conditions will not be affected. Construction and operation have been managed to minimise disturbances to the local area and existing occupants. The proposed installation will result in no material worsening of existing conditions.

Transport: CT1 Improving Alternatives to Car Use

The Council will ensure that there are better alternatives to car use by making it easier and more attractive to walk, cycle and use public transport and by managing traffic congestion and the supply of car parking.

The proposed development will generate a high number of new trips from visitors, but is located in an area with existing good and accessible public transport, including tube, bus, and cycling provision.
Transport: CR3 Street and Outdoor Life

The Council will require opportunities to be taken within the street environment to create ‘places’ that support outdoor life, inclusive to all, adding to their attractiveness and vitality.

The V&A is engaged to promote and increase understanding and enjoyment of the designed world. This is not limited to the inside of the Museum, but the large areas of public space outside and as part of the wider setting on Exhibition Road amongst other cultural institutes. The proposed bridge will assist in supporting outdoor life and will add to the vitality of the area by introducing an attractive interactive installation, to stimulate engagement and interest.

The temporary bridge installation maintains pedestrian access on the pavement and visitor access into the museum. Road users will not be impacted. The proposal has been designed to have minimal impact on local residents, will be managed by Gallery Assistants during Museum opening hours, and will be locked when closed. Full amenity will be restored when the bridge is disassembled.

Arboriculture: CR6 Trees and Landscape

The Council will require the protection of existing trees and the provision of new trees that complement existing or create new, high quality green areas which deliver amenity and biodiversity benefits.

There will be some pruning to the London Plane trees, but this will cause no long term damage to the tree or to their amenity value. Specialists have been consulted and any works will be carried out in the most sensitive way according to British Standards. All works will be agreed with RBKC before commencing.

5.2 Other policy considerations

Reference has also be made to the RBKC Transport Supplementary Planning Document (2008), specifically to chapter 8: Reducing the impact of new development on the highway. A construction management plan has been developed (discussed in Sections 7 and 8) to avoid impact on traffic flow, safety, and pedestrian amenity. Schedules of the construction delivery and storage are discussed, as well as timings of the works to mitigate again transport impacts. In regards to Section 9: Streetscape of the Transport SPD which details the good practice for the street design and maintenance. This has been captured in this application to mitigate against impacts to the pavement and avoid street clutter associated with the proposal.

The Subterranean Development SPD is also relevant to this proposal due to concern regarding the impact of subterranean development on the special architectural and historic interest of the Grade I listed building. The policy highlights that excavation and construction of foundation may have consequential effects on historic foundations. Section 8 addresses these concerns.
Also relevant to consider for this proposal is the Queen’s Gate Conservation Area Proposal Statement (1989) which seeks to ensure that conservation is as much concerned with ensuring that “changes are compatible with their surroundings as with retaining the exact appearance of an area and its building” (p.3). The Proposal Statement notes the South Kensington Museums as an Area of Special Character, of value to both the borough and to Greater London. Given its special character it is suggested that any changes would be part of intense discussions and treated as artefacts in their own right. As set out above the temporary nature of the works and its relationship with the heritage buildings generate no negative impact on the Conservation Area.

5.3 Summary

It is considered that the proposed bridge installation complies with the relevant local planning policies. The temporary project showcases engineering ingenuity, and has no lasting effect on the setting of historic value nor will it cause any material damage to the building. Engagement with local residents indicates they are generally in support of the scheme and have been advised of the temporary change of the views to the V&A. The scheme has been designed and developed to minimise impacts on pedestrians, visitors and road users, and no trees with be damaged during the construction and operation. The bridge will be a focal point for the area and be an attractive structure that adds a point of interest to the street.
6 Heritage Statement

The proposed temporary bridge installation is situated in an important historic environment and adjacent to the V&A Museum which is a significant heritage asset. Relevant conservation and heritage policies have been identified on a national, London-wide, and local level to establish the nature, extent and importance of the setting and the ways that the proposed bridge installation aligns with policies to preserve and enhance the V&A heritage asset. The V&A have also produced a heritage statement identifying how the application has regard to national and local policy related to the historic environment. This can be found in Appendix L.

6.1 Context

6.1.1 National

The Planning (Listed Buildings and Conservation Areas) Act 1990, Section 72 states that when buildings are proposed in a conservation area, “special attention shall be paid to the desirability of preserving or enhancing the character or appearance of that area.” Further, paragraph 132 of the NPPF confirms that “When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset’s conservation when a development is proposed” (paragraph 132).

6.1.2 London Plan

The V&A Museum is situated in the Central Activity Zone (CAZ) in the London Plan (Policy 2.11 Central Activities Zone- Strategic functions). The London Plan Policy 4.5 London’s visitor infrastructure also designates South Kensington Museum complex as a Strategic Cultural Area (Map 4.2). This emphasises the importance of heritage and cultural areas in attracting visitor numbers and stimulating the economy. Policy 7.8 Heritage assets and archaeology in the London Plan notes that the desirability of identified significant heritage assets and historic environments are sustained and enhanced to utilise their positive role in place shaping. This is supported by Policy 7.4 in the London Plan which details that a development should have regard to form, function, and structure of an area.

6.1.3 RBKC

The RBKC Consolidated Local Plan (2015) confirms South Kensington as the site of the world’s first ‘designed’ cultural and educational destination, originally envisioned by Prince Albert who purchased the land with part of the proceeds from the Great Exhibition of 1851, and from which Exhibition Road got its name. Exhibition Road runs from South Kensington in the south to Hyde Park in the north, and is home to major educational and cultural sites including the Grade I listed V&A Museum, the Natural History Museum, the Science Museum, Royal Albert Hall and Imperial College London. Known in the Victorian period as ‘Albertopolis’ after Prince Albert as the pioneer of the Great Exhibition, the area now receives very high visitor counts every year to this area of significant cultural
importance. The area is now designated as the South Kensington Museums Conservation Area which is of Metropolitan importance.

