

KRP

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Structural & Civil

Caversham Court Gardens

Structural Repair Specification

Eastern Boundary Wall, Below Ground Vaults and Landscaping

Tender Issue – December 2024



For

Reading Borough Council

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Design Surveys Inspections CAD Drawings

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Caversham Court Gardens – Structural Repair Specification – Garden Walls and Pavement Vaults

A. Background & Structure Description

Caversham Court is a public park/garden and was a mansion located on the North bank of the River Thames in Caversham. The park lies within the St Peter's conservation area and is listed as Grade II in the National Register of Parks and Gardens.

Defects have been recorded to the Eastern and Western boundary walls of the park and to a below ground range of brick vaulted arches, adjacent to the eastern wall within the gardens. These defects require remedial works to preserve these structures of historic importance.

At the request of the Client, the works to the western boundary wall will be tendered separately and is therefore excluded from this tender package.

The **East Boundary Wall** is made up of several different sections, each with a different style of construction:

1. Eight bays of flint panels, framed with dressed stone and buttresses, flanking the main gate, which was rebuilt in 2009.
2. An uninterrupted stretch of flint-built wall, featuring four lancet windows with brick surrounds, stone copings, and occasional gablets. On the west side at the southern end, the lower portion of this wall is made up of brick courses.
3. Flint with brick lacing and edgings, stone copings.

On the internal, western side of this wall, a sloping path leads down through the gardens. On the external, eastern side, there are two large lime trees and one newly planted lime tree. The ground directly adjacent to sections 2 and 3 has been asphalted and marked up with blue badge parking bays to the north and forms the private driveway access to The Rectory to the South.

A portion of Section 1 to the south of the main gate and the whole of Section 2 have been identified by KRP as being unstable and will have been propped by the time these remedial works are carried out. The appointed contractor will need to liaise with KRP and the temporary works installer to agree a suitable method for the removal of the props and the safe deconstruction of these portions of wall.



The portion of Section 1 that requires reconstruction is approximately 10m long and approximately 3m high. Wall section 2 is approximately 13m long by approximately 2.5 by 2.8m high.

The **West Garden Wall** is built of brick with buttresses on both sides, a terracotta bullnose stringcourse, stone copings and an iron railing system running the whole length of the top of the wall. On the internal, eastern side there is evidence of the greenhouses which once stood against the wall; checks cut out of the brickwork, and metal eye fixings, some of which still support espaliered fruit trees. The northern section of land to the east is now allotments. The southern section, next to the river, is home to the Reading Canoe Club. On the external, western side, the buttresses house terracotta pipes which are understood to have once part of a greenhouse heating system. There are a number of large trees on this side, and the strip of land directly adjacent to the wall has historically been used for parking.

The wall measures approximately 72m from the gated entrance into the allotments at its northern end to the gated entrance to the canoe club to the South, with buttresses provided at typically 3.2m centres along the length of the wall. The buttresses are more substantial on the side of the Warren, with corresponding, but smaller projections on the allotment side.

The wall typically measures approximately 4m high on the allotment side and retains approximately 1m of soil on the side of the Warren.

Three joined **Brick Masonry Vaults** exist beneath the pavement leading from the gated entrance to the gardens, off of Church Road, down towards the river, below the eastern boundary wall.

When entering the vault via the gated entrance from the garden, the first vault is believed to have been a store, the second vault in to the South was a Boiler Room, which led to a coke passage that passed through the boundary wall to the Rectory next door.

The passage out from the Rectory has been bricked up and we understand the passage itself was backfilled in-behind the bricked up entrance.

The pavement is wide enough for vehicular traffic, although we understand that only pedestrian foot traffic and ride-on mowers have been permitted to pass over the vaults in the recent years.

The arch over vault one appears to be a single brick thick (215mm). There is a 240mm high upstand along the edge of deck over the vaults. By indirect measurement, we estimate that the deck is approximately 315mm thick over the crown of the arches, but the build-up of the deck is currently unknown.

Vault 1 (The Store) shows historic repairs to the intrados of the vaulted arch. There are diagonal cracks extending from the junctions between the springing points of the arch and the front and rear vault walls, in to meet a crack that extends along the intrados of the arch. There are also a number of loose bricks in the vicinity of the damage.

The crack patterns strongly suggests past overloading the arch structure. The damage is such that the load carrying capacity has been affected and the vaults have been propped as a result. The appointed contractor will need to liaise with KRP and the temporary works installer to agree a suitable method for the removal of the props and management of the loading of the pavement over the vault whilst the remedial works are carried out.



Below Ground Pavement Vaults

B. Previous Survey Reports

Two previous survey reports have been carried out in the recent past:

- 1) Clivedon Conservation Workshop Ltd: Caversham Court Gardens – ‘*Condition Survey*’, April 2022.
- 2) KRP Consulting Engineers: KRP CCG Report 0922_Final – ‘*Caversham Court Gardens – Structural Assessment of Garden Walls and Below Ground Vaults*’, October 2022.

The initial report by Clivedon assessed the condition of the walls and reported on the repair needs identified at the time and called for the review of a section of the eastern boundary wall that was leaning. This report is reproduced in full in Appendix 4 for information only and should not be relied upon without the express permission of the author.

The report by KRP assessed the structural stability of the eastern boundary wall. Within the report KRP reviewed and expanded on the repair needs identified by Clivedon.

During the course of the assessment, KRP’s scope was extended to include a structural assessment of a below ground range of brick constructed vaults.

Within the KRP report we advised the Client that temporary works were required to stabilise the below ground vaults and a section of the eastern boundary wall.

The KRP report is reproduced in full in Appendix 3.

In order to capture the construction details and assist with the design of the remedial works, the following **Supplementary Surveys** were carried out by KRP.

A **Measured Survey** to produce drawings of both boundary walls and the pavement vaults, with cross-sections at regular centres (5m or less) through each boundary wall to show verticality and longitudinal/transverse cross-sections through the vaulted arch structures sufficient to capture arch deformation.

The measured survey drawings are available as a series of pdf drawings files which are presented in Appendix 1.

A high resolution **Photogrammetry Survey** of the walls to capture current construction detail and condition that can serve to provide a high quality reference for the rebuild and that has been used to assist in the final design of the remedial works.

The photogrammetry Survey results are available high resolution images (1mm per pixel) which can be accessed via the link below:

<http://epipolar.com/zoom/caversham/>

Further assessment of the foundations and buttress construction was carried out and reported in KRP report KRP CCG Report 22138_Final, dated March 2023. This report is presented in full in Appendix 6.

A further measured survey was carried out to capture the general arrangement of the gardens in the vicinity of the below ground vaults and to provide a longitudinal cross-section through the pavement and the vaults to inform the design of a new cover slab over the top of the arched structure. The survey results are presented on Drawing 22138-A1 in Appendix 1.

C. Overview of Repairs

East Boundary Wall

Sections 1 and 2 of the East boundary wall are to be catalogued and carefully dismantled before being rebuilt utilising as much of the original stone masonry as possible, set in a natural hydraulic lime mortar. The foundations to the demolished wall are to be exposed by trial pitting following demolition of the wall to allow the engineer to assess their adequacy or call for strengthening where necessary. Tree root protection is to be incorporated into the works to protect the rebuilt wall from the adjacent lime trees.

Vaults

The soffit of the vaults require raking out and repointing of the masonry with a naturally hydraulic lime mortar. Any dislodged bricks require resetting so that they follow the profile of the arches. The abutments, piers and original portions of flank wall require raking out and repointing, again in lime mortar, resetting any dislodged bricks. The foundations to the piers and abutments are to be verified by trial pitting to allow the engineer to assess their adequacy or call for strengthening where necessary.

A reinforced concrete cover slab is to be provided over the below ground arches. The slab is to be suspended, spanning between stub walls constructed on the line of the masonry walls that support the arches.

Landscaping

The pavement extending down from the main entrance to the park, over the below ground vaults, to the first aco to the south of the kiosk is to be replaced with a SUDs permeable resin bound gravel system, with cut-off drains provided at each end of the run of paving, with additional drains provided at each end of the impermeable cover slab over the arches. The cut off drains will discharge to soakaways as surveys by others have failed to identify an alternative suitable means of water disposal.

D. General Repair Specifications

All materials shall be used in strict accordance with the manufacturer's data sheets that are current at the time of the works. The Contractor is responsible for obtaining the most recent data sheets at the time of install.

The works will be carried out during daytime working hours.

The Contractor shall have a proven track record in the repair and refurbishment of historic masonry structures.

The Contractor will be required to submit a detailed works programme to the Contract Administrator (CA) prior to the Works commencing.

In carrying out the works, the Contractor shall take all necessary precautions to prevent or reduce any inconvenience to the public in general and shall use every practicable means to prevent or reduce noise and annoyance in the vicinity of the Works.

In carrying out the works the Contractor shall take all necessary precautions to protect the Public by maintaining exclusion zones. Dust and debris arising from the works shall be adequately contained within the works areas.

It is the responsibility of the Contractor to provide all necessary protection of the works against inclement weather where practicable.

D.1 Site Accommodation, storage and Welfare

The Contractor shall visit site identify and agree with the Client any facilities for welfare, storage or accommodation that they are permitted to use and include for any additional provisions and maintenance of office / welfare units, as required to comply with CDM requirements.

The location of any such additional units is to be proposed to the Client by the Contractor within the tender package.

It is envisaged that covered, lockable storage units will be required for the Contractor's equipment and a suitable secured area for storage of materials. The Contractor shall agree with the Client a suitable location for such storage and will be responsible for ensuring the areas are secure and safe.

As a minimum the Contractor shall ensure that a full set of construction drawings, specifications, site instructions and quality records are held on site at all times for review by the Client's representatives. Copies of any delivery notes, shall also be held as shall the results of any site tests. The Contractor shall keep a photographic log of works conducted that shall be made accessible to the Client, CA and Engineers upon request.

D.2 Materials and Applications

The materials for the works, where possible, shall be supplied from a single manufacturer to ensure compatibility and long-term durability. Where possible, materials to be used in these works have been specified in this document. In some instances final selection of materials requires further selection by the specialist, who shall assume design responsibility for the selected materials.

KRP must approve (through the CA) in writing any changes from the materials specified in this document, that are to be used in the construction of these works.

All materials used shall be applied strictly in accordance with the manufacturer's technical information sheets and relevant health and safety guidelines. The Contractor shall obtain directly from the material supplier the most recent material data sheets ahead of works commencing.

The Contractor shall afford the materials suppliers every facility to enable the materials supplier to carry out periodic site checks. This service, however, will not absolve the Contractor of his responsibility to carry out all the works strictly in accordance with the Specification and material data sheets. All materials must be compatible and shall not have any effects on long term durability and bond.

The Contract Administrator will reject any material that fails to meet this Specification and any material that appears to be incompatible with any other material to be used in the Works.

Repair materials shall be delivered in sealed containers or bags, clearly labelled with the following information:

- Type of materials
- Brand name
- Intended use
- Manufacturer's batch number

Materials shall be used in rotation and stored in a clean, dry area protected from extreme temperatures. Proof of purchase and/or use is to be retained for all materials used.

The Contractor shall permit representatives of the manufacturers to inspect work in progress and take samples of their products from site if requested. The representatives of the manufacturers may also carry out any testing or sampling requested by the Contract Administrator and report directly to the Contract Administrator.

D.3 Warranty Certificates

The Contractor will supply the CA with insurance backed warranty upon satisfactory completion of the contract. The form of warranty to be agreed with Client in advance of works commencing.

Materials – The warranty will cover material replacement of the specialist manufacturers' products that are found to be defective in manufacture.

Workmanship – The warranty for workmanship will cover incorrect or faulty workmanship that has not been carried out in accordance with the instructions provided in the specification.

Dispute – In the event of any dispute arising from the warranty necessitating the use of an independent consultant, the costs of the consultant services will be borne by the supplier and/or contractor on a proportional basis to the party adjudged responsible. In any judgement the decision of the CA will be final.

D.4 Site Quality Control

The Contractor will be required to undertake a small number of preliminary site trials of repairs and coatings on this contract, which will be reviewed for approval by the Surveyor / CA.

The contractor shall allow for making up to ten trial patties of mortar, with varying aggregate components and coloured additives in order to best match the appearance of the existing mortar for the approval of the Client.

Further testing shall also be undertaken by the Contractor during the works to the extent defined within the contractors own quality plan to check that the quality of the work is maintained. The records of all site tests shall be submitted to the CA for approval.

The Contractor will be required to prepare and maintain site quality control records during the works in accordance with their Quality Plan. These records shall be submitted to the CA and will be used for measurement and payment purposes.

These records relating to the masonry repairs, surface treatments and coatings shall identify and record the following:

- On site tests and results
- Locations of repairs / coatings / surface treatment in the form of as-built drawings

- Date of preparation / break out
- Date of completed repair / coating / surface treatment
- Records of preparation and application for all subsequent layers of multi-layered systems.
- Invoices for materials used in the works
- Traceability of invoices and materials and their location in the works
- Approval by the CA of the break out / repairs / coatings / surface treatments

The contractor shall submit his Health & Safety file to the CA prior to works commencing on site.

The Health & Safety file shall contain full details of the materials that are proposed together with COSHH Assessments and Method Statements. All method statements shall be signed off and accepted by the Client before works can commence on site.

Any deviation from the specified materials must be agreed and approved by the CA/KRP before use on site.

Non-Conformance:

If a material sample fails to achieve specified criteria or to pass specified tests, inform the CA without delay and submit proposals for rectification

The Contractor shall obtain approval for any rectification before proceeding. The CA may issue instructions for the work to be stopped or delayed until reasons for the failure have been established, possible consequences assessed and appropriate preventative and remedial measures taken.

E. Method of Measurement

The works have been measured generally to the Concrete Repair Association Standard Method of Measurement.

F. Shoring & Strutting

Contractor shall provide and maintain during the execution of the works all shoring, strutting, needling and other supports reasonably required to preserve the stability of the works to the walls and arch structure. The design of any such temporary works will be the responsibility of the Contractor.

During the foundation works to the western wall, prior to excavation, the wall shall be propped at each buttress location on the allotment side to maintain wall stability when the earth is removed and until the foundation strengthening has been fully implemented.

The Contractor will be held responsible for all injuries to persons and for making good or reimbursing the cost of making good all damage to the building owners or to any surrounding property caused by or arising out of any failure on his part to comply with the requirements of the above paragraph.

G. Form of Contract

The form of Contract for the works shall be determined by the Client, but should include a Contractors Design portion, for the elements of the construction that require the input of the specialist contractor, specifically the selection of an appropriate replacement for damaged stone and the final design of the naturally hydraulic lime mortar to match the existing to the satisfaction of the CA.

We suggest that a JCT Intermediate Works Contract with Contractors Design would be appropriate for these works.

The Contractor will be required to carry and maintain a level of professional indemnity insurance appropriate to the scale of the works, with the limit of cover and indemnity agreed in advance with the Client and their legal advisors.

H. 'Allow for ...' Items

Where the term 'Allow for ...' is used in the Schedule of Works, this implies that the Item is included for the purpose of pricing and should not be executed (nor orders placed for materials) until the precise nature and extent of the work has been agreed with the CA and confirmed in writing by him.

I. Works at Completion

The Contractor shall remove all rubbish, plant and surplus materials from the site and leave the whole of the works in a clean condition fit for immediate occupation and use to the satisfaction of the CA.

The Contractor is to allow for making good to damaged areas at the end of the Contract, this includes the replacement of top-soil, turf and gravel damaged by the works.

J. Due consideration of other wildlife

All due consideration should be given to the presence of wildlife whilst working in the gardens.

Should any protected species be found in the course of the works, work on site should stop and this should report immediately to the Client and CA.

K. Due consideration of the listed status of the building

The boundary walls and vaults are curtilage structures of the adjacent Grade II listed gardens and should

therefore be treated as such. Every endeavour is to be taken to carry out all work in a manner that reflects the building's historic and architectural significance.

All works are to be carried out in a conservation minded manner using methods appropriate to a listed building. The approach of 'limited intervention' is to be adopted throughout these works. Where possible all works are to be reversible.

Only materials that are accepted as being appropriate and compatible with Historic masonry structures are to be used in the repair of the walls. Under no circumstances should cement be used in the repair of the structures unless specified within this documents and with agreement from the Client and the local authority planners.

L. Dry & Inclement Weather Conditions

During warm, dry and/or windy weather, new masonry work, pointing and rendering should be kept covered with polythene sheeting and dampened hessian to inhibit the rate of drying out.

During driving rain the finished work should be kept covered with sheeting until set and for a minimum seven days after at the Surveyor's discretion.

No masonry or rendering work to be carried out when the temperature is below +3°C on a falling thermometer or below +1°C on a rising thermometer.

All work is to be protected against damage by frost at night by being covered with insulating material (sacking, boarding, etc.).

No masonry or rendering work to be carried out when temperature is above + 30°C. All work to be fully protected against direct exposure to the sun, hot temperatures and strong winds by hessian which is to be kept free of the wall and kept regularly dampened down.

Any damage caused by dry, windy, inclement or frosty weather to work executed under this Contract up to the time of Practical Completion is to be raked out/carefully removed and made good at the Contractor's expense.

1. Cataloguing of Stonework Prior to Demolition

- 1.1 Prior to demolishing Sections 1 and 2 of the eastern boundary wall, the existing stones shall be carefully catalogued, with each piece of cut stone being uniquely referenced and their position within the structure and their orientation recorded by the Contractor. Detailed photographs of the fully labelled cut stone shall be taken by the Contractor. The system and records capturing the existing construction and the means of labelling and storing of the materials shall be agreed as being sufficiently detailed between the Contractor and the CA prior to the demolition and reconstruction.
- 1.2 The flints in the wall panels should be stored in such a way that the flints forming the wall panels can be re-used in the reconstruction of the same wall panels. It is not considered practicable, nor is it expected, to reuse the flints in the original position and orientation when rebuilding.