Policy CV 12: Vision for South Kensington in 2028 in the RBKC Local Plan (2015) builds on Prince Albert’s vision for a “wide range of world-class institutions connecting the science and art of the past, present, and future.” In this area plans should include innovative public realm proposals and cultural experiences, for a “contemporary re-evocation of the original Victorian vision.” The proposed bridge installation is in line with this vision.

In front of the V&A Museum’s Cromwell Road entrance is situated two K6 telephone boxes that are Grade II listed. These form part of the setting to the V&A entrance but are located outside of the application boundary and will not be affected by the proposal.

The site is also located within the Queen’s Gate Conservation Area, and the Council’s Public Art SPG (2004) highlights the importance of high quality design.

6.2 Policy Compliance

Significant consideration has been given to the design of the bridge to minimise any effect to the historic environment and/or the Grade I listed V&A Museum building, in accordance with the Planning (Listed Buildings and Conservation Areas) Act 1990 and the NPPF. The proposed bridge installation is a temporary structure that is not attached to the listed building and its installation will cause no harm to the original fabric during construction or operation. The bridge installation, even given its temporary nature, will enhance the vibrancy around the Museum in line with the cultural ambitions of the area. In many ways the bridge installation will resonate with the original spirit of the Great Exhibition itself, presenting evidence of how engineering can change lives in other parts of the world.

The proposed bridge installation would be in place for four months. A limited number of other temporary art installations and structures on the frontage of the Museum have previously been granted permission including the Heatherwick Studio’s temporary steel entrance canopy 2012 (Ref PP/12/01841), and the more recent bucket and utilities sculpture (Ref PP/15/03879) on the junction of Exhibition Road and Crowell Road. Based on these precedents, and the pre-application advice sought (Appendix A), it is considered that the works would have minimal impact on the setting and special interest of the Grade I building and would contribute, albeit for a temporary period to the character and appearance of the conservation area.

Despite the scale of the temporary bridge installation, the form of the bridge is utilitarian in design and is made of lightweight materials including steel cabling and a timber walkway meaning that there is permeability and sight onto the V&A building façade and features behind, thus not wholly obscuring the historic embellishments.

Although utilitarian and unelaborate in form, the proposed bridge will be impressive and elegant in design. The use of modern materials and construction will contrast to the historic façade of the V&A buildings, whilst also
complementing it with its architectural interest and engineering ingenuity. The bridge will be of great public interest and will be a focal point for visitors whilst also encouraging activity and participation.

Views onto to the Cromwell Road entrance of the V&A from the south-west to the south-east will be partially obscured by the bridge installation, however this will only be to the lower third of the building and for a temporary period.

The proposed bridge installation would cause no harm to the original fabric and frontage of the V&A Museum. At its closest point at the main entrance, the bridge is set back approximately 2.7m from the building, from the centre of the decking, so there would be some visual separation and no physical impact on the building itself. The bridge’s location will have no impact, during construction and operation, on other special-interest features in the surrounding area, including the Grade II listed K6 telephone boxes situated on the pavement but outside of the construction hoarding area. There will be no impact on street lights or other street furniture.

There will be no advertising boards on or around the bridge installation. Information about the assembly and of the bridge itself will be positioned at points on the bridge installation and on the boarding enclosing the area under the stairs up to the walkway. Instead the existing V&A information boards adjacent to the steps will be used. There will be some sponsorship names discreetly incorporated within the structure and an instructions panel for public safety and bridge access (cautions of wet weather and instructions on direction of travel) but these will be unobtrusive and minimal. The main information will be made available inside the museum for public interest and the installation will be supervised by briefed Gallery Assistants who can answer visitor enquiries. There will be no associated visual clutter, to either detract from the historic façade or from the bridge installation, or with the feel of the existing street scene and public space.

There is sufficient existing lighting from the street lights on Cromwell Road and from the V&A Museum to illuminate the bridge to levels to ensure adequate health and safety during night hours. No additional lighting is proposed on or around the installation, as such there will be no interference with existing light levels in the local area.

There will be no impact to the foundations or structure of the listed building as a result of the excavation work associated with foundations for the installation. There will also be minimal vibrations from the excavation work and this will be monitored during works. Pilling is a non-preferred approach for the ground anchors but if required, to minimise disturbance to tree roots or deal with ground conditions, vibrations will be specified to be limited to a PPV of 10mm/s and on-site monitoring of vibration levels will be monitored throughout construction. Arup has conducted deeper excavations with bigger piles into the ground which were also closer to the façade with no reported vibration damage reported, so are confident that there is little possibility of structural damage due to vibrations.
6.3 Summary

Overall, the visual impact of the proposed bridge will be minimal, a factor that is reinforced by its temporary nature. There will be no attachment to the front of the museum necessary, and a visual and physical separation between the façade and the installation will be maintained throughout. There will be limited clutter and no additional lighting is proposed. The proposal is in accordance with the policy objectives to promote active public spaces and cultural institutions. Exhibition Road has a long-standing reputation of being a destination for public art and the bridge installation will contribute to the vibrancy and attractiveness of the area.
7  Highway and construction issues

The proposed bridge installation has been designed to provide an active public space and point of interest. Impacts on highways have been considered and the bridge installation is designed to mitigate against any issues. This includes ensuring the pavement has a minimum of 4m clearance and that the hoardings are as small as possible to ensure pedestrian flows are continued. Delivery of construction materials are scheduled to avoid interfering with the red route and museum access and storage of materials is discreet within the existing hoardings to minimise space requirements.

7.1  Overview

The proposed bridge installation would be situated immediately across the public entrance of the V&A Museum on Cromwell Road (A4), however does not oversail the highway. The A4 forms part of the London strategic road network and is categorised as a Red Route. It should be noted that the installation, albeit a bridge, does not span any vehicular trafficked route and runs parallel to both the V&A Museum and the road. The bridge will be an interactive art installation to demonstrate the concepts and application of engineering, it is not intended to become a highways structure.

As showing in the submitted drawing SKO1, the footpath outside the Cromwell Road entrance is very wide (approximately 14m) with a line of trees approximately 3-4m from the road edge. This width between the bridge and the road (approximately 8m), despite the trees and telephone boxes, is therefore considered adequate to comfortably accommodate the pedestrian flows along the footpath, during operation of the bridge installation.

7.2  Hoardings

It is noted that several hoardings have been placed along this footpath over recent years in connection with other works and installations, which have often resulted in the footpath width being reduced to that between the existing road edge and the line of trees (approximately 3.5 to 4m). It is noted that some hoardings have also extended over a larger area than those associated with the proposed installation. The hoardings associated with assembly and dis-assembly which totals six weeks (approximately four weeks for assembly and two weeks for dis-assembly). As such it is not envisaged that the assembly and dis-assembly hoardings would obstruct pedestrian movement along the footpath when in operation.

7.3  Transport and access

Several taxi stands and coach/bus stops are presently situated on the road edge immediately outside the southern entrance of the V&A. As such the footpath, together with the steps, regularly acts as a gathering point for visitor groups to the V&A. However due to the very small pavement footprint of the installation, effectively the towers and the access and egress points, this would not significantly reduce the space available for groups to congregate; the construction
methodology also seeks to maintain these congregation points as detailed in Section 8.

An adequate headroom of 2.7m (minimum) for pedestrians would be maintained under the installation in order that access to the southern entrance of the V&A via the steps would still be possible. The installation would also not intrude significantly upon the ramps to either side of the central steps in front of the entrance, thus retaining the current access provision for mobility impaired visitors.

As the installation is confined exclusively to the footpath there would be no impact on traffic operations while the bridge is in use. Consequently there would be no impact upon either servicing vehicles and/or emergency service vehicles stopping at the kerbside. However, some minor disruption is likely to occur when the bridge is being assembled and dis-assembled, the impacts and mitigations of which have been addressed in Section 8 of this document.

7.4 Logistics

The works area would be hoarded off during erection and removal of the installation. The works would take place on a sequential basis to minimise hoarding size and impact to pavement access. The hoarding area will also allow for the storage of materials thus no extra areas are necessary. It is also envisaged that deliveries of the bridge installation materials would take place at appropriate times agreed in consultation with the local planning and highway authorities in order not to interfere adversely with other loading and unloading operations.

7.5 Consultation

Arup has engaged with TfL on the temporary bridge installation in this location. At the initial meeting TfL did not identify specific insurmountable issues but required further information and internal consultation to be able to confirm any general support for the proposal. They advised of relevant licenses to be obtained (see Section 10: Other Licences), confirmed the need to undertake site investigations, identified preferred contractors to undertake the site ground investigations, and will positively assist in the final design development. TfL officers were identified to undertake internal consultations and ensure that the correct departments are engaged and informed of the proposal. A further meeting is to be scheduled with TfL following the submission of this planning application and the scheduling of the site investigations.
8  Construction Management Plan

This section summates the proposed pre-construction ground works, and the assembly and dis-assembly of the temporary bridge installation. The approach limits the time taken for assembly and dis-assembly to conserve the public access on the pavement and visitor and staff access to/from the museum.

8.1  Construction sequence development drivers

The construction sequence for the proposed installation is based on the following drivers:

- Producing a safe and unobtrusive construction sequence;
- Minimising disturbance to the local area
- Maintaining public access along the public footway;
- Maintaining access to the V&A main entrance;
- Limiting out of hours working to safety-critical operations (lifting, deliveries, etc.); and
- Engaging the community and passers-by in the construction.

8.2  Construction sequence

The construction sequence is divided into three stages with sub-phases within which are discussed in the sections below:

- Stage 1: Pre-construction/site investigation;
- Stage 2: Earthworks - excavation and/or piling (phases 1-2); and
- Stage 3: Bridge assembly (phases 3-9).

8.2.1  Stage 1: Pre-construction/site investigation

Desk top studies have been conducted to indicate where existing buried services are located, to identify the likely soils that might be encountered and to assess the likely extent of the tree roots. Site investigation work is required to verify this information and ensure that the proposed design takes into account the actual site constraints. We are in discussions with the required stakeholders to get these surveys completed by the end of February.

Arup proposes integrating these three required checks (services and tree location and soil type) into a single trial pit operation. The number of trial pits will be dependent on the initial findings and specialist requirements (e.g. geotechnical, tree specialist). The excavation process will involve the installation of a temporary hoarding to the relevant isolated pit locations; the temporary removal of the paving stones; the excavation of soil, the inspection of roots and services, completion of in-situ geotechnical tests and the removal of soil samples. Once the inspections and tests are completed the pits will be backfilled and compacted in an approved manner and the pavement fully reinstated.
8.2.1.1 Pre-construction/site investigation mitigation measures

Potential damage to the paving stones will be eliminated through the utilisation of suitable methods and protective membranes to protect the work area. Furthermore, hand excavation would be used to allow for the careful removal of soil around services and tree roots will be used during ground investigations. Finally, the soil area will be compacted before reinstating the paving stones to reduce the risk of settlement.

8.2.2 Stage 2: Earthworks - Excavation and/or piling (Phases 1 and 2)

Deadman anchors and bridge tower pads form the foundation of any suspension bridge with the role of restraining the main cables and supporting the steel tower sections respectively. Typically deadman anchors are either large buried concrete masses which rely on the passive and frictional resistance of the soil against the concrete mass, or piled structures which rely on the inclination of the piles and/or their bending capacity. Both options have been presented, as the chosen option will depend on the outcome on the ground surveys that are currently being mobilised for. The ground survey will also give a clearer idea of the constraints on construction. Once the foundation option is established, the Council will be informed. The options are discussed in Table 1: Deadman anchor options summary below.
Option | Pile and pile cap option. Maximum of four 600mm diameter piles | Gravity deadman anchor
--- | --- | ---
Hoarding area | 3.5 x 8.5m | 10 x 10m
Paving stone removal area | 2.5 x 7.5m | 8 x 8 m
Deadman size | 1.5 x 6.5 x 1m | 3.5 x 5.5 x 3m (2.5m below the ground)
Required excavation depth | Shallow excavation required but installation of the four piles with pile rig will be required. | Excavation and batters required to 2.5m below ground level.
Advantages | Large reduction of deadman anchor size, pavement space take and required excavation. | No piles required; Potential to remove deadman anchor once exhibition is over.
Disadvantages | The piles will need to be driven to a depth of approx. 8m below the ground and will not feasibly be able to be removed. | Deep excavation required; Large deadman anchor required; May require sheet trench; Difficulties regarding anchor removal.