2. MATERIALS

2.1 Naturally Hydraulic Lime Mortar

- 2.1.1 The source of hydraulic lime mortar to be approved with the CA prior to purchase/use.
- 2.1.2 The hydraulic lime is to be used in accordance with the manufacturer's technical advice and recommendations.

2.2 Bricks & Terracotta

- 2.2.1 Wherever possible the existing bricks and Terracotta units are to be re-used for the works.
- 2.2.2 For use in repairs and modification of existing, bricks and terracotta units are to be selected by the Contractor to match the existing in size, shape, type, strength, colour and texture to the approval of the Client via the CA.

2.3 Flint

- 2.3.1 Wherever possible existing flints are to be reused in situ. Where flints are missing they should be replaced with flints sourced to match the existing. Where new flints are being used they need to be soaked in clean water before being placed.
- 2.3.2 New flints are to be a mixture of field flints and chalk flints (predominantly chalk flints) to match those within the existing walls.

2.4 Stone

- 2.4.1 The Contractor shall have design responsibility for selecting an appropriate stone, with similar characteristics, physical and chemical to the existing stone for use in the repairs.
- 2.4.2 For the purposes of pricing stone to be:
 - Hartham Park or Park Lane Bath Stone for the repair for the stone elements

2.5 Biocide

- 2.5.1 To be Wykamol Microtech Biocide (www.wykamol.com).
- 2.5.2 Biocides are only to be used where they are specifically approved by English Nature and instructions have been specifically confirmed by the Surveyor/CA.

3. REPAIRS

3.1 Workmanship

- 3.1.1 The whole of the works is to be executed in the best and most workmanlike manner and with materials of the best description in accordance with the directions and to the satisfaction of the Surveyor/CA.
- 3.1.2 The appropriate sections of work are to be inspected and measured from time to time before being covered up and the Contractor is to give due notice and is to afford every facility to the Surveyor for inspecting and checking the work.

3.2 Removal of biological growth

- 3.2.1 Carefully remove biological growth with wooden spatulas, metal scrapers and stiff bristle brushes where this will not cause damage. If the substrate is friable or likely to be damaged remove as much by hand as possible. Apply biocide solutions such as Microtech Biocide in accordance with the manufacturer's instructions and the relevant COSHH assessment and other health and safety requirements.
- 3.2.2 Following application clean down after 5 days with natural bristle brushes and re-apply biocide to minimise further re-growth.

3.3 Formwork

- 3.3.1 The niche arches to the flint panels and the lancet windows shall have replica arched formwork created, for each wall panel and each lancet by templating the existing profiles of the arches before the walls are taken down. The uniquely referenced arch formers shall then be used to form the replacement arches when the walls are rebuilt.

3.4 Lime Mortars

- 3.4.1 Hydraulic lime mortar to be mixed in accordance with manufacturer's instructions
- 3.4.2 For pricing purposes allow for:
- 1 x part by volume hydraulic lime NHL3.5
 - 2 parts sand

3.5 Pointing and rebuilding

Preparation for repointing

3.5.1 The extent that the existing mortar is to be removed is to be agreed with the CA before proceeding with the work. Preparation to be carried out as follows:

- Always work from the top of the walls downward.
- Carefully remove any hard/cement pointing with sharp chisels.
- All tools used to remove existing pointing/mortar are to be narrower than the joints.
- Great care is to be taken not to damage the corners and arrises of the brickwork.
- No mechanical cutting appliances are to be used.
- Where hard/cement pointing cannot be removed without damaging the masonry it should be left in place.
- Rake out the joints with a blunt screwdriver, or similar instrument, to at least twice the width of the joint.
- For flintwork rake out to 40mm from the face.
- Brush out all loose debris and dust from the raked out joints.
- Wash out the joints and wet the wall down to reduce the level of initial suction of moisture.
- The masonry to be thoroughly dampened down before re-pointing allowing a period of free water to dry out.
- Repeat dampening down on unpointed areas as the work proceeds as necessary to ensure masonry is damp when re-pointed.

Re-pointing

3.5.2 Point up raked out joints as follows:

- Press the mortar well into the joints filling all voids.
- Keep the mortar away from the surface of the brickwork at all times.
- Pack the joints with mortar.
- Remove excess mortar.
- Use a brush to compact the joint once the mortar starts to set. Leave the mortar slightly

recessed from the edge of the brickwork, exposing sand particles to provide a textured finish.

3.6 Brickwork

3.6.1 Bricks are to be used to create the quoins, piers, base, and backing of the eastern boundary wall and they form the majority of the western boundary wall

- Bricks are to be laid ensuring there is a suitable bond across the wall.
- Take care to ensure that all brick courses line through along the length of the wall.
- Bricks should be dampened down before laying.
- Bed and perp joints should be no greater than 13mm.
- Brickwork is to be kept well protected throughout the works to prevent damage.
- Brickwork should be built to a maximum rise of 1000mm (in typical conditions) before being left to achieve a firm set.
- All brickwork is to be finished/pointed as set out in section 3.5 above.
- Care should be taken not to smear mortar over the bricks during the construction and pointing process.

3.7 Flintwork (East Wall) Flintwork Rebuild

Refer to the SPAB Technical Pamphlet 16 "Care and Repair of Flint Walls" for further information.

Demolition

3.7.1 Sections 1 and 2 of the eastern boundary wall have been identified by KRP as being unstable and will have been propped by the time these remedial works are carried out. The appointed contractor will need to liaise with KRP and the temporary works installer to agree a suitable method for the removal of the props and the safe deconstruction of these portions of wall, after cataloguing in accordance with section 1 of this specification. The contractor shall make due allowance for the dismantling and disposal of the propping system.

3.7.2 The Contractor shall maintain access to the rectory during the demolition works and shall agree with the Rectory any required temporary restrictions to the access to facilitate the works.

3.7.3 The Contractor shall allow for the inspection of the foundations by KRP having demolished the wall sections. Three trial pits measuring 600mm long x 600mm wide shall be excavated at locations to be agreed with the Engineer to allow inspection. Some localised remedial works might be required following the inspection. A provisional sum item is included for this in the Bill of Quantity. The Contractor shall include a two week duration in their program to allow for inspection, design and implementation of remedial works to the sections of wall requiring rebuilding.

3.7.4 Building Flint work

- The existing flints shall be salvaged and re-used.
- Flints are to be roughly knapped before laying but do not need to squared.
- Flints are to be laid in a random formation, to match the flint work of the original wall panel, shown on the photogrammetry survey (see Section B). A sample panel is to be constructed for approval before works commence.
- When bedding flint in mortar no two stones should touch, but they should be set as close together as possible to avoid excess areas of mortar.
- Long bonding flints should be built in at regular intervals
- Any voids should be filled with brick and tile rubble. Care should be taken to ensure that every crevice is filled, particularly in the toothing of piers.
- Flint work should built to a maximum rise of 600mm (in typical conditions) before being left to achieve a firm set.
- All flint work is to be finished/pointed as set out in section 3.5 above.
- Care should be taken not to smear mortar over the flints during the construction and pointing process.
- Adequate protection should be provided to all new and repaired brick and flint work.

3.8 Stonework

3.8.1 General:

- Obtain stone to match existing, which must be free from defects that will affect its workability and free from defects visible in completed work.
- The stone is to be thoroughly seasoned at the time of delivery.

- Cutting, dressing, laying and jointing of stone to be carried out by skilled masons.
- All stainless steel fixings, dowels, pins and cramps are to be Grade 316 Austenitic.

3.8.2 Cutting out complete stones for replacement:

- Rake out joints using a fine-toothed mason's saw and hooked knife blade.
- Lever stones from position without damage to surrounding work.
- Remove all loose bedding and backing material, fixing dowels and cramps from voids and wash out with clean water.
- Use timber blocks to prop adjacent work where necessary.

3.8.3 Cutting out for piecing in or mortar repairs:

- Cut out area of decay or spalling back to sound stone using small sharp chisels or sharp saw blades to an approximate depth of 75 mm.
- Cuts are to be raked backwards to form dovetail joints, or if fixing with pins or dowels cut square.
- Cut outs are to be neat with dead flat surfaces to receive new stone, or keyed to receive mortar repairs.
- Remove all loose material from cut out using a bristle brush and wash out with clean water.

3.8.4 Preparation of stone for replacement and piecing-in:

- Cut stones to full dimensions for bonding with face work and backing.
- Take all necessary measurements and moulds for new stones direct from existing stones to be repaired/replaced or, if stones are missing, from adjacent work.
- Work the exposed and joint face of each stone to a square and true plane surface free from hollow rough areas.
- Prepare stones so that the natural bed is vertical and at right angles to wall face in cornices and other projecting stones, parallel to the radial centre line of each stone, and at right angles to the wall face, in arches.
- Finish new stones on all exposed faces to achieve a plain worked finish to match the original finish of existing stonework.

- Drill holes for dowels or pins to equal depth in adjacent stones.
- Cut dovetail channels in adjacent stones for cramps.

3.8.5 Piecing-in new stone:

- Work the new stone to provide a tight fit into the cavity and dress to a profile matching the surrounding work. New joints are to be of the minimum width necessary to place the repair. Cut 'V' shaped sinkings on joint faces to help the stone grip the backing bed.
- Protect adjacent work to prevent mortar staining.
- As necessary drill holes to receive stainless steel pins or dowels of a suitable size for the repair.
- Remove dust from holes and inject resin or mortar in such a way that air will not be trapped. Pins should be cut to length before injecting resin.

3.8.6 Pinning/stitching fractures & cracks in stonework:

- Agree size and number of pins before commencing work.
- Drill holes one side of crack through the stone diagonally to receive suitably sized stainless steel threaded rod. Holes are to be oversize in diameter, e.g. 12 mm for 10 mm rod.
- Remove all dust from the holes by blowing and/or flushing out with clean water.
- Cut rod to length, the head of the rod is to be set back into the hole by 20 mm.
- Inject NHL 3.5 hydraulic lime grout into the hole ensuring that no air is trapped at the end of the hole, fill the hole from the deepest point back to the surface.
- Insert the treaded rod by gently pushing and screw twisting it so that surplus grout is driven out of the hole. Collect and remove all surplus grout immediately.
- Once the grout has semi set remove surplus grout from the head of the hole.
- Once the grout is fully set point in the top 20 mm with matching mortar.
- All stainless steel is to be Grade 316 Austenitic.

3.8.7 Laying and bonding new and reinstated stones:

- Lay and bond new and reinstated stones in the exact position previously occupied.

- Provide stainless steel dowels, pins and cramps as necessary.
- Ensure that bond, joint size and any other special feature are replicated to match existing.
- Flush out voids with clean water.
- Dampen stone for reinstatement/replacement. Spread a mortar bed on the stone and tamp into place using the mortar bedding as a lubricant.
- Pack mortar around the stone when set in position using a suitably sized pointing iron. Push mortar home firmly.
- Set joint slightly back from stone face, or to match existing.
- Where arrises are eroded set joint back to round edge avoiding the creation of ledges that may trap water.
- Match existing surrounding work by stippling with a wet bristle brush following the initial set of the mortar.
- Wash surrounding work with clean water to prevent staining.

3.8.8 General clean:

- Carefully remove dirt and loose surface accumulations from the face of the stonework with stiff bristle brushes.
- Review the condition of the stonework upon completion of the general clean and the extent and nature of further cleaning and repair with the CA.

3.8.9 Protection

- The work shall be protected from direct sun and rain until the face has dried and hardened.
- Protect all new work against frost, any joints damaged due to frost action should be cut out and re-done. Working in ambient temperatures below 5°C should only occur after the agreement of appropriate frost protection measures with the Contract Administrator. Where there is the risk of freezing the structure should be protected with hessian and sufficiently covered with bubble wrap or insulating material. Additional heating for the structure may also be necessary.
- During dry weather all new pointing shall be kept moist (but not wet) to ensure that the

set takes place slowly. In hot weather hang damp hessian over the masonry. Avoid working in direct sunlight.

- Turn back scaffold boards adjacent to masonry faces at night or during heavy rain.
- Any mortar or stains caused by the works on the face of the masonry must be completely removed, to the satisfaction of the Contract Administrator, before the mortar hardens.

3.9 East Wall Section 3 Specifics – Western Elevation (Interior Side)

- -Replace defective bricks with like-for-like replacements – allow for 50 bricks
- - Isolated areas of repointing to brick and flintwork – allow for 10m² total area of wall to be repointed.
- - Allow for 45no. flints to be re-bedded.
- - Insert drip edge into 4no. copings.
- - Consolidate spalling stone on gablets with shelter-coat

~~**3.10 Western Wall Specifics – South Elevation (Interior Side)**~~

~~**3.11 Western Wall Specifics – North Elevation (Exterior Side)**~~

3.12 Below Ground Pavement Vaults

- 3.12.1 The below ground vaults shall be cleaned with antifungal solution, raking out and repointing to stabilise the masonry, in particular the abutments and piers which will be carrying load from a new slab over. The flank wall requires deep raking out and repointing.
- 3.12.2 The top 3 courses of the parapet over the entrance to vault shall be taken down and rebuilt on original alignment.
- 3.12.3 Three trial pits shall be excavated to allow engineers inspection of the foundations of the abutments (both sides) and the piers between Vaults 1 and 2. The contractor shall allow for excavating three pits, each 600mm square on plan x 1m deep, but shall take care not to undermine the foundation.

3.13 New Suspended Slab Constructed Over Below Ground Vaults

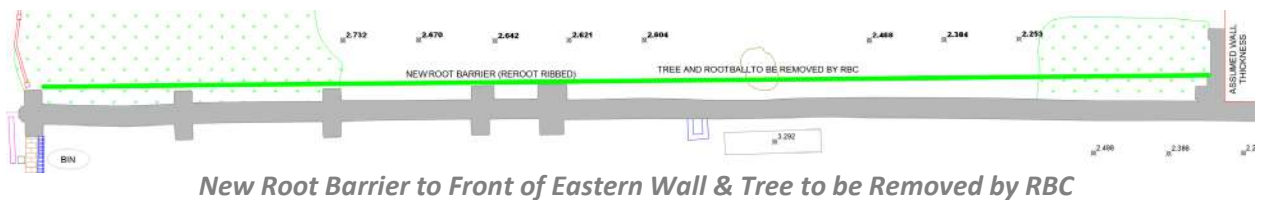
- 3.13.1 A new structural slab is to be constructed to carry pedestrian and occasional small maintenance vehicles, such as mowers, over the arches, whilst not directly loading the span of the arches.
- 3.13.2 The contractor shall allow for constructing the replacement slab to the details shown on Drawings 22-138 –S1 and S2.

3.14 Paving and Landscaping Over Below Ground Vaults

- 3.14.1 The paving over the below ground vaults is to be replaced with a resin bound gravel. This will extend from the cut off drain at the top of the path down to the cut off drain to the south of the Kiosk. Away from the newly installed concrete slab the paving will be a SUDs system and will discharge straight to ground through the porous gravel, the open textured macadams and MOT subbase below, with no additional drainage required. The concrete slab is impermeable and hence cut off drains are required on either side of the new slab.
- 3.14.2 The paving levels are to be reconstructed to match the existing levels. A minor increase in level (25mm) in a small zone is required to facilitate the construction of the new slab. This zone is identified on the drawing identified below.
- 3.14.3 The contractor shall allow for constructing the landscaping to the details shown on Drawing 22138 –L1.
- 3.14.4 The new ACO MD150 drains specified on Drawing 22138-L1 shall be installed following the manufacturers guidance and the detail shown on Drawing 22138—S1.
- 3.14.5 Five new soakaways are to be constructed to the details on Drawing 22138-L1.
- 3.14.6 Excavate trenches and install 160mm diameter EN 1401 drainage pipe laid to min 1:80 falls, with connections made to soakaway crate system with PSMFA Flange adapter and to existing/newly installed ACO drains. Drainage pipes shall be encased in concrete with minimum thickness of 100mm. Flexcell soft joints shall be provided within the concrete encasement at each pipe joint. Trenches to be backfilled compacted and turfed on completion.

3.15 Tree Works

- 3.15.1 The large lime tree on the exterior side of the eastern wall is to be felled and the root-ball removed by Reading Borough Council. There is a newly planted lime tree towards the gated entrance to the gardens and a new tree is to be planted on the land of the Diocese to replace the felled lime. To protect the wall against disruption from the tree roots, the Contractor shall excavate a narrow trench tight to the wall on the exterior side to permit the installation of a 750mm deep Green Blue Urban ReRoot Ribbed root barrier along the full length of Sections 1 and 2, before trimming the barrier to sit just below ground level, backfilling and compacting the excavation with the removed soil and disposing of any excess soil on completion



Compiled by:

Chris Olton BEng CEng MICE

Reviewed by:

Kenneth R Paul CEng MStructE

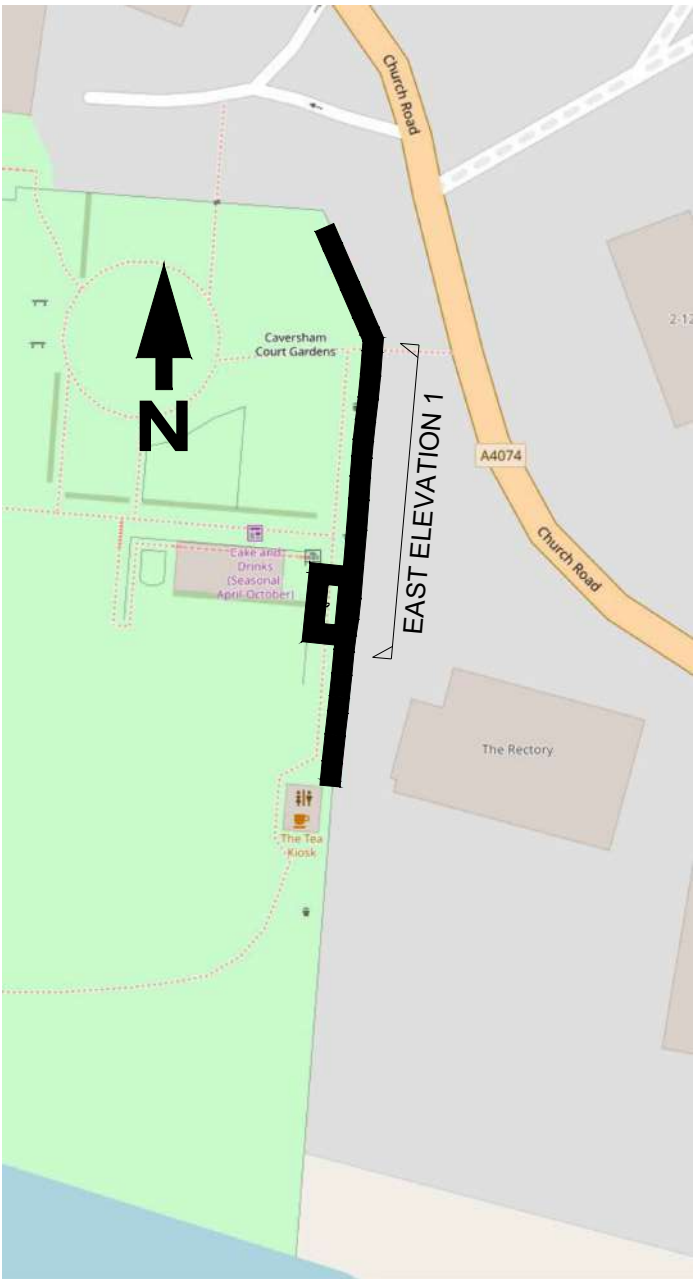
KRP CONSULTING ENGINEERS LTD



APPENDIX 1
DRAWINGS

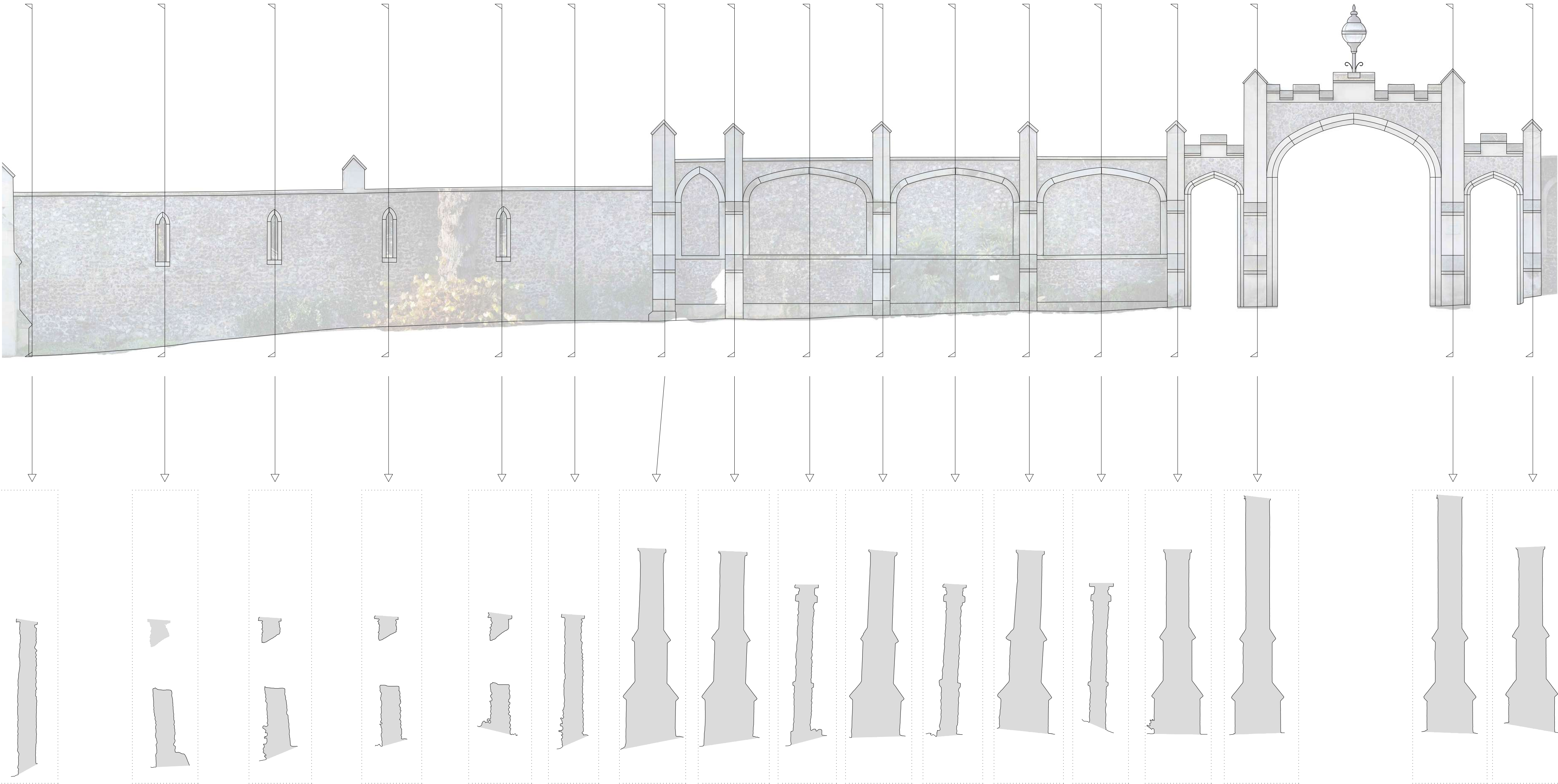
1A. EAST WALL - EAST ELEVATION 1 - ORTHOPHOTO

SCALE 1:50



1B. EAST WALL - EAST ELEVATION 1

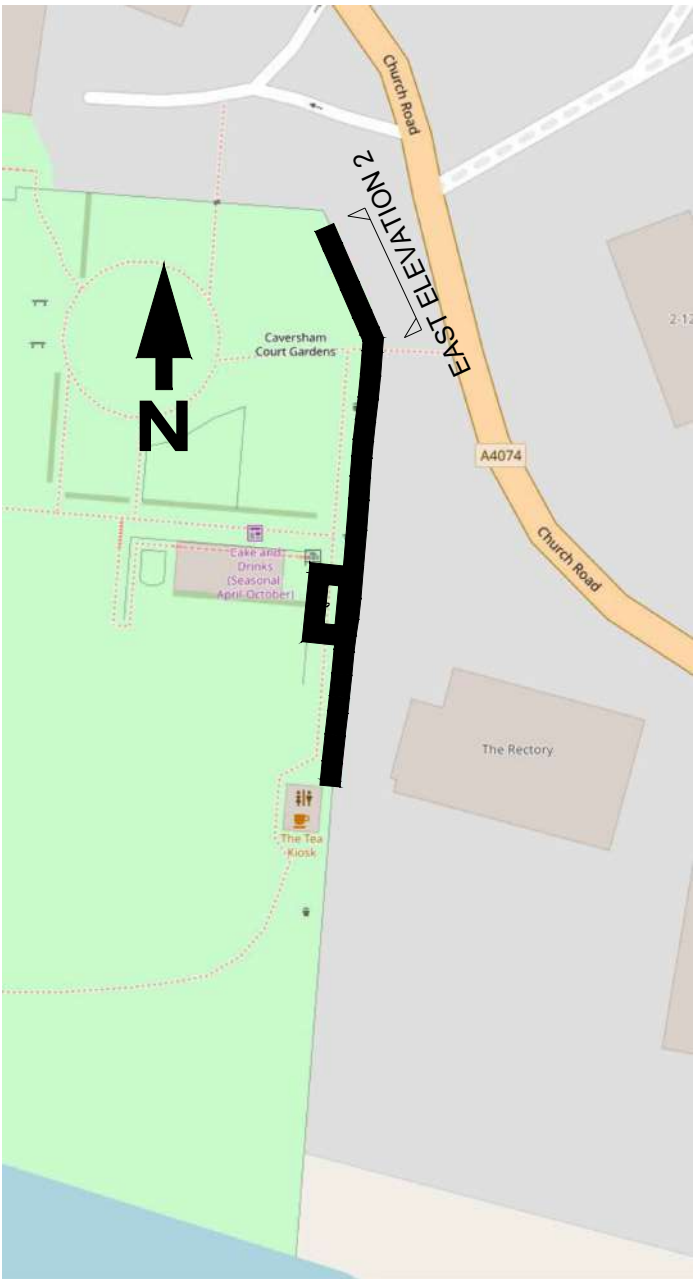
SCALE 1:50



Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	EASTERN WALL - EAST ELEVATION 1	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Drg No.	22138-E1	Rev.

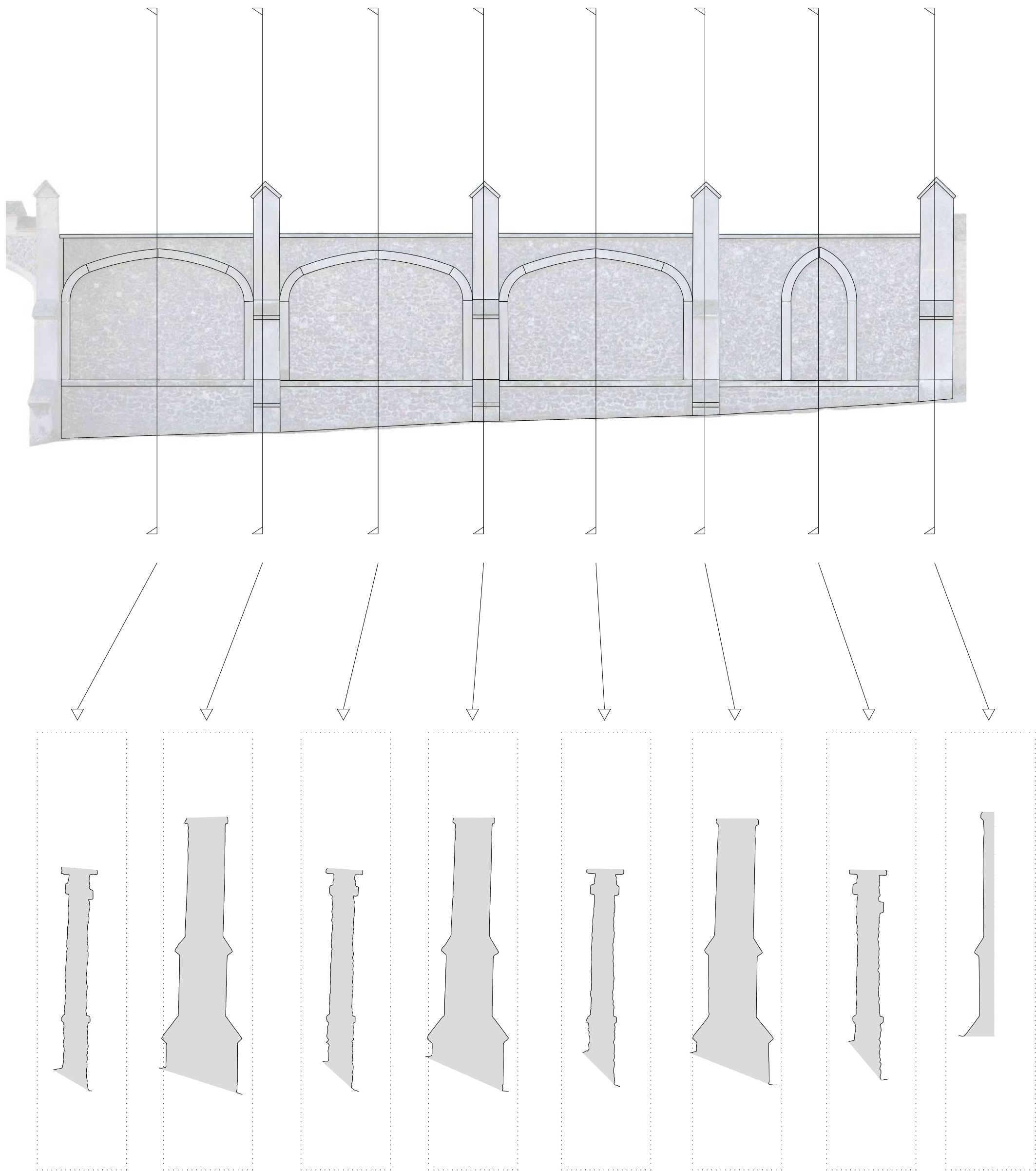
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SCALE 1:50



2B. EAST WALL - EAST ELEVATION 2

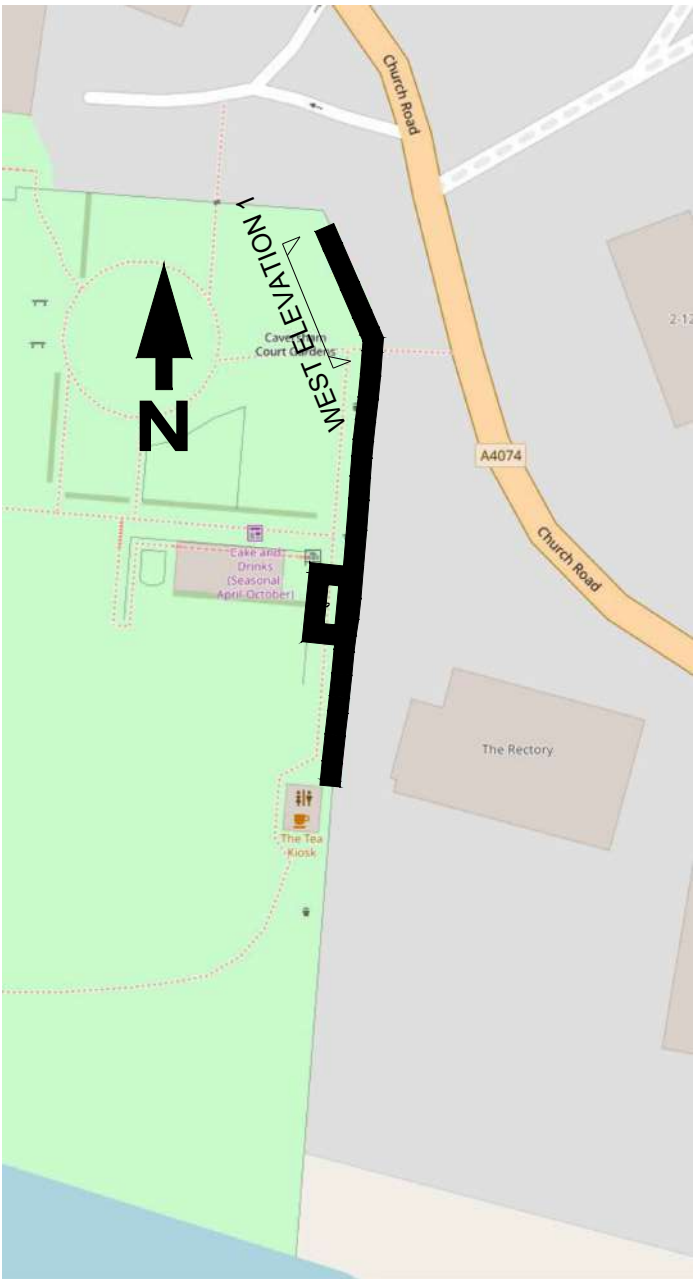
SCALE 1:50



Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	EASTERN WALL - EAST ELEVATION 2	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Drg No.	22138-E2	Rev.