Table 1: Deadman anchor options summary

The tower pad foundations support the steel tower sections and the suspended steel cables which connect to the bridge deck. The bridge has been designed to minimize the size and depth of any excavation required for the tower pad foundations. The resulting pad size is 5x3.5x0.7m (LxWxD) which will support the bridge tower section and the landing frame.

Option | Tower pad foundation (Shallow bearing pad)
--- | ---
Hoarding area | 7 x 6m
Paving stone removal area | 6 x 5 m
Deadman size | 5 x 3.5 x 0.7m
Required excavation depth | Shallow excavation to 1m approx. required
<table>
<thead>
<tr>
<th>Advantages</th>
<th>No piles required; Potential to remove tower pad once exhibition is over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disadvantages</td>
<td>Shallow excavation required; Larger construction area required</td>
</tr>
</tbody>
</table>

Table 2: Tower pad option summary

In order to minimise the disruption to pedestrians and V&A visitors during construction, the required hoarding areas will enclose the deadman anchor and the tower pad together. The western deadman anchor and tower pad will be constructed and completed before the eastern equivalent commences, this allows for the ingress and egress of V&A users up the opposite ramp. See Figure 4: Western deadman anchor and tower pad indicative hoarding zone. See below for the diagram showing the hoarding work area. There is a larger version in Appendix G.

Figure 4: Western deadman anchor and tower pad indicative hoarding zone.

The construction of the western deadman anchor and tower pads is described below in Phase 1 of the construction sequence, and is shown in Appendix E in full. Installation of each western and eastern deadman anchor and tower pad would take six days. As indicated above access to the Cromwell Road entrance to the V&A Museum will be maintained throughout.

**Sub-Phase 1: West deadman anchor and tower pad (est. 6 days)**

a) Place hoarding around demarcated area;

b) Remove pavestones where required and place protection material down where excavation equipment will operate;

c) Move excavation equipment into hoarded area;

d) Conduct excavation and prepare for concrete pouring;

e) Place concrete to form anchor block and tower pad;

f) Backfill around concrete once partially cured;

g) Clear site and move equipment to east side.
Sub-Phase 2: East deadman anchor and tower pad (est. 6 days)

Once the process is complete for the western side, the process will be repeated for the Eastern side, opening up the West side for public access. This stage follows the same stages as Phase 1 above.

8.2.3 Earthworks mitigation measures

As discussed in the pre-construction/site investigations, potential damage to the paving stones will be eliminated using suitable methods and protective membranes to protect the work area. Monitoring of potential vibrations induced by excavation equipment will be undertaken to ensure no impacts to the façade are caused. The concrete pouring will be scheduled to minimise disruption to pedestrians and appropriate plant equipment will be used to limit noise.

8.2.4 Stage 2: Bridge assembly (sub-phases 3-9)

The bridge assembly is divided into a further seven phases (Sub-phases 3 to 9 on the construction sequence, see Appendix E). The total duration of the bridge assembly time is estimated at 13 days with two night time shifts. During the bridge assembly stage the Cromwell Road entrance to the V&A will remain open and accessible during all museum opening hours. There are two night time shifts when the main entrance will be inaccessible, however this is outside of museum opening times and will not affect daily museum operations. During assembly a temporary disabled access ramp will be installed at the front of the museum. This is to account for the temporarily blocked off disabled ramps to the east and west of the V&A main entrance, and these disabled access routes will be reinstated once the bridge is in operation and the hoarding is removed.

The details of the bridge assembly schedule is described below:

Phase 3: Spider crane setup and material delivery (est. 1 day)

1. Positioning of hoarding;
2. 3.2 Delivery of spider crane on flatbed truck;
3. 3.2 Positioning of spider crane in preparation for bridge tower elements and steel cables ropes delivery (Position 1);
   3.3 Using spider crane to place building materials into temporary storage drop zone.

Phase 4: Bridge tower construction (est. 2 days)

4.1 Spider crane moved to Position 2;
4.2 Individual tower elements moved to the indicated position on trolleys, the remaining elements are left in storage area;
4.3 Assemble the bridge tower section in the horizontal position and prepare crane for lift.

Phase 5: East tower lifting (est. 2 days)

5.1 Right tower lifted into position with spider crane of A-frame;
5.2 Tower sections fixed to tower pads;
5.3 Hoarding and crane moved to West tower area.
Phase 6: West tower lifting and temporary ramp construction (est. 3 days)

6.1 Hoarding, materials and equipment moved after closing hours;
6.2 Bridge tower assembled;
6.3 Spider crane assembled in Position 3;
6.4 Bridge tower lift into positioned with spider crane or A-frame;
6.5 Bridge tower fixed to tower pad.

Phase 7: Night instalment of main cables (est. 1-2 nights)

7.1 Set up indicated hoarding and second spider crane;
7.2 Lay out of main cable as shown and connect suspenders at required points along cable length;
7.3 Lift the main cables at either end onto the bridge tower sections using of the spider cranes;
7.4 Connect main cables to anchors on either end;
7.5 Adjust main cable to correct sag;
7.6 Remove temporary access barrier and allow V&A users to enter through maintained central access route;
(7.7 Repeat operation for second main cable).

Phase 8: Bridge decking assembly (est. 2 days)

8.1 Construct the steel landing platform frame and scaffolding stairs on each side;
8.2 Commence bridge decking from either side; this processes involves the incremental connection of edge beams, cross beams and timber decking whilst moving the edge restraint forward;
8.3 Safety hand rail and temporary parapet moved out as decking progresses;
8.4 Repeat process until 3m away from temporary access zone on either side (safe zone).

Phase 9: Bridge decking completion and other finishes (est. 1 night and 2 days)

9.1 During a night shift the temporary access to the V&A will be closed off and the remaining 14m of bridge decking will be completed; 
9.2 Once decking is completed, installation of web mesh and other finishes;
9.3 Removal of all hoarding and construction equipment;
9.4 Clearing of site and preparation for opening.

8.2.5 Bridge assembly mitigation measures

As with the pre-construction/site investigation and the earthworks, potential damage to the paving stones will be eliminated using suitable methods and protective membranes to protect the work area. The construction process has been designed to minimise noise, and construction times will take place at appropriate times in consultation with RBKC. Furthermore, the construction sequence maintains a 4m clear walkway width for pedestrians and V&A visitors, and although the cable operation requires full closure of the V&A entrance, this operation is programmed to occur after V&A closing time to mitigate disruption to V&A users.
8.3 Dis-assembly

It is envisioned that the bridge will be disassembled in a reverse fashion to the way in which it is assembled with all equipment rapidly moved off site. It is intended that the bridge components will be used on a B2P project in the fields, depending on suitability and logistics of material shipping. See Appendix F for the proposed deconstruction plan.

The notable implications of the dis-assembly process:

- Lowering of the steel tower sections and bridge deck;
- Demolishing of the tower pad and the deadman anchors;
- Removal of concrete rubble and other construction materials;
- Full reinstatement of pavement slabs and surfacing.

The deconstruction of the bridge is expected to take 15 working days and two night shifts.

8.3.1 Dis-assembly mitigation measures

As with the previous construction stages, potential damage to the paving stones will be eliminated using suitable methods and protective membranes to protect the work area. The dis-assembly process is also tailored to minimise noise, although some noise is unavoidable when removing the concrete tower pads and deadman anchors. At these times, operations will be scheduled in consultation with RBKC to minimise disturbance to local residents.

Like the construction sequence, the deconstruction sequence maintains a 4m clear walkway width for pedestrians and V&A users. The cable removal operation requires full closure of the V&A entrance but this operation is programmed to occur after V&A closing time to mitigate disruption to V&A visitors. All waste will be stored within the hoarded areas and moved off site at times least likely to cause inconvenience to pedestrians and visitors. Finally, to reduce the deconstruction period and level of disturbance the deeper parts of the deadman anchors can be left in place beneath the pavement with adequate space for shallow services to pass above.

8.4 Hoardings

The hoarding used during assembly and dis-assembly will be standard plywood hoarding which will showcase some information on the construction works occurring within the hoarding, the project and details of the V&A exhibition and its sponsors. Viewports in the hoarding will be provided to allow pedestrians to look into the assembly site and engage with the construction process.

The hoarding lines indicated on the drawings (see Appendix H for details of the proposed hoarding zones for bridge construction) show the outer face of the hoarding. The hoarding build up and support structure will fall within the outlined area and will not interfere with the retained pedestrian zone. The steel plate and ballast support structure required for the hoarding rest on the pavement and do not require intrusive excavation.
A protective membrane will be placed beneath the hoarding structure to minimise the risk of abrasion to the pavement.

### 8.5 Deliveries

A ‘just in time’ delivery approach will be adopted. This approach allows for minimal storage of building materials on site, which is beneficial for construction, Health and Safety, and security as there are minimal materials stored overnight. This approach allows building materials to be delivered by smaller vehicles with quicker off-loading times which will reduce disruption to pedestrians and V&A visitors. Table 3 below lists the likely delivery sequence and timings during the assembly process. The Delivery Plan drawing in Appendix G provides a visualisation of deliveries. Any materials that need to be kept on site will be able to be stored within the hoarding zone and will be adequately secured and locked.

<table>
<thead>
<tr>
<th>No</th>
<th>Sub-Phase</th>
<th>Delivery description</th>
<th>Approximate parked off load time (hours)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hoarding and equipment</td>
<td>Hoarding plus equipment required for pavement removal</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Excavation equipment</td>
<td>Machinery required for excavation, shoring and steel and formwork placement</td>
<td>4</td>
<td>Requires temporary blocking of the pathway (30min)</td>
</tr>
<tr>
<td>3</td>
<td>Concrete pumps</td>
<td>Pumping of the anchor block and tower base pad each side</td>
<td>7</td>
<td>Requires temporary blocking of the pathway (7 hours each side – out of hours)</td>
</tr>
<tr>
<td>4</td>
<td>Excavation equipment</td>
<td>Moving excavation equipment offsite</td>
<td>2</td>
<td>Requires temporary blocking of the pathway (30min)</td>
</tr>
<tr>
<td>5</td>
<td>Delivery of first spider crane</td>
<td>Delivery required for tower construction and main cable placement</td>
<td>3</td>
<td>Requires temporary blocking of the pathway (45min)</td>
</tr>
<tr>
<td>6</td>
<td>Delivery of bridge tower elements and cables</td>
<td>Delivery of all bridge tower elements and cables on drums</td>
<td>4</td>
<td>Requires intermittent blocking of the pathway (multiple 10min periods)</td>
</tr>
<tr>
<td>7</td>
<td>Delivery of second spider crane</td>
<td>Delivery required to assist in main cable placement</td>
<td>3</td>
<td>Requires temporary blocking of the pathway (45min)</td>
</tr>
<tr>
<td>8</td>
<td>Delivery of decking, crossbeams and webnet mesh</td>
<td>Delivery of decking, crossbeams and webnet mesh</td>
<td>4</td>
<td>Requires intermittent blocking of the pathway (multiple 10min periods)</td>
</tr>
<tr>
<td>9</td>
<td>Removal of spider crane and other equipment</td>
<td>Removal of spider crane and other equipment</td>
<td>7</td>
<td>Requires intermittent blocking of the pathway (45 min &amp; 10min periods)</td>
</tr>
</tbody>
</table>

Table 3: Project Delivery Details
Pre-application meetings with RBKC officers identified that deliveries should take place outside of usual recommended construction hours. This is to limit impact on the TfL red route and to the high volumes of visitors to the V&A museum. The most suitable construction work and associated delivery times will be agreed upon with RBKC and adjacent consultees to the area before work commences.
9 Operational Management

This section outlines the key operational aspects of the exhibition, including public safety, site security and the nature of the bridge. The V&A have also issued a Security Statement (see Appendix I) specific to the proposal with the objective of ensuring the safety of public, staff and property during the bridge installation period.