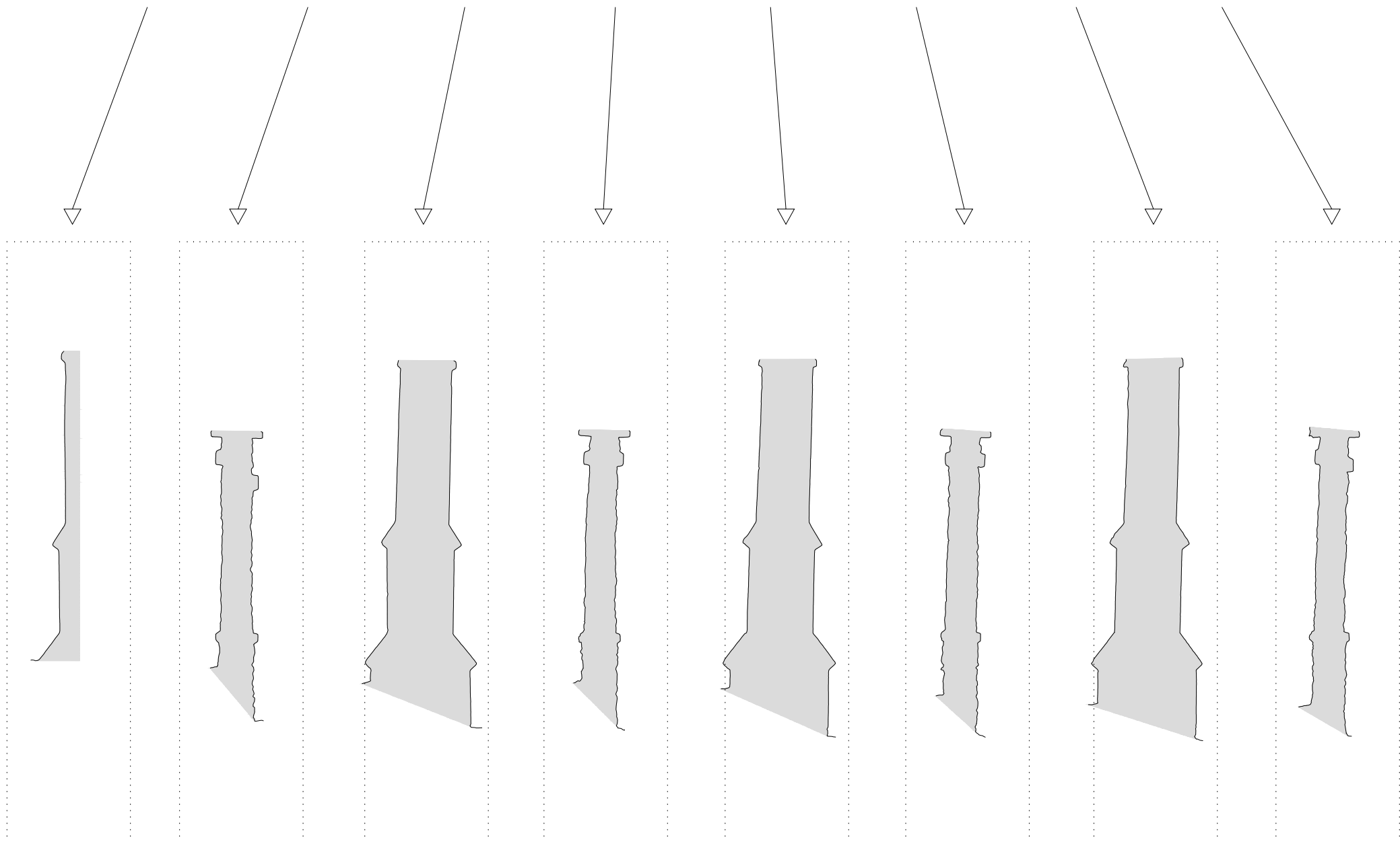
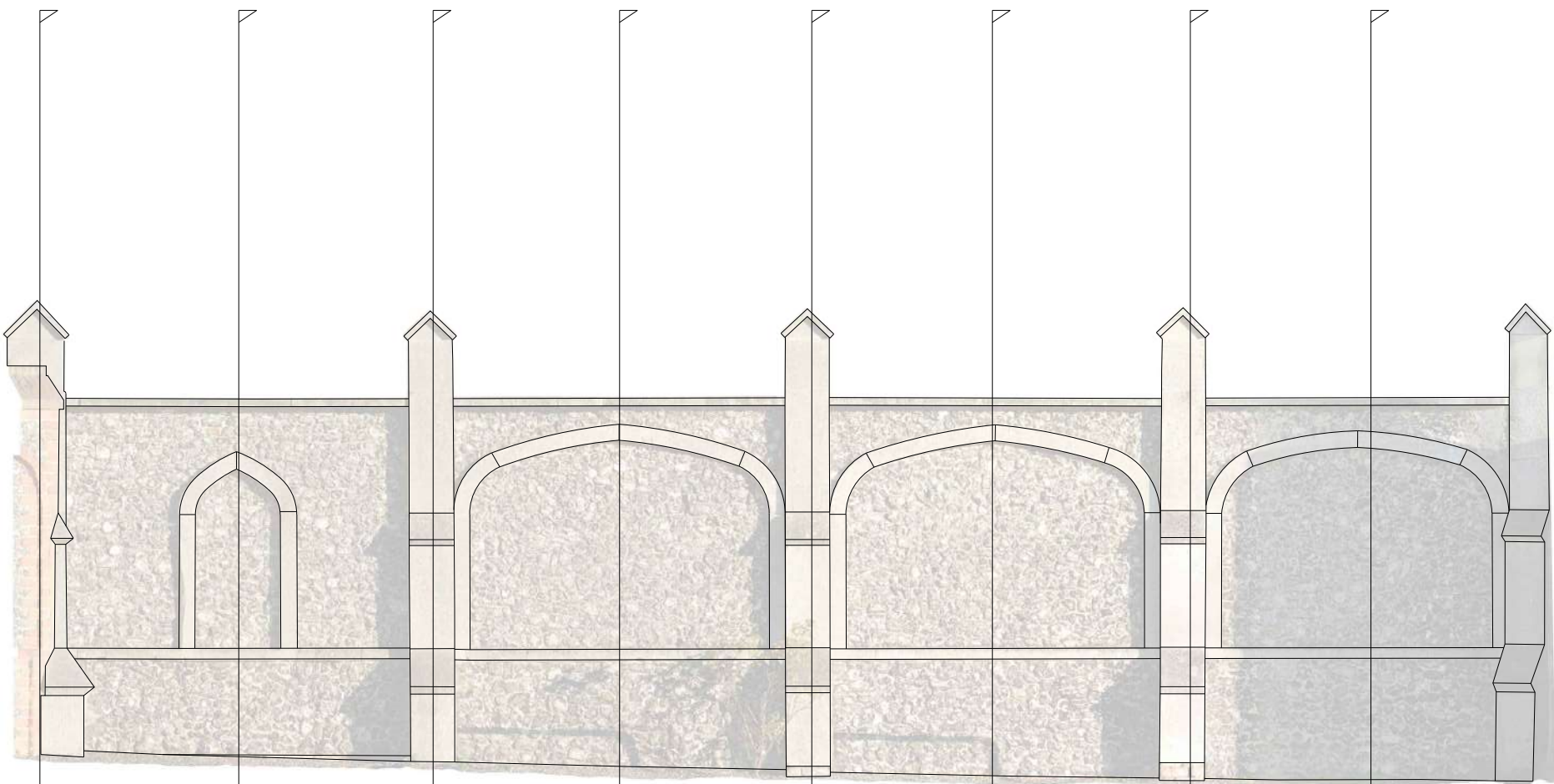
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SCALE 1:50



3B. EAST WALL - WEST ELEVATION 1

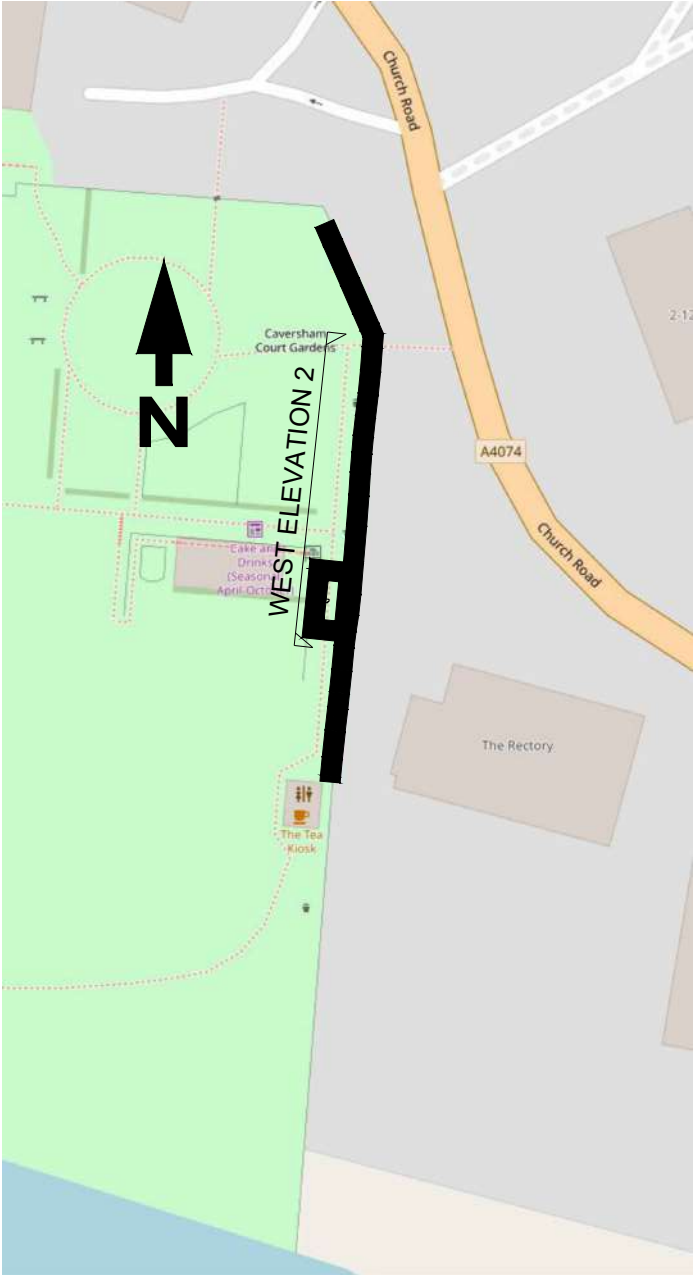
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Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	EASTERN WALL - WEST ELEVATION 1	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Dwg No.	22138-E3	Rev.

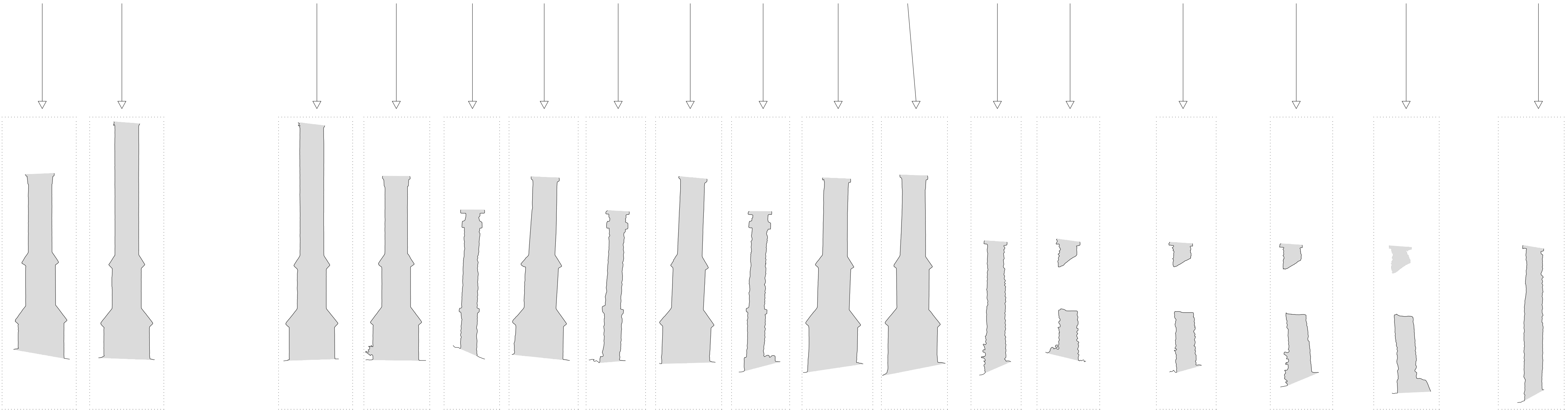
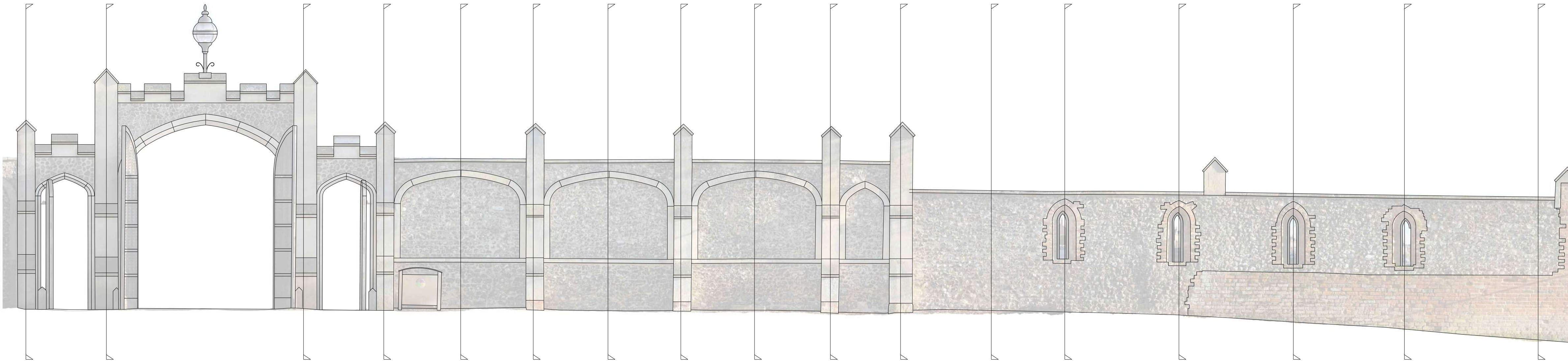
4A. EAST WALL - WEST ELEVATION 2 - ORTHOPHOTO

SCALE 1:50



4B. EAST WALL - WEST ELEVATION 2

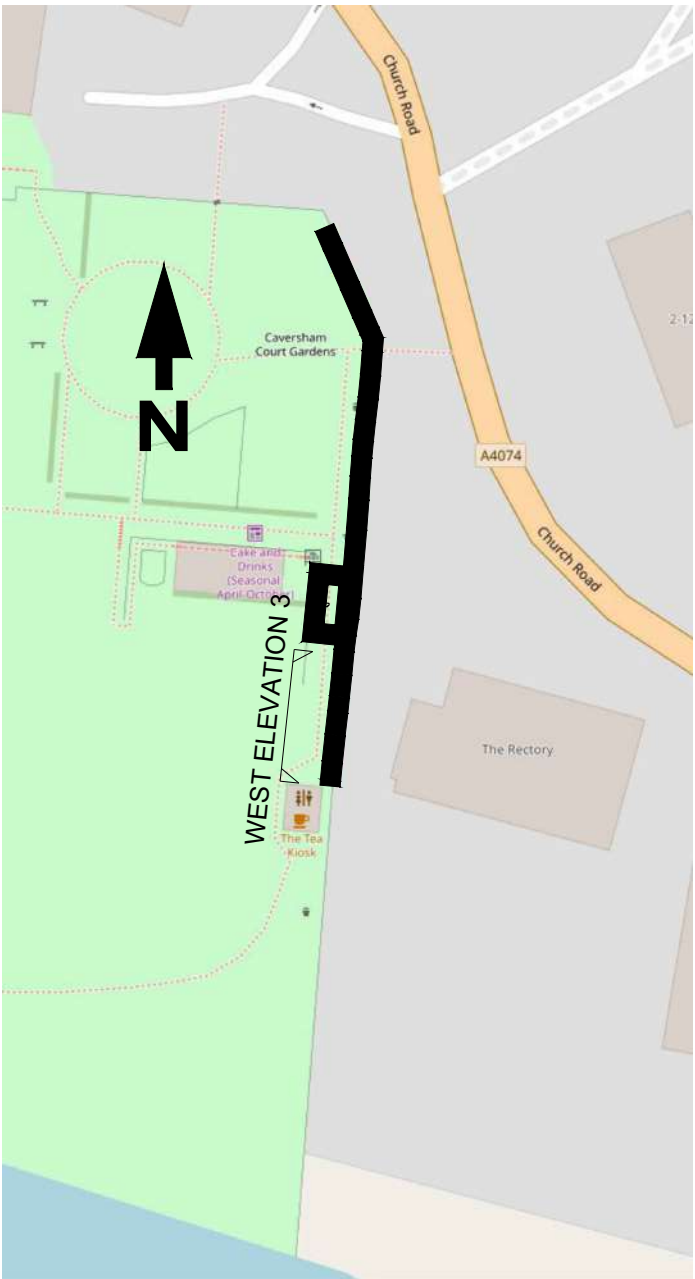
SCALE 1:50



Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	EASTERN WALL - WEST ELEVATION 2	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Drg No.	22138-E4	Rev.

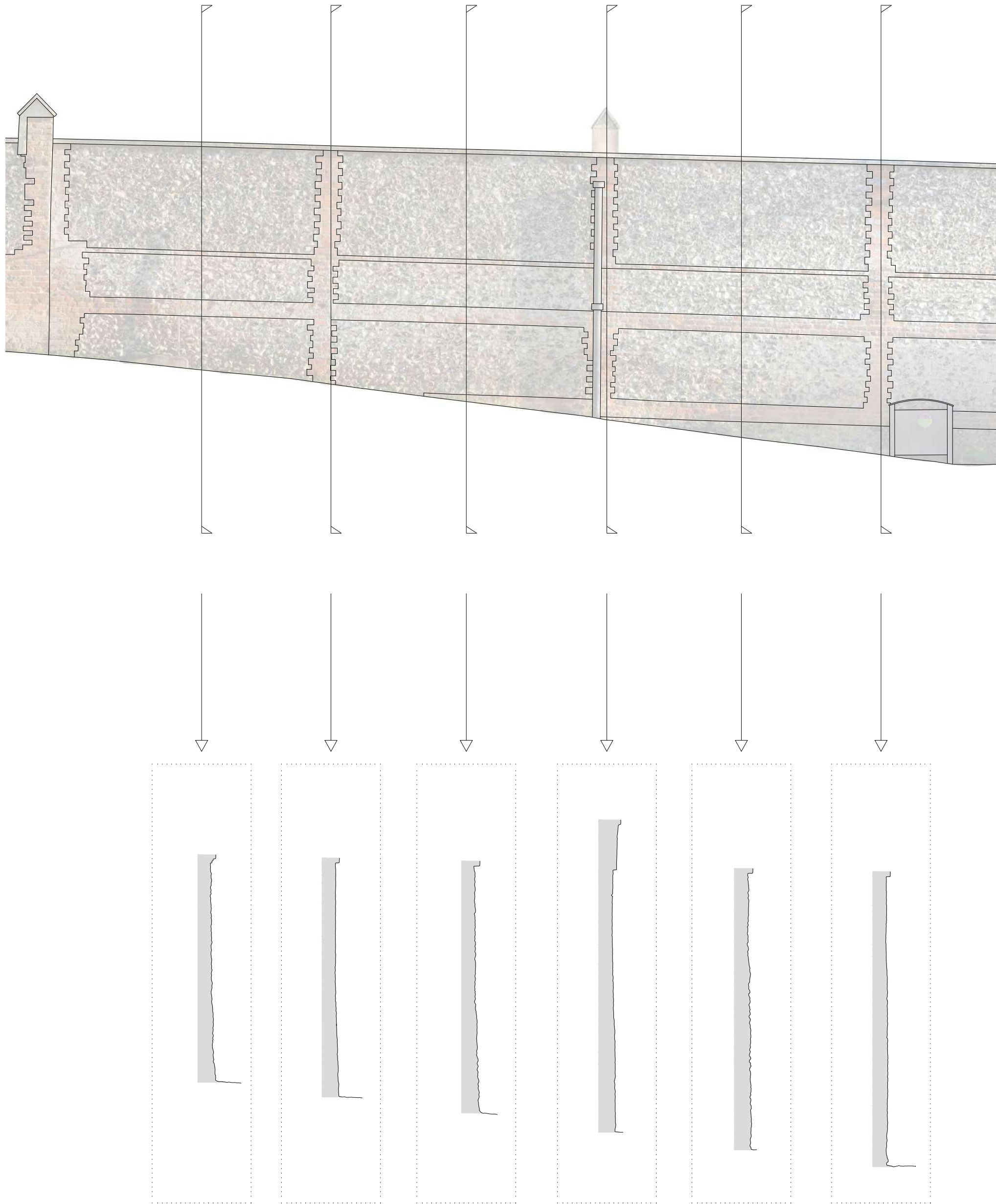
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SCALE 1:50