9.1 Site Security

The V&A Control Room will deploy a security officer to unlock and open the B2P installation on a daily basis between 10:00-17:45 Saturday-Thursday, and until 22:00pm on Fridays. The security officer will then hand the manning of the bridge to a Gallery Assistant assigned by the Visitor Experience Department to cover the area during public access times, including Friday Late Views. The keys to lock and unlock the B2P installation will be securely kept at the Control Room/Biometric Key Safe and access will only be granted to authorised members of staff.

Outside of normal opening hours, access to the bridge will be restricted by providing a lockable security gate at the bridge gates on either side. The V&A Control Room will assign, on a daily basis, a security officer to lock the bridge. The V&A have confirmed that that the security officer will confirm with the Visitor Experience member of staff that the bridge is clear of public and there are no reported issues before lockdown is completed.

The V&A Control Room will also be able to remotely monitor the B2P installation via CCTV during non-public hours and provide immediate response to any incidents taking place in the area, in line with established museum emergency response procedures. The V&A Security Department will be notified of any security related incidents and will take the necessary actions to resolve the issue or escalate the occurrence to the appropriate services.

It is understood that there is adequate existing lighting in the area from the street lampposts and the V&A exterior lighting to ensure that the bridge is visible during dark to avoid injury and prevent vandalism.

During construction, a just-in-time delivery methodology for materials will be in place, meaning that few construction tools will need to be left on site. For equipment that does need to be left on site, it will be stored within the safety of the construction hoardings, which will be locked out-of-hours.

9.2 Public Safety

The bridge exhibition will be accessible during V&A opening times only, and will be closed and locked at both ends at night. During the normal V&A opening times, the public will be able to access the bridge via the stairs provided from 10:00-17:45pm Saturday to Thursday, and until 22:00pm on a Friday. A Gallery Assistant will be on duty to oversee the bridge during these public opening hours, and will be given a full briefing and will be provided with a radio to remain in contact with the Visitor Experience Duty Manager, Supervisors and the Control
Room. In addition, all Gallery Assistants will be given a full induction into the V&A’s Health and Safety procedures. The Gallery Assistant will also be provided with relevant information to assist in the interpretation of the bridge, and the links between the installation and the wider Engineering Season.

Appropriate signage will be provided to inform visitors of the following:

- On-site attendee during bridge opening hours;
- Statement that the structure is sufficiently stable so as to present no risk to general public;
- Variable gradient;
- Required direction of travel across the bridge;
- Movement of the suspension bridge structure deck in response to pedestrians walking across;
- Direction of travel when accessing and egressing the bridge;
- Grab rails to be used when crossing the bridge;
- Caution when bridge surface is wet.

This will allow people to make an informed choice as to whether to access the structure. The V&A’s Emergency Response Team (ERT) will be made available at all times to provide adequate support to visitors and staff in case of minor incidents, including first aid.

### 9.3 Bridge Robustness

The bridge installation is a replica of bridges that provide safe access across rivers to thousands of people in rurally isolated areas around the world. The bridge installation will be structurally robust, however suspension bridges are by nature lively bridges and there will be some degree of movement on the bridge installation.

To better accommodate the varied experiences of visitors from across the world, the proposed solution for the temporary bridge installation will incorporate a stiffer deck than adopted in the fields and will consist of a bridge deck with a normally curved vertical profile over the 60m span, having a maximum gradient of 1:20, designed to the recommendations set out in BD29-04 (Design Manual for Roads and Bridges). It should be noted that the normally curved profile under static loading will change depending on the loading of the deck and the gradient may briefly exceed the 1 in 20 target gradient at times.

A 60m span has been selected for the following reasons:

- allows the bridge to use available space closer to the museum, outside of the main utilities routes running under the pavement, providing better options for the anchor blocks and tower pads;
- allows the structure and foundations to be kept further away from the main branches of the trees and their root balls, and also from the Grade II listed telephone boxes;
allows access underneath the entire bridge, with no areas restricted by
headroom (a shorter span would not achieve this).

Steps will be provided at both ends of the structure to access onto the bridge deck. These will be designed to the requirements of BS 8300 (Inclusive Access) and will be suitable for use by ambulant disabled people. There will be no more than 13 risers in each flight, with riser heights of 150mm and tread depths of 300mm. Handrails, designed to BS 8300, will be provided to both sides of the steps, to provide guidance and support to those who require it. Contrasting and slip resistant nosing will be provided to each step.

The width of the deck will be approximately 1.05m. Level landings, 2m long, are provided at the top of the steps just before and just after the main bridge deck. It is intended that access across the bridge structure will be regulated to allow movement in one direction only.

The steps will incorporate up stands to allow a detectable edge for guidance and hand rails will be provided. On the bridge deck itself, a rail and steel wire mesh side screen will be provided along the entire length.

Access Beneath the Bridge Structure for the exhibition material will be maintained at a minimum of approximately 2.7m.

The decking planks will be laid parallel to the direction of travel. All walking surfaces will be coated in anti-slip timber coating (to meet the requirements of BS 8300 Annex E) to reduce the risk of accidents on the deck;

The bridge will be structurally capable of being fully loaded with occupants but the management regime will limit occupancy to minimise the movement of the deck in operation.

Unfortunately, due to space limits it is not possible to provide disabled access onto the bridge.