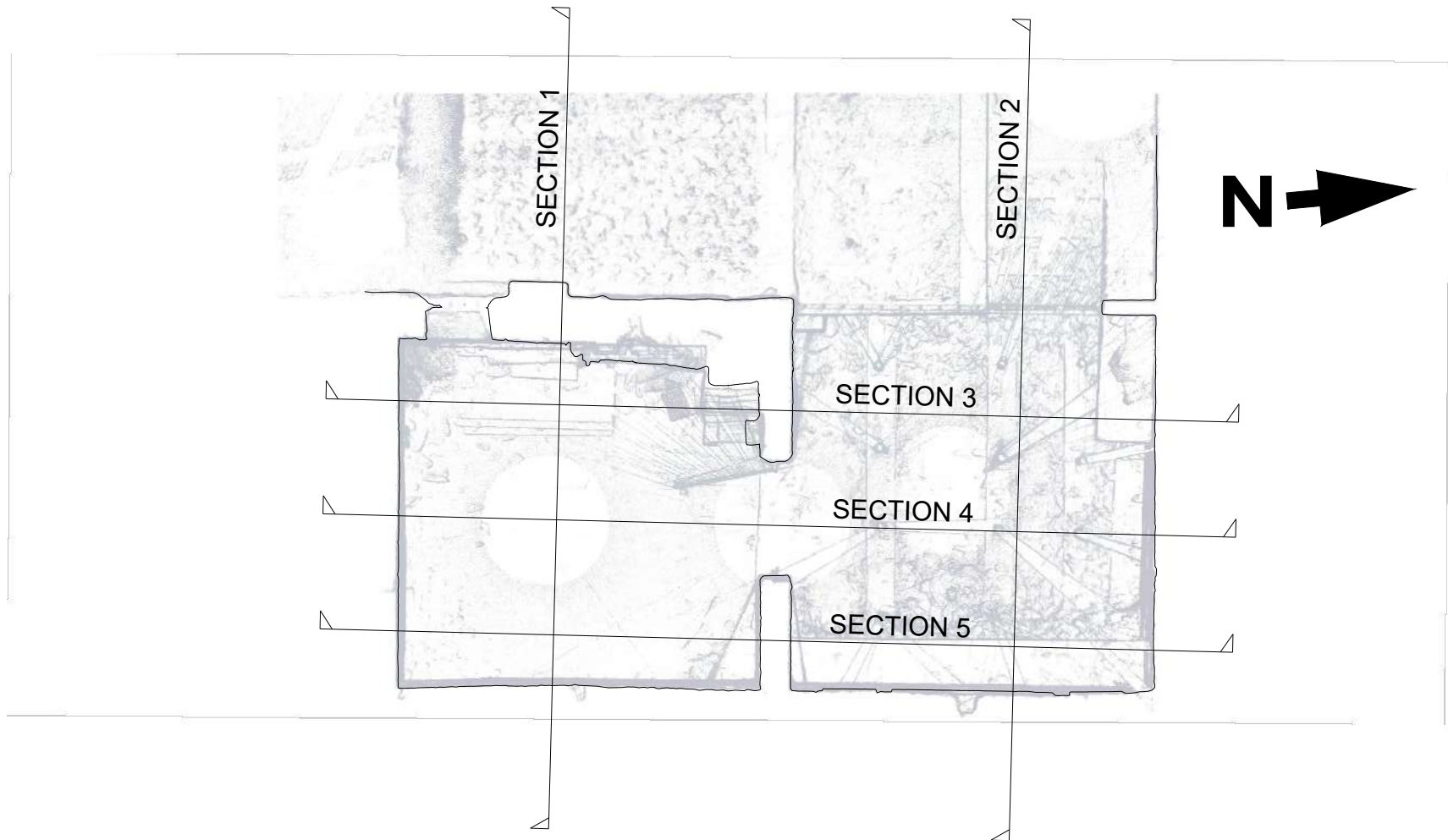
5B. EAST WALL - WEST ELEVATION 3

SCALE 1:50

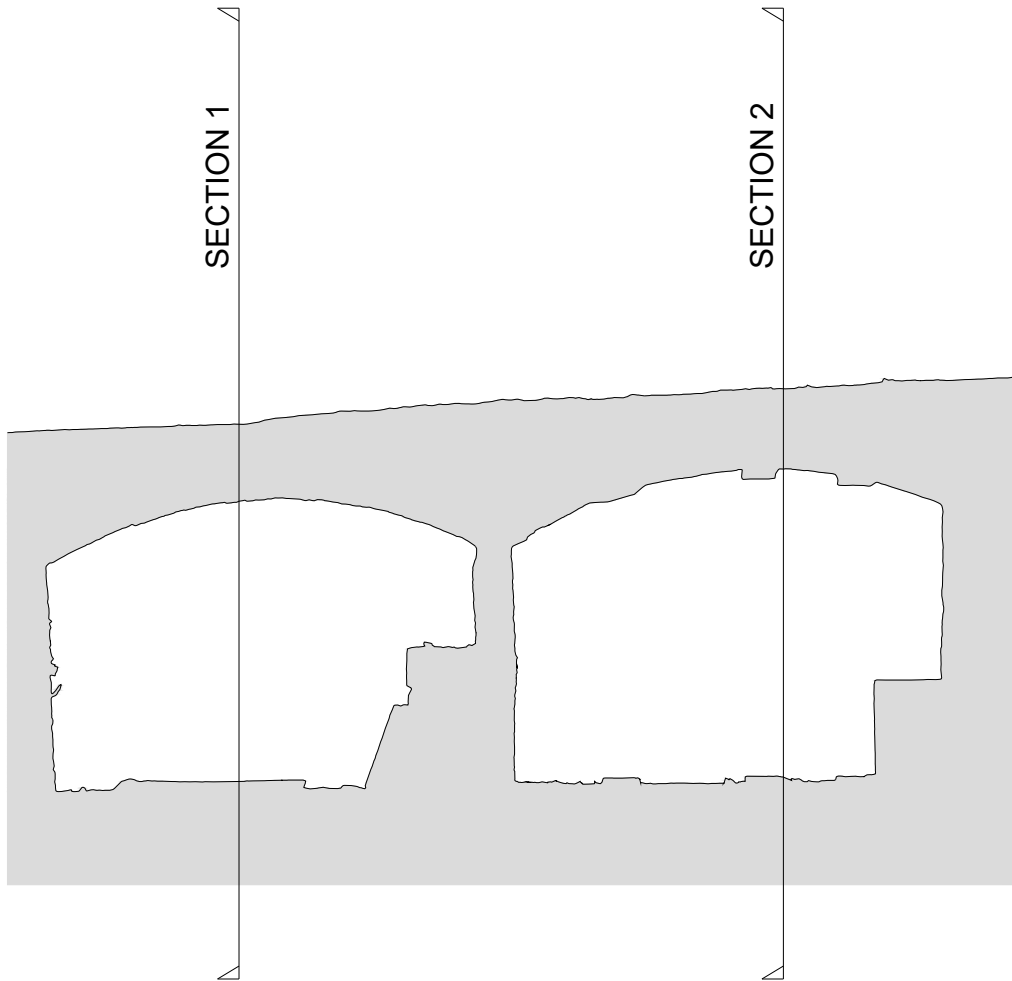


Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	EASTERN WALL - WEST ELEVATION 3	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Org No.	22138-E5	Rev.

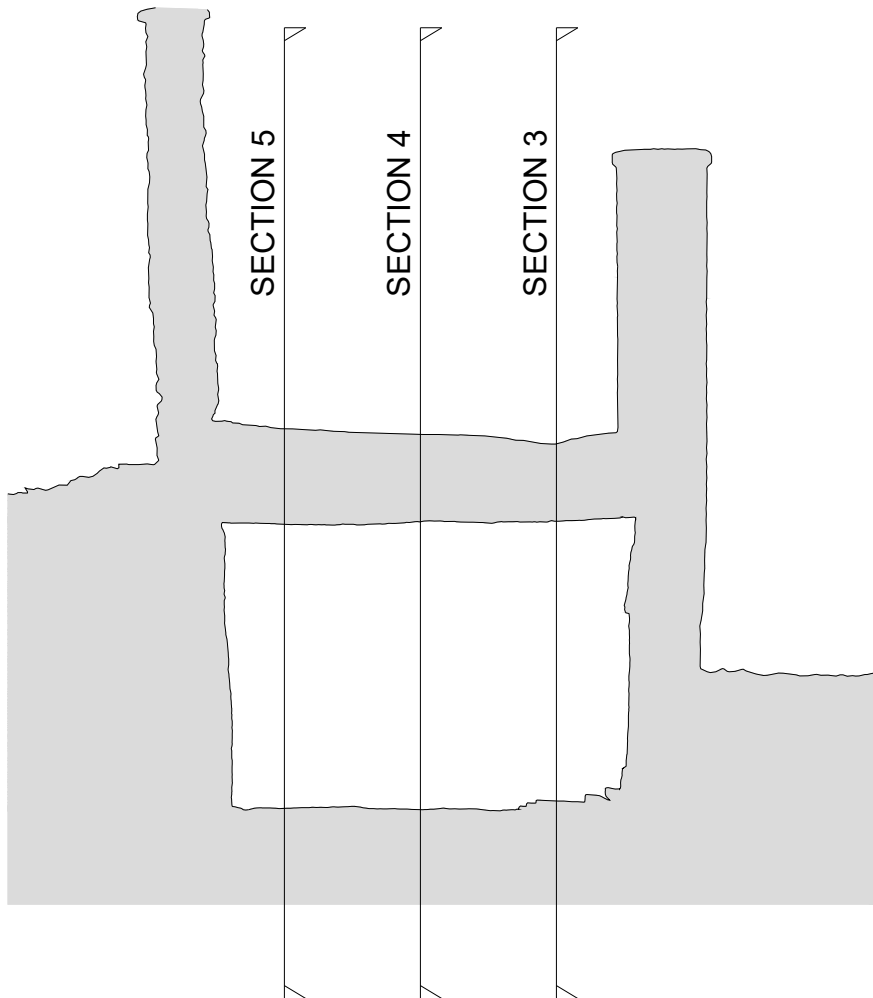
6A. EAST WALL - VAULT - PLAN
SCALE 1:50



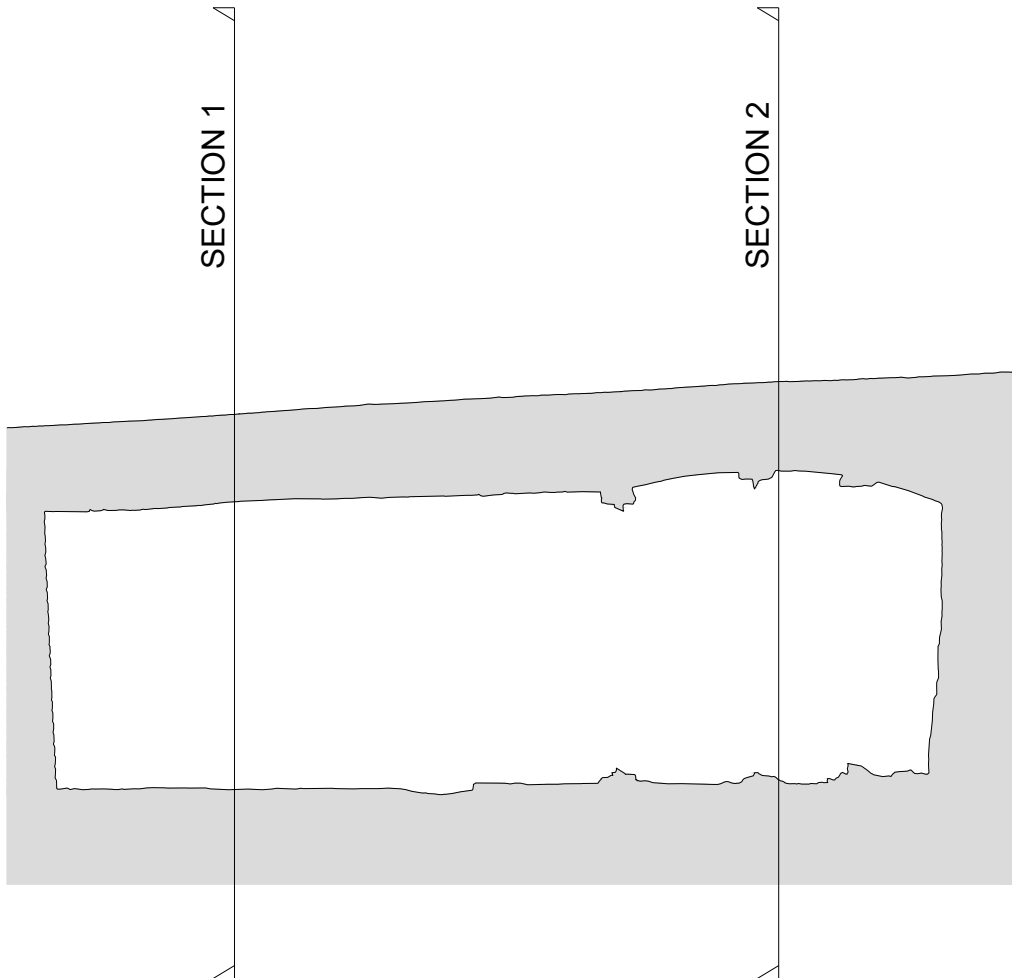
6D. EAST WALL - VAULT - SECTION 3
SCALE 1:50



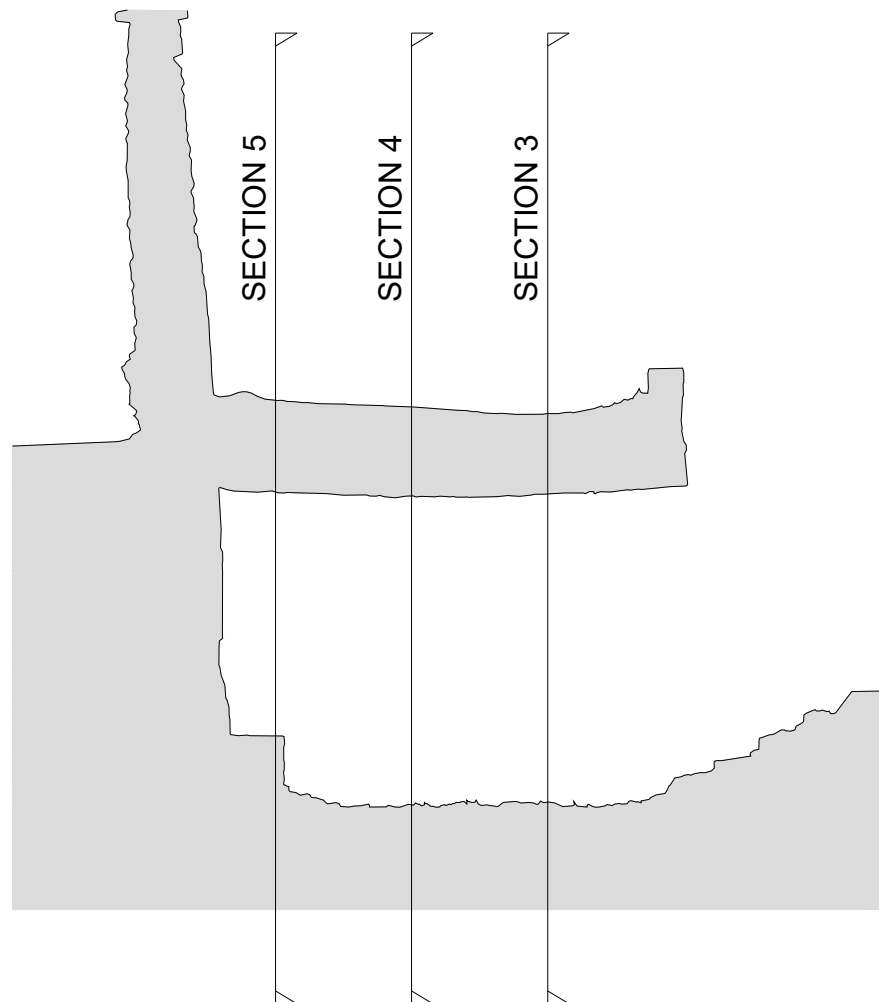
6B. EAST WALL - VAULT - SECTION 1
SCALE 1:50



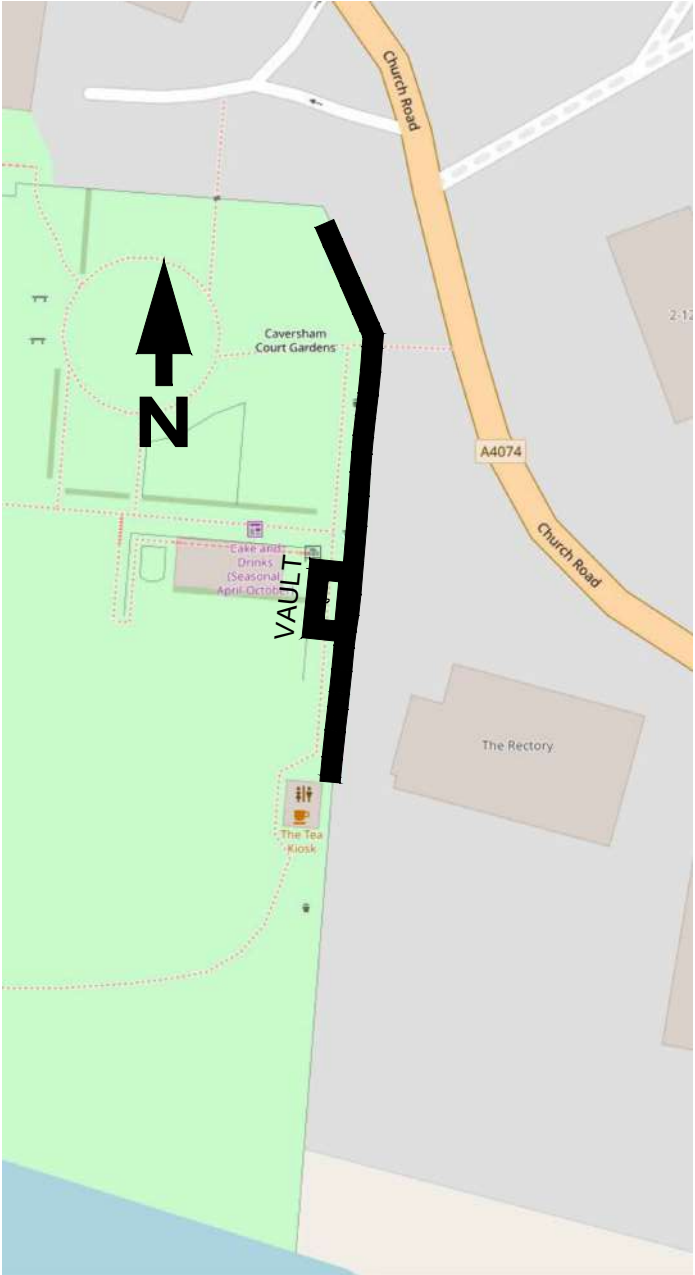
6E. EAST WALL - VAULT - SECTION 4
SCALE 1:50



6C. EAST WALL - VAULT - SECTION 2
SCALE 1:50



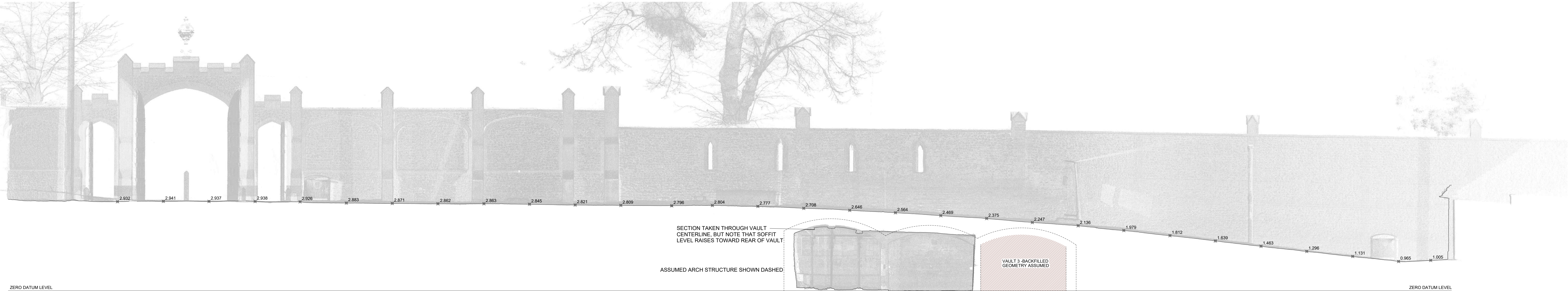
6F. EAST WALL - VAULT - SECTION 5
SCALE 1:50



Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing Title	BELOW GROUND VAULTS	
Scale	1:50	Date FEBRUARY 2023
Drawn By	CO	Checked By KRP
Drg No.	22138-E6	Rev.

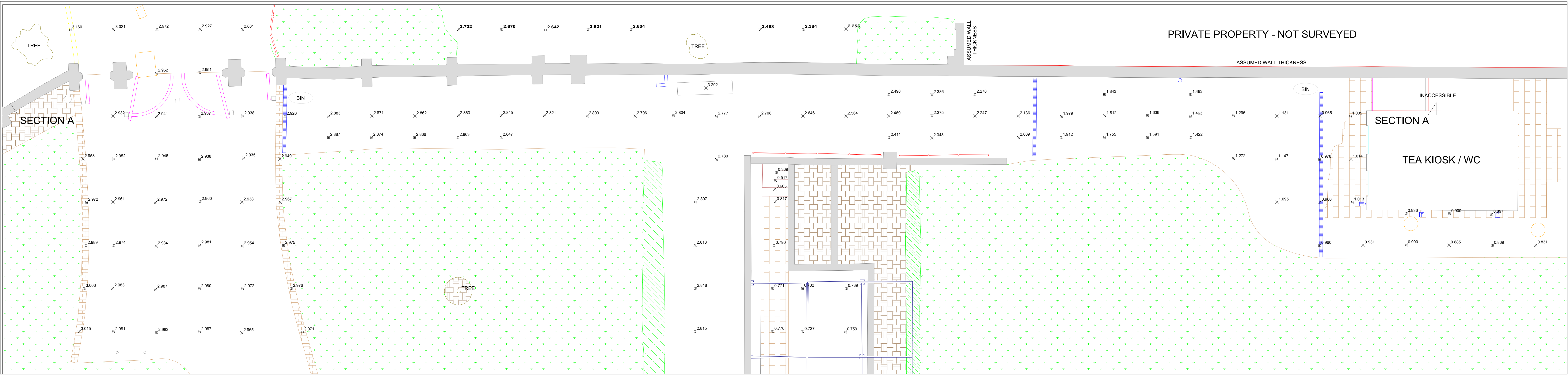
1A. SECTION A - PROFILE THROUGH VAULT WITH GROUND LEVELS

SCALE 1:50



1B. SITE PLAN

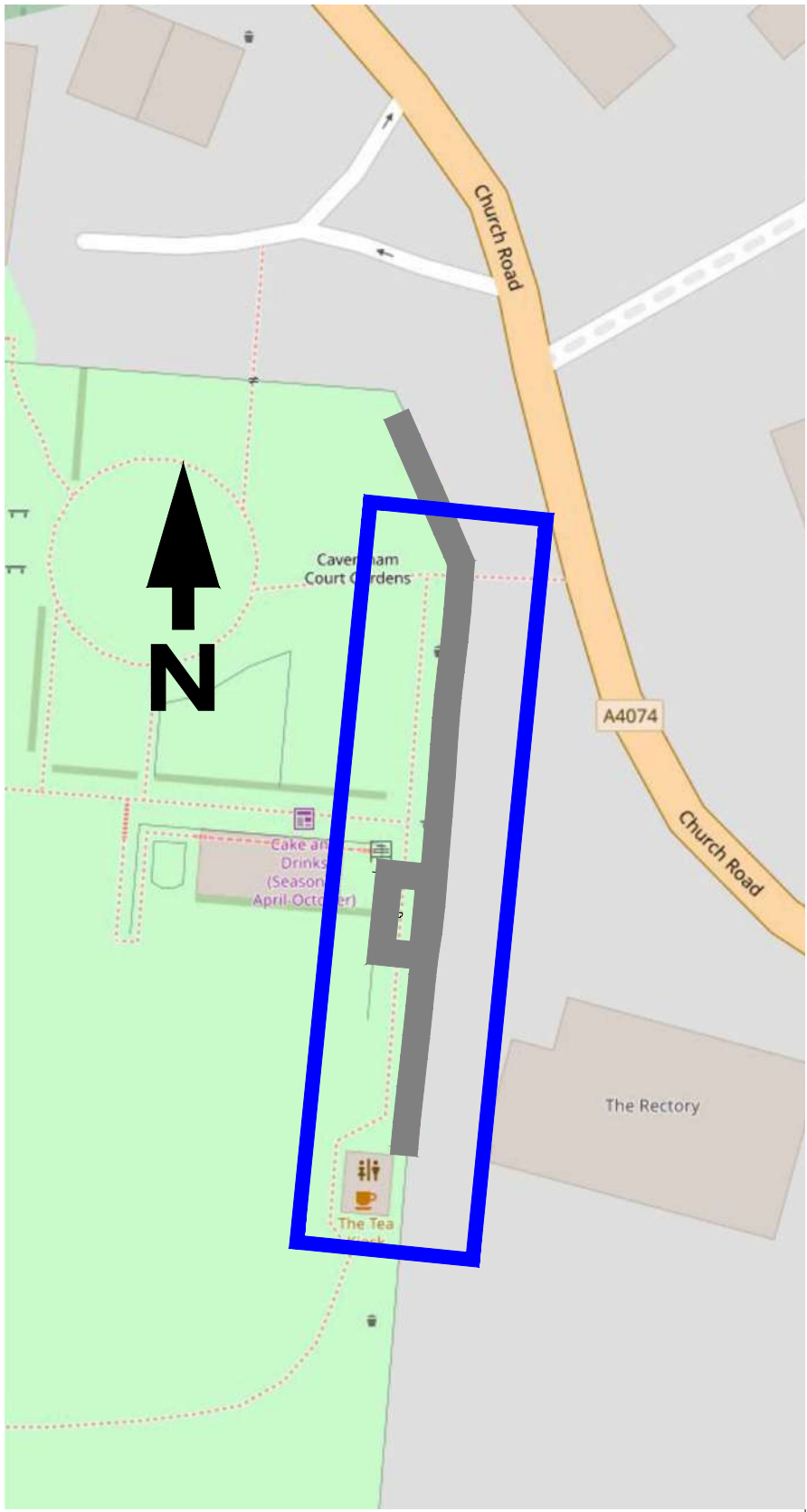
SCALE 1:50



SYMBOLS USED

BIN	
DOOR	
DRAIN	
GATE	
GRASS	
HEDGE	
KERB	
LEVELS	0.000 (METERS ABOVE DATUM)
NO DATA	(NOT SURVEYED)
PATH (EDGE)	
PAVING	
POST	
RAILING	
SERVICE COVER	
SOIL	
STEPS	
AWNING STRUCTURE	
TREE	
WALL	

KEY PLAN



Rev	Date	Amendment
Issue		
Client	READING BOROUGH COUNCIL	
Job title	CAVERSHAM COURT GARDENS	
Drawing title	VAULT / PAVEMENT SITE PLAN AND LONGITUDINAL SECTION	
Scale	1:50	Date JULY 2023
Drawn By	CO	Checked By KXP
Dwg No.	22130-A1	Rev.