9.4 Emergency Evacuation

The V&A have an emergency evacuation procedure in place in case of a full evacuation of the V&A building. The evacuation procedure will be adapted to consider bridge users and has been reviewed by the V&A. Fire marshals and security staff will be on hand to assist staff and visitors to assemble to the designated assembly points via the nearest exit. The V&A fire officer and London Fire Brigade have been consulted and have stated that the bridge will not impact on their fire safety activities.

9.5 Way Finding and Information

Signage and visual graphics will be limited to the small boards already in place outside of the V&A to describe the purpose of the exhibition and provide background information on the charity Bridges to Prosperity. The V&A’s curators have expressed interest in keeping advertising as minimal as possible to maintain a limited impact, whilst still providing the public with sufficient information. Other signage will be limited to way finding and information to ensure safe and sensible use of the bridge by the public.
Throughout the construction period, there will be a number of construction hoardings to ensure the safety of the public and minimise nuisance. It is proposed to provide some information and visuals of the exhibition and the construction methodology on these hoardings, in order to supplement the remainder of the exhibition and further engage the public during the construction process. There will be a permanent hoarding around the stairs leading up to the bridge walkway to provide safety to users when ascending and descending. It is planned that this hoarding will also be used to provide visitors with some information about the bridge and the engineering season.
10 Tree Survey

As shown in Appendix D there are five London Plane trees located at the edge of the pavement adjacent to the main entrance of the V&A, and therefore within close proximity to the proposed bridge exhibition. These trees are managed by TfL as the relevant highway authority, and do not hold any specific Tree Protection Orders beyond their status within a Conservation Area.

Figure 5: Indicative location of trees (T1 to T5) located adjacent to V&A main entrance.

A survey of the trees has been completed in support of this application. The survey was undertaken by Barrell Tree Consultancy 7th October 2015 by Phillip Brophy (HNDArb MArborA CEnv MICFor), who is a Professional member and Registered Consultant of the Arboricultural Association, a Chartered Forester and a Chartered Environmentalist.

The results of the tree data collected and the subsequent approximate root protection areas (as calculated following BS5837:2012) are summarised in the following table (refer to Appendix D to see the corresponding trees as referenced in column 1):

<table>
<thead>
<tr>
<th>Tree Ref.</th>
<th>Species</th>
<th>Height (m)</th>
<th>Diameter (cm) @ 1.5m</th>
<th>Maturity</th>
<th>Low Branches</th>
<th>Category</th>
<th>RPA radius² (m)</th>
<th>RPA area² (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>London plane</td>
<td>16</td>
<td>52.5</td>
<td>Mature</td>
<td>-</td>
<td>A</td>
<td>6.3</td>
<td>125</td>
</tr>
<tr>
<td>T2</td>
<td>London plane</td>
<td>17</td>
<td>57.5</td>
<td>Mature</td>
<td>-</td>
<td>A</td>
<td>6.9</td>
<td>150</td>
</tr>
<tr>
<td>T3¹</td>
<td>London plane</td>
<td>18</td>
<td>70</td>
<td>Mature</td>
<td>2m</td>
<td>A</td>
<td>8.4</td>
<td>222</td>
</tr>
<tr>
<td>T4</td>
<td>London plane</td>
<td>16</td>
<td>85</td>
<td>Mature</td>
<td>-</td>
<td>A</td>
<td>10.2</td>
<td>327</td>
</tr>
<tr>
<td>T5</td>
<td>London plane</td>
<td>13</td>
<td>45</td>
<td>Maturing</td>
<td>-</td>
<td>A</td>
<td>5.4</td>
<td>92</td>
</tr>
</tbody>
</table>

Notes:
1. Over extended laterals on V&A museum side for tree T3
2. The RPA extents will affect the proximity of the public highway and therefore rooting should be anticipated to be more preferentially occurring within the public footpath areas and therefore are likely to extent further towards the V&A Museum than the above stated radii. Onsite investigations will be vital in determining accurate rooting extents/depths.

Table 4: Tree data collected by Barrel Tree Consultancy
In the pre-application stage Arup engaged the relevant TfL Tree Officer, including a site visit. The officer agreed that the proposed bridge scheme is feasible, subject to the key points discussed below. These will be addressed as the foundation design is finalised. RBKC’s Tree Officer has also been briefed on the proposals and attended the pre-application meetings on-site and has raised no major concern provided a root survey is conducted and design considered accordingly.

- Trial excavations will be undertaken to understand the size, route and extent of tree roots. The construction is to avoid affecting the tree roots. All site investigations will be undertaken by a specialist contractor and will be attended and overseen by TfL’s Tree Officer, Grayham Tindal. This is due to be conducted at the end of February and the outcome will be shared with RBKC at the earliest available time. A permit is to be sought to undertake the site investigation, which TfL are currently mobilising for and who have advised of contractors who usually undertake the surveys on behalf of TfL.

- Some level of canopy pruning, likely only to be to T3 and possibly T4 may be required for bridge implementation and support and when considering additional tree growth over the warmer months. TfL indicated that they would allow pruning of less than 1m.

- The trees are to be protected during construction, both by boxing out the trunk and agreeing a pruning schedule for the branches before work commences.

It should be noted that Barrell Tree Consultants also reviewed the previously considered scheme of a shorter bridge (circa 40m span) that was originally submitted for pre-application in October 2015, and concluded that the previous shorter option was not viable due to its nearer proximity to trees 3, 4 and 5.

In summary, further site investigation will be undertaken to establish the full extent of the root reach. From this assessment, and on the provision that no significant roots or above ground parts of the trees will be damaged by the construction work, a design option for the deadman anchors will be selected, and subsequently shared with RBKC. A pruning schedule will also be planned if necessary, based on the Barrell Tree Consultancy recommendations and with input from the TfL tree officer.
11 Pre-application engagement and consultation

Prior to finalisation of the application scheme consultation has taken place with a number of stakeholder groups including the V&A Museum, Exhibition Road Association, TfL and local resident associations.