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www.krcpsconsulting.co.uk

FIG.1: NEW SLAB - ARRANGEMENT OF PERMANENT SHUTTERING AND STUB WALLS PROVIDING SLAB SUPPORT SCALE 1:50

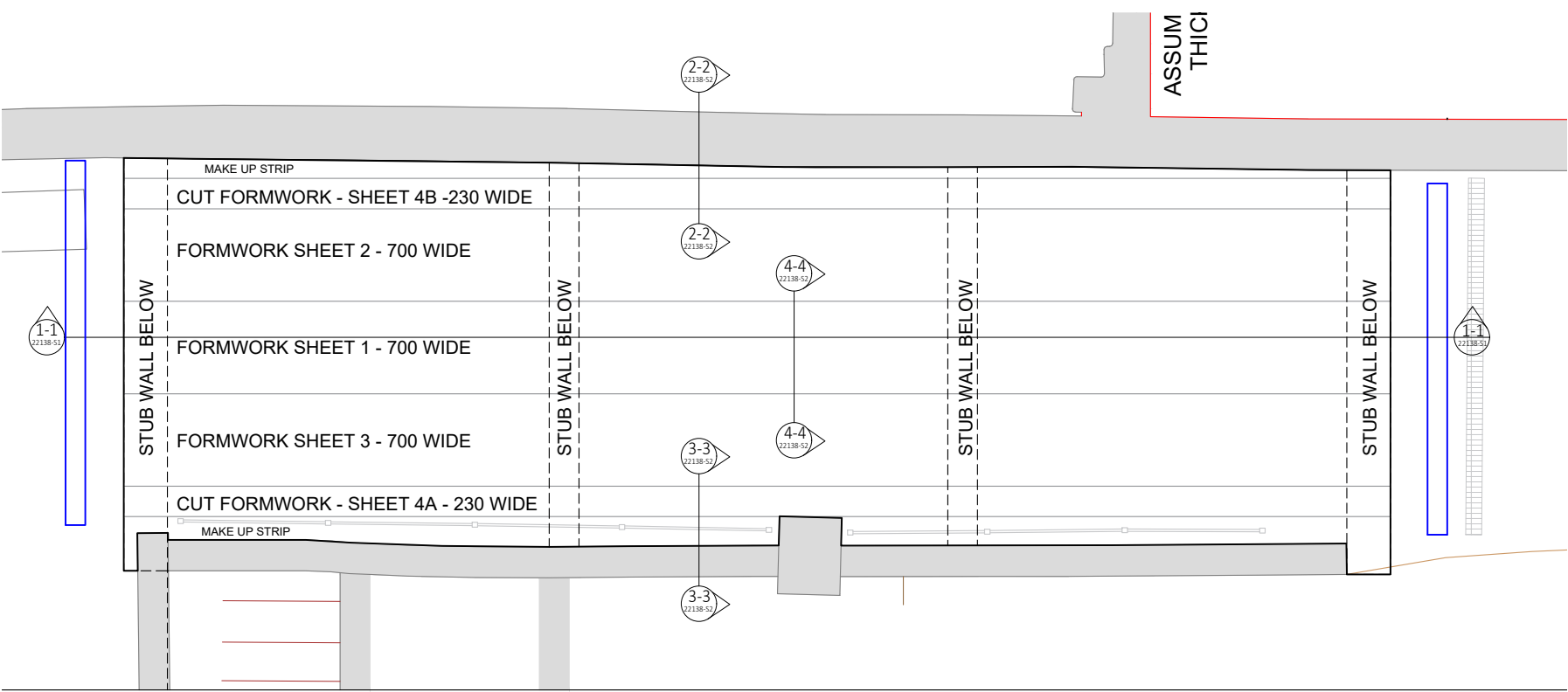


FIG.2: NEW SLAB TOP STEEL SCALE 1:50

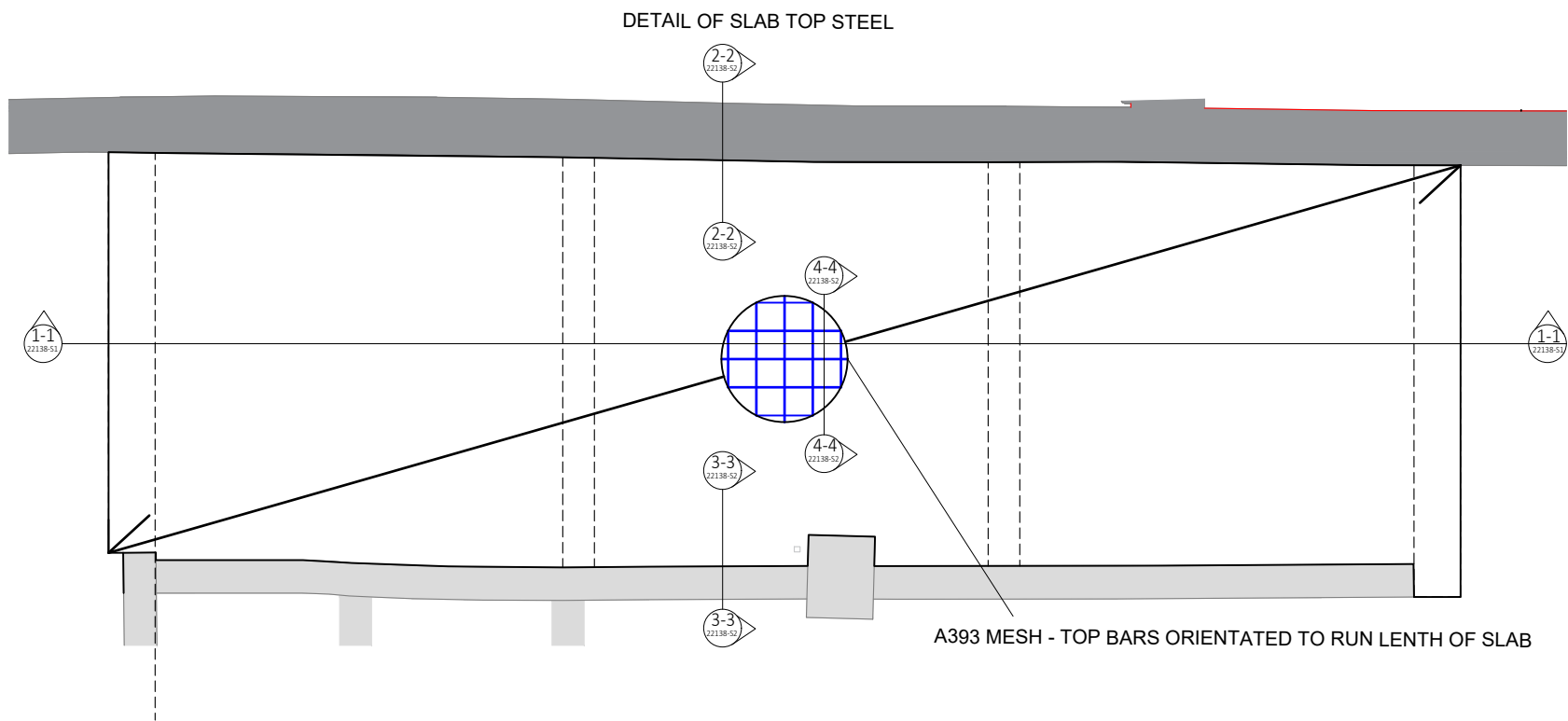


FIG.3 NEW SLAB BOTTOM STEEL SCALE 1:50

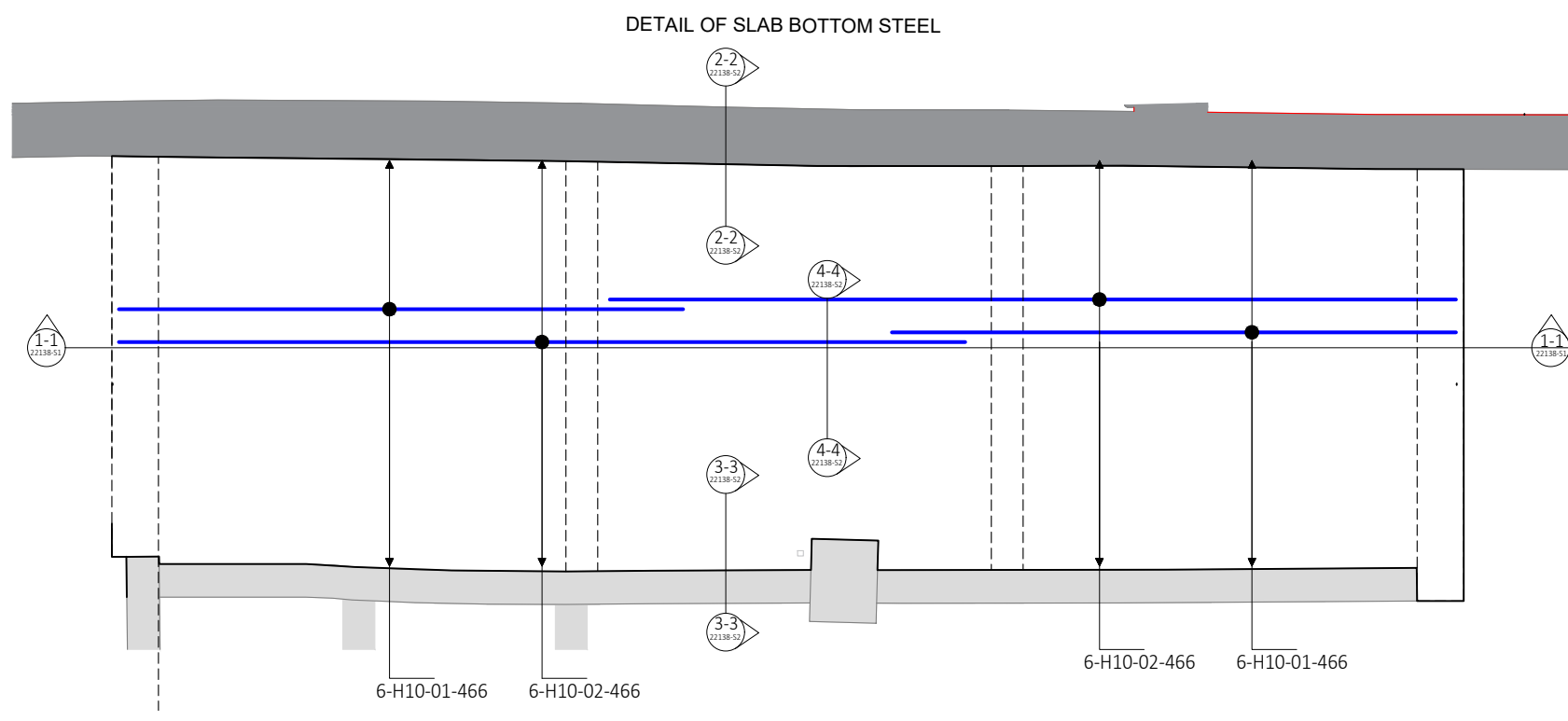


FIG.4: SECTION 1-1 THROUGH NEW SLAB CONTINUED SCALE 1:10

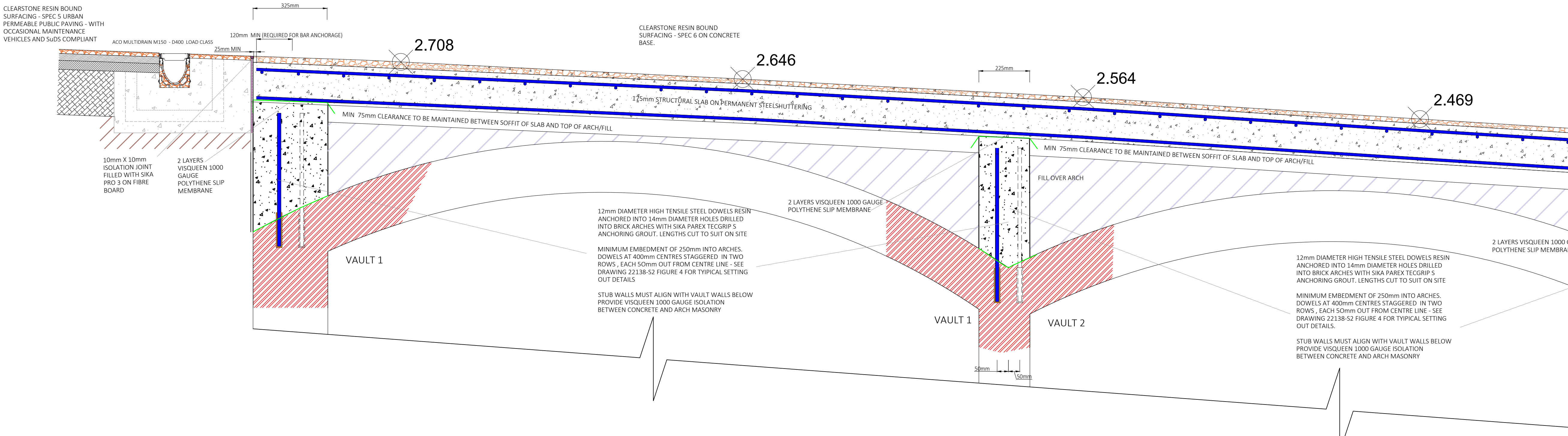
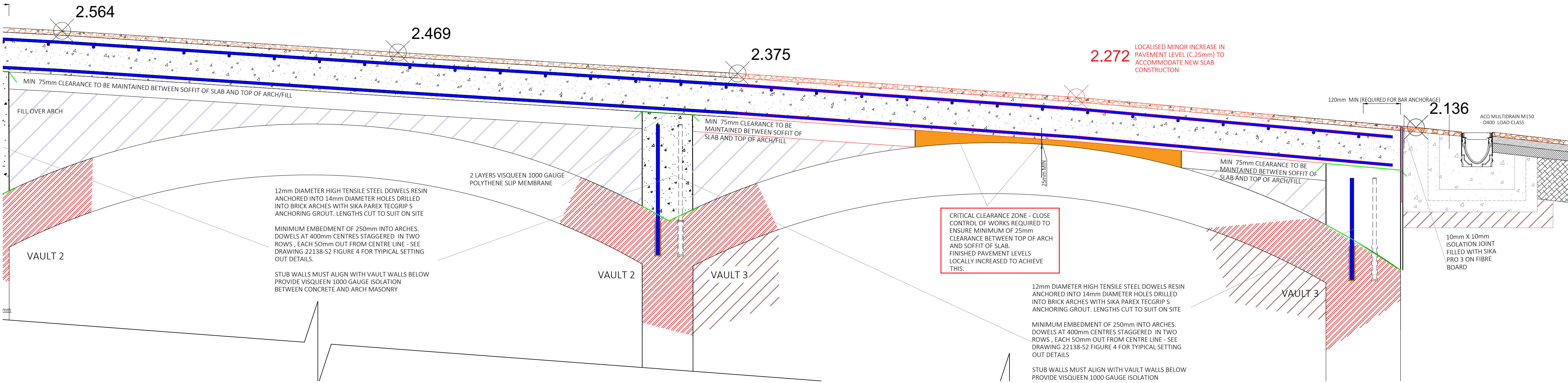


FIG.5: SECTION 1-1 THROUGH NEW SLAB CONTINUED SCALE 1:10



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1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DETAILS, DRAWINGS, SPECIFICATIONS, REPORTS AND OTHER DOCUMENTS ISSUED BY THE ENGINEER, ARCHITECT AND OTHER DESIGN TEAM MEMBERS.
2. REPORT ANY DISCREPANCIES IMMEDIATELY AND AWAIT FURTHER INSTRUCTIONS BEFORE PROCEEDING WITH ANY ASSOCIATED CONSTRUCTION WORKS. IF A DETAIL APPEARS UNCLEAR, OR THERE IS ANY DOUBT, THEN CONTACT KRP FOR FURTHER ADVICE.
3. CONTRACTORS ARE NOT TO WORK TO THIS DRAWING UNLESS IT IS AT TOR CONSTRUCTION STATUS, AS THE DESIGN MAY NOT HAVE BEEN FINALISED.
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GENERAL NOTES:

DO NOT SCALE DRAWING. USE EXISTING DIMENSIONS ONLY.

IF IN DOUBT ASK

Notes on RC drawings:

1. All dimensions are in mm unless noted otherwise.
2. DO NOT SCALE from this drawing.
3. This drawing is to be read in conjunction with all the relevant drawings and specifications from all the relevant parties.
4. All reinforcement to be $f_y = 500$ MPa high tensile unless noted otherwise.
5. Concrete to be PAV1 mix, minimum strength 35MPa at 28 days.
6. Cover to reinforcement to be 25mm minimum to all faces.
7. Top steel supported on bottom steel.
8. All laps, bar or mesh to be minimum 400mm.
9. Reinforcement abbreviations: F = Far Face, N = Near Face. Reinforcement call-up details.

28/12/20-30-150

Number of bars: 1
Type of bar: 1
Bar spacing: 1
Bar diameter: 1
Bar Mk. number: 1

9. Slab reinforcement layers details

Layer T1
Layer T2
Layer B1

IF IN DOUBT ASK!!!!

SECTION ID
DRAWING NO.

Rev	Date	Amendment
Issue		

Client: READING BOROUGH COUNCIL

Job title:

CAVERSHAM COURT GARDENS

Drawing Title: OVER-SLAB TO BELOW GROUND PAVEMENT VAULTS AND VAULT REPAIRS SHEET 1 OF 2

Scale: 1:50/1:10 Date: JULY 2023

Drawn By: CO Checked By: KRP

Drg No. 22138-S1 Rev.:

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FIG.1: SECTION B-B SCALE 1:10

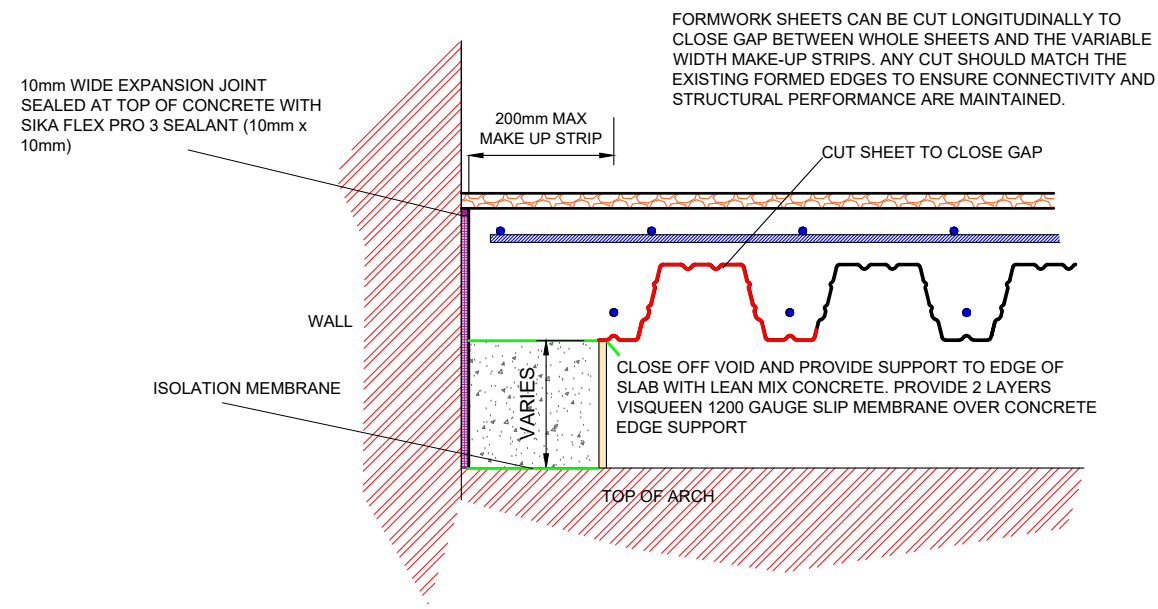


FIG.2: SECTION C-C SCALE 1:10

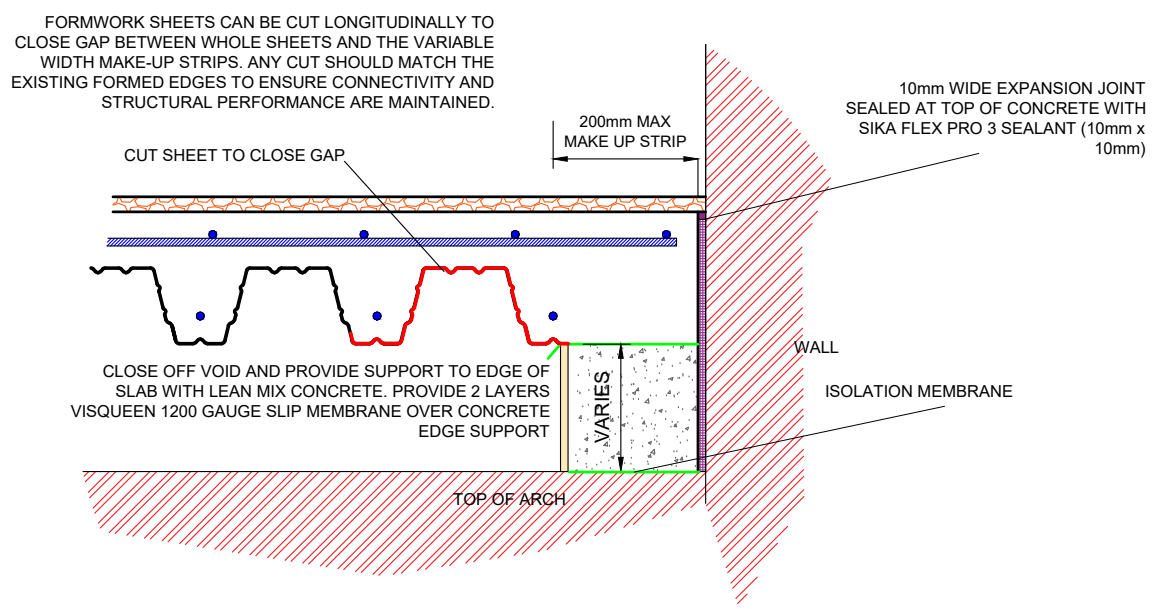


FIG.3: SECTION D-D SCALE 1:10

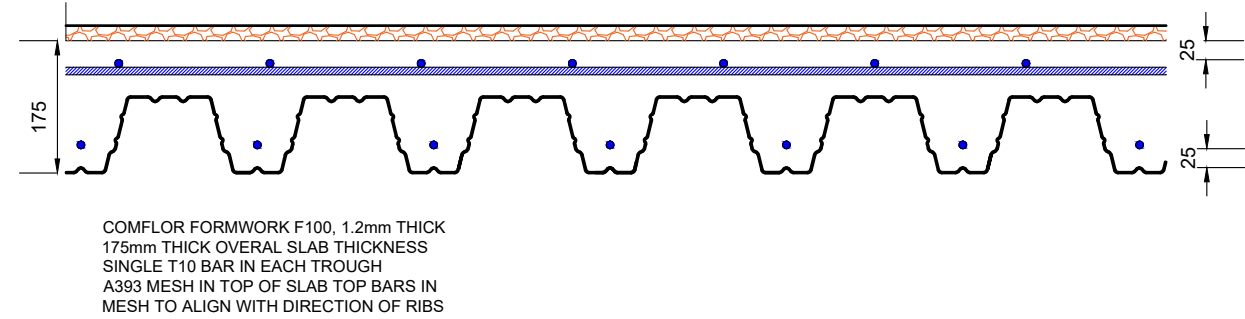


FIG.4: TYPICAL SETTING OUT OF DOWELS INTO MASONRY ARCHES/CONCRETE STUB WALLS SCALE 1:10

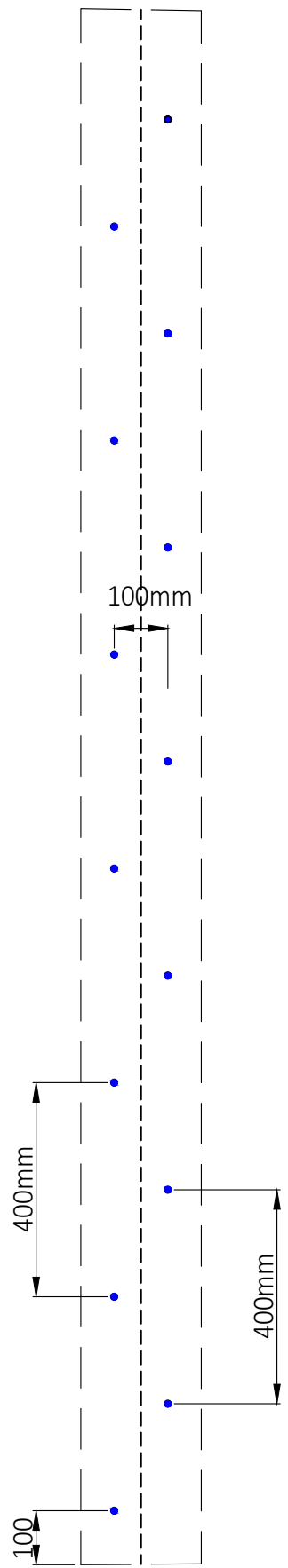
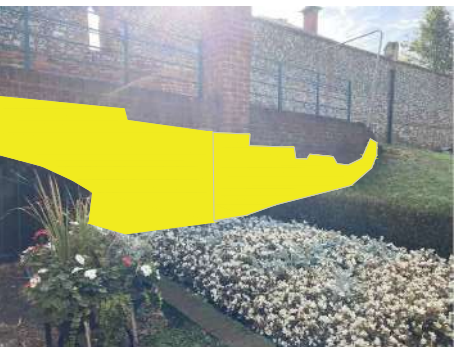


FIG.5: INVESTIGATION AND REMEDIAL WORKS TO SUPPORTING ARCH STRUCTURE



RAKE OUT AND REPOINT ORIGINAL FLANK WALL BELOW PARAPET WITH NHL 3.5 MORTAR

DISMANTLE AND REBUILD TOP 3 COURSES OF PARAPET OVER ENTRANCE ARCH - HATCHED IN RED



RAKE OUT AND REPOINT ABUTMENT WITH NHL 3.5 MORTAR

ALLOW SINGLE TRIAL PIT TO INSPECT FOUNDATIONS TO ABUTMENT

POSSIBLE UNDERPINNING REQUIRED



RAKE OUT AND REPOINT PIERS WITH NHL 3.5 MORTAR

ALLOW SINGLE TRIAL PIT TO INSPECT FOUNDATIONS TO PIERS

POSSIBLE UNDERPINNING REQUIRED



RAKE OUT AND REPOINT ABUTMENT WITH NHL 3.5 MORTAR

ALLOW SINGLE TRIAL PIT TO INSPECT FOUNDATIONS TO ABUTMENT

POSSIBLE UNDERPINNING REQUIRED

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Notes on RC drawings

- All dimensions are in mm unless noted otherwise.
- DO NOT SCALE from this drawing.
- This drawing is to be read in conjunction with all the relevant drawings and specifications from all the relevant parties.
- All reinforcement to be $f_y = 500$ MPa high tensile unless noted otherwise.
- Concrete to be PAV1 mix, minimum strength 35MPa at 28 days.
- Cover to reinforcement to be 25mm minimum to all faces.
- Top steel supported on bottom steel.
- All laps, bar or mesh to be minimum 40mm
- Reinforcement abbreviations:
F = Far Face N = Near Face. Reinforcement call-up details

28/12/30-150
Number of bars — Bar spacing
Type of bar — Bar Mk, number
Bar diameter —

9. Slab reinforcement layers details

Layer T1
Layer T2
Layer B1
IF IN DOUBT ASK!!!!