Arup has developed the bridge design and proposed construction methodology with continual input from the V&A Museum in order to ensure that access to the museum is not negatively affected and that their out of hours activities such as late openings and events are not impacted. This has led to the phased construction plan which will see the bridge towers erected sequentially by separating the two sides of the bridge into separate working areas, and where the final walkway span installation will be scheduled for out of hours working.

The design proposal was presented to the V&A to ensure they understood and are satisfied that the bridge will not impact on their building structure. The V&A have expressed their satisfaction with the design development and have provided their full support for the proposed installation as a major especially in its contribution to their engineering season. Refer to Appendix K for the Letter of Support from the V&A.

A first consultation event was held on 11th November 2015 to local residents to introduce them to the proposal and obtain feedback. This was held with representatives from the following resident associations who form the Exhibition Road Cultural Group:

- Thurloe Residents Association
- Onslow Neighbourhood Association
- Brompton Association
- Kensington Society
- Princes Gate Residents Association

The consultees expressed their general support of the bridge and believe the bridge is a good installation which would visually demonstrate the principles of engineering and intellectually connect to the public. Areas for the project to address in the design and delivery of the bridge were raised as follows:

- Setting a precedent – The residents were assured and accepted that the application is in response to the specific Engineering exhibition only. The V&A and resident associations are meeting to design the V&A’s approach for engagement over future exhibitions.
- Noise & vibration – The residents seemed satisfied that the mitigation measures proposed minimised these potential issues. The works will not cause reverberation and the works will be completed within ‘sociable hours’. Refer to section 6.2 for the measures proposed.
- Size and presence of the structure (both during construction and once constructed) – The bridge installation will be a large and significant visual impact. This has been considered in the design development, and the use of
lightweight and permeable materials has been emphasised, as well as the temporary nature of the scheme. The structure will be transparent in terms of lines of sight onto the listed building behind. Visualisations and dimensions of the bridge both when under construction and when constructed were provided to ensure residents were made aware of the full scope of the installation. The residents are favourable to the scheme.

- Impact of structure on the pavement – An assessment of the structure as part of the design development process was undertaken to demonstrate that the structure will not negatively affect the pavement underneath. The TfL Highways Officer has been engaged with and raised no major concerns over the impact on the pavement providing appropriate protective measures are incorporated. This professional opinion was relayed to the resident groups to address concerns.

- Access strategy and management – The residents wanted to understand how the bridge would be secured out of hours and how access would be managed especially during peak periods and out of hours. The bridge is designed with lockable gates either end of the bridge and there is existing CCTV that the V&A will monitor. During the day, there will be a Gallery Assistant fully briefed and present at all times. The V&A has produced an Access and Security Statement, an Emergency Evacuation Procedure and a Visitor Experience Statement (found in Appendix I) to ensure safe operation of the bridge. Section 9 outlines this management strategy in full.

On the 28th January the director of Design, Exhibition and Futureplan for the V&A issued a letter to the resident associations notifying them that Arup would submit a full planning application to RBKC at the beginning of February. The letter also advised that there will be a second consultation meeting held at the V&A (scheduled for 16th February 2016) where Arup will show the developed designs for the installation and answer any further questions. Relevant senior staff from the V&A will also be in attendance at this consultation event.

There will be a further meetings with the V&A to discuss in detail the bridge construction and deconstruction method.

Pre-application advice has also been sought from the Royal Borough of Kensington and Chelsea as the local planning authority, the first on 4th September 2015 and a second on 2nd November 2015 and both held on site. The pre-application responses can be found in Appendix A. The meetings were attended by the Arup design team and the RBKC planning officer, conservation officer, tree officer and transport officer. In response to comments raised, the bridge design has be amended. Amendments have included:

- Moving the bridge installation closer to the V&A to avoid impact on pedestrians and road users;
- An investigation into different foundation options to limit impact to the pavement;
- The duration of the installation to enforce the temporary nature of the bridge;
- The minimum use of advertising and signage;
- Full tree survey to avoid any damage to the existing trees.
12 Other Licences

It is understood that a licence is required to place a temporary structure on the footway in line with the terms of:

- the Highways Act 1980 (sections 169, 172/3/4, 184 and 278);
- the GLC General Powers Act 1970 (section 15);
- the Local Government (Miscellaneous Provisions) Act 1976;

This also relates to building materials or plant (machinery) that cannot be left on the highway without a valid permit.

As such a licence will be required for all temporary structures and materials or plant that are to be stored on the public highway, before work starts. TfL issue these licences, and any renewals, for three months at a time.

TfL are advising whether a permit for off-loading materials will be required.

Applications for the appropriate licences/permits will be made upon the grant of planning permission.
13 Conclusions

The proposed temporary bridge installation will make a positive and lively contribution to the public realm, both visually and for an enhanced visitor experience to the V&A Museum. The bridge compliments the Engineering Season taking place from June to November 2016 at the V&A, and highlights how low tech but effective bridge design and placement can improve access, education, and health as the aims of the B2P project promote. The modern materials and the assembly technique contrasts with the historic façade of the Grade I listed building whilst engendering the *total design* ethos of the subject of the exhibition, Ove Arup.

Consultations were undertaken with relevant officers from RBKC and TfL, as well as the Advisory Committee of the Exhibition Road Cultural Group. Issues raised and recommendations have been addressed and incorporated in the design for a more robust proposal. These include pedestrian movements on and off the bridge, mitigating impacts on the conservation area, safeguarding of trees and the safe, efficient and minimally intrusive construction and operation of the bridge.

It is considered that this temporary bridge installation application complies with national and local planning policy and considerations and should be granted planning permission.
Appendix A

Pre-Application Response from RBKC
Appendix B

Site Photograph
Appendix C

Bridges to Prosperity Day by Day Construction
Appendix D

Tree Survey
Appendix E

Construction Sequence
Appendix F

Deconstruction Sequence
Appendix G

Delivery Plan
Appendix H

Hoardings Zones for Bridge Construction
Appendix I

V&A Access and Security Statement
Appendix J

Construction Materials
Appendix K

V&A Letter of Support
Appendix L

Heritage Statement