SECTION ID

DESTINATION
DRAWING No.

A	12/24	Repairs to flank wall added
Rev	Date	Amendment
Issue		

Client: READING BOROUGH COUNCIL

Job title: CAVERSHAM COURT GARDENS

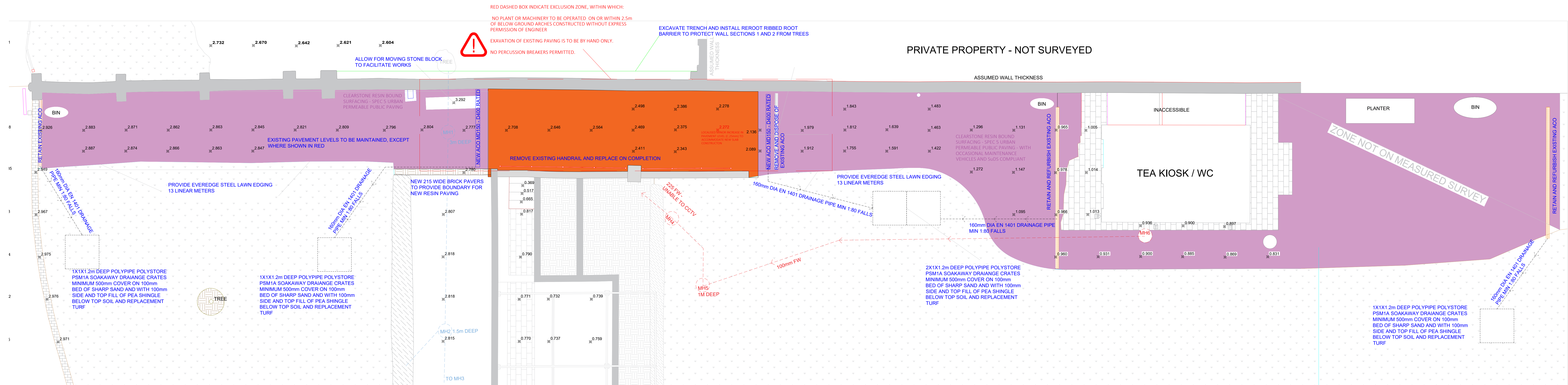
Drawing Title: OVER-SLAB TO BELOW GROUND PAVEMENT VAULTS AND VAULT REPAIRS SHEET 2 OF 2

Scale: 1:50/1:10 Date: JULY 2023
Drawn By: CO Checked By: KRP

Drg No. 22138-S2 Rev.

KRP
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SCALE 1:50



KEY TO REPLACEMENT PAVING

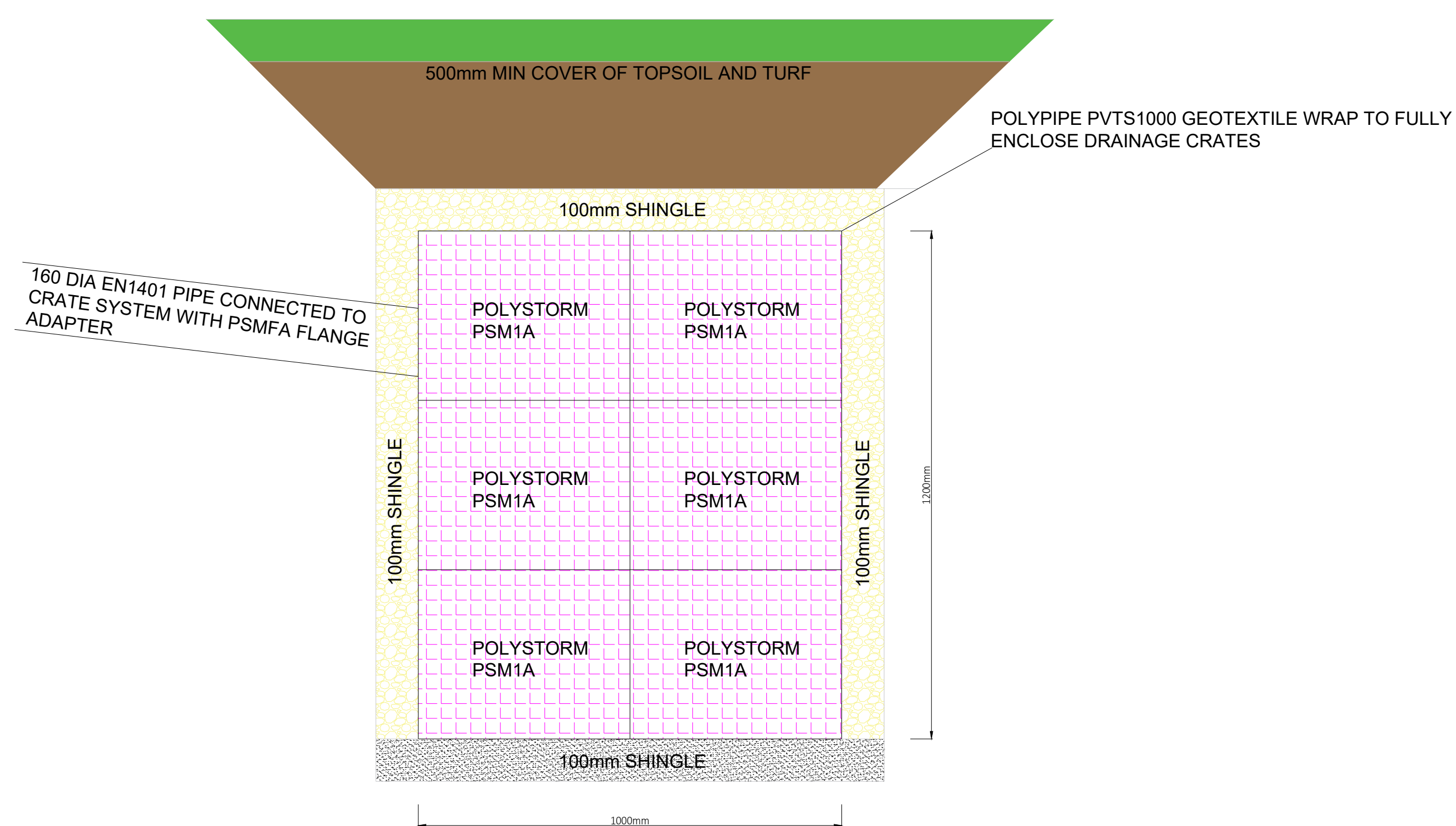
Figure 1

100

KEY TO DRAINAGE

NEW DRAIN AND DIRECTION OF FLOW

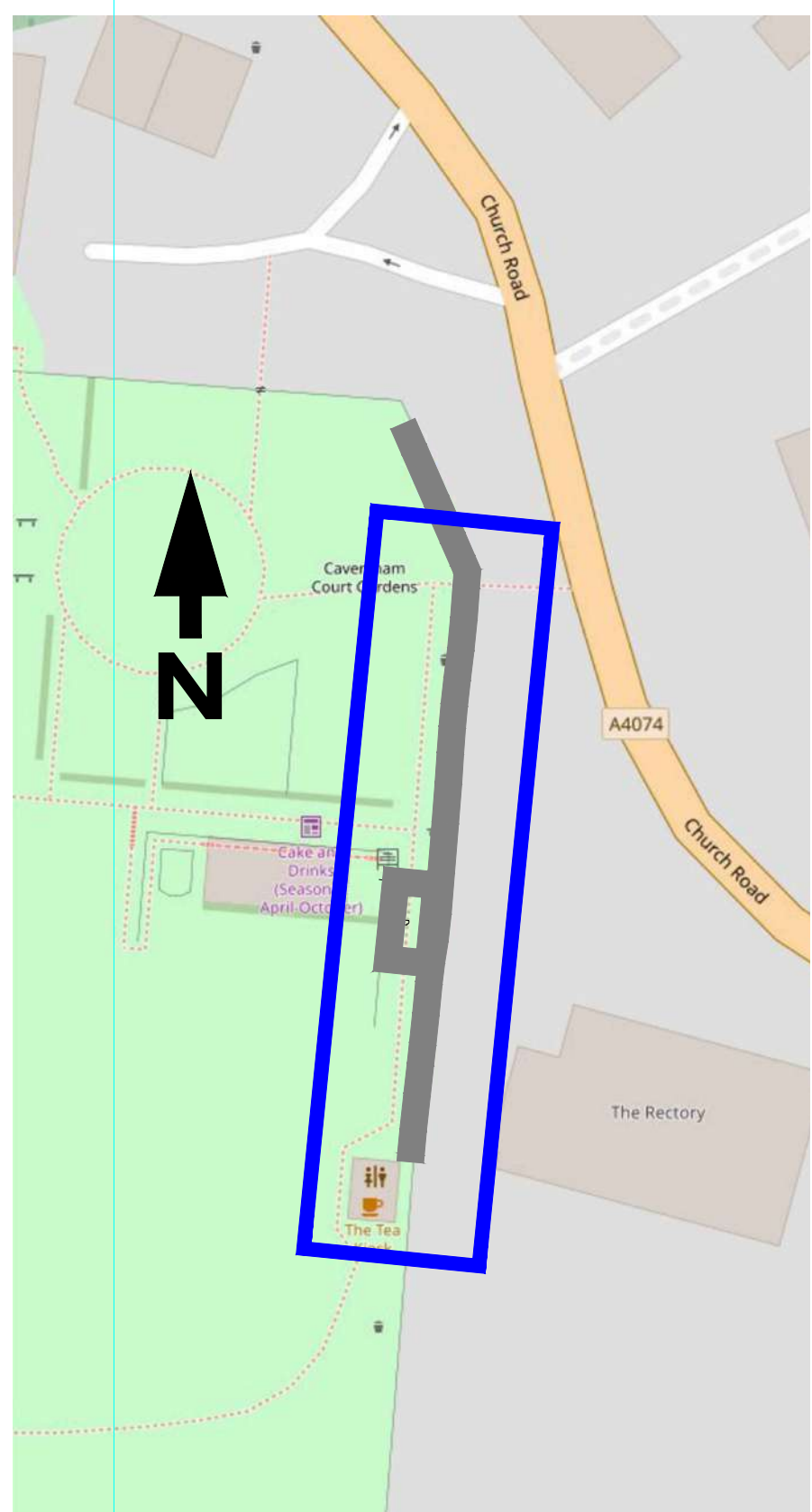
SCALE 1:10



SYMBOLS USED

BIN	
DOOR	
DRAIN	
GATE	
GRASS	
HEDGE	
KERB	
LEVELS	
NO DATA	
PATH (EDGE)	
PAVING	
POST	
RAILING	
SERVICE COVER	
SOIL	
STEPS	
AWNING STRUCTURE	
TREE	
WALL	

KEY PLAN

[illegible]

Rev	12/04	Extended/landscaping to south look.
Rev	Date	Amendment
Issue		
Client		
READING BOROUGH COUNCIL		
Job title		
CAVERSHAM COURT GARDENS		
Drawing Title		
LANDSCAPING		
Scale	1:50/1:10	Date 30.07.2003
Drawn by	CO	Checked by KRP
Dwg No. 221-30-01		Rev.

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APPENDIX 2
BILLS OF QUANTITY

Caversham Court Gardens - Structural Repairs

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
1.00 1A	GENERAL <u>GENERAL DESCRIPTION OF WORKS TO BE UNDERTAKEN</u> <i>Boundary walls</i> <u>Eastern Wall</u> Vegetation removal and surface cleaning Careful recording of existing construction details, dismantling and rebuilding of severely leaning sections of eastern boundary wall (Sections 1 and 2) Replacing damaged bricks, flints, stone copings and repointing to Eastern Wall Section 3. Excavation of Trial Pits and installation of root barrier. <u>Western Wall</u> ~~Vegetation removal and surface cleaning~~ ~~Removal of Iron Railing along top of wall, removal of iron nails, raking out and repointing, remove corroding ironwork from buttresses, repair chases out from buttresses, install new foundations and ties to bases of buttresses that have separated from wall panels.~~ <i>Below Ground Pavement Vaults</i> Surface cleaning, raking out and deep repointing of brickwork arch soffits, walls and piers. Construction of new reinforced concrete slab supported on the abutments and piers of the vaults to avoid loading the span of the arches. <i>Landscaping</i> Provide new SUDs pavement leading down to and beyond the new slab over the arch topped with resin bound gravel. Resin bound gravel provided over new slab. Cut off drains provided either end of new slab, discharging to new soakaways. It is the contractors responsibility to verify accuracy of fee calculation on the returned completed BoQ.					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
B	<u>PLANT</u>					
1.0	Provide , maintain and clear on completion all necessary plant and tools			item		
2.0	Protection of plant			item		
C	<u>MANAGEMENT</u>					
1.0	Provide all necessary on and off site contract supervision.			item		
D	<u>SITE ACCOMMODATION/MESS ROOMS/STORE CANTEEN/OFFICE/WC</u>					
1.0	Provision of any necessary accommodation, welfare and storage facilities over and above any provided by the Client on site - to be agreed in advance by Contractor			item		
2.0	Maintain items above			week		
3.0	Removal of above facilities on completion			item		
E	<u>ACCESS,WEATHER PROTECTION AND HOISTING</u>					
1.0	Provide and erect access scaffolding as necessary to facilitate the works			item		
2.0	Maintain items above			week		
3.0	Dismantle and remove items above			item		
4.0	Dismantle store and replace on completion any obstructions to the western wall within canoe club, to the extent agreed in advance with Client to facilitate wall repairs			item		
	Carried forward					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
	Bought forward					
F	<u>INSURANCE</u>					
1.0	Insurance of the Works			sum		
2.0	Insurance of Plant			sum		
3.0	Insurance against damage to persons and property			sum		
G	SITE SERVICES					
1.0	Water for the Works incl TW Licence			sum		
2.0	Electricity for the works - allow for additional power over and above that provided by the Client			sum		
3.0	Temporary safety fencing/screens/fans/guardrails			sum		
4.0	Signing and guarding			sum		
5.0	Site security fencing - full hoarding to prevent public access.			sum		
6.0	Waste removal - skips			sum		
H	ROUTINE TRIALS AND TESTING					
1.0	Allow for making up to ten trial patties of mortar, with varying aggregate components and coloured additives in order to best match the appearance of the existing mortar for the approval of the Client.	D.4	1.00	No.		
2.0	Having first agreed which of the mixes in 1.0 above will be carried forward in the works, construct test panel 1m wide x 1m high of flint masonry construction for client acceptance ahead of rebuilding eastern wall	3.7	1.00	No.		
3.0	Having first agreed which of the mixes in 1.0 above will be carried forward in the works, repoint a trial area of the brickwork on each of the eastern and western walls for acceptance by the Client before proceeding with the works	3.6	1.00	No.		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
2.0	TEMPORARY WORKS Design and install temporary works ~~Provide raking shores to temporarily stabilise the 21 buttresses requiring repair~~	F		~~Item~~		
2.5	~~inspect and maintain all above items~~			~~Week~~		
2.6	~~Dismantle and remove all of the above items on completion~~			~~Item~~		
2.7	Contractor to allow for the dismantling and disposal of the timber raking prop system to the eastern boundary wall to facilitate the works.	3.7.1		Item		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
3.0	East Boundary Wall - Section 1					
3.1	Removal of biological growth - full extent of wall section	3.2	33.00	m ²		
3.2	Careful cataloguing of construction and positions of materials in construction	1		Item		
3.3	Create replica arched formwork for each niche arch	3.3		Item		
3.4	Dismantle and store all material to be reused in construction	1		Item		
3.5	Disposal of all waste materials			Item		
3.6	Excavate three trial holes 600wide by 600 long to the depth of the wall foundation to allow engineer inspection - do not undermine	3.7.3	3.00	Item		
3.7	Rebuild the wall plumb but to match the original construction detail, retain the pier adjacent to the gate and allow for:	2 & 3		Item		
3.8	Not used					
3.9	Replace 3x damaged/dripless copings			Item		
3.10	Replace 5 no. damaged stones			Item		
3.11	Remove all loose and delaminating material and apply colour matched shelter-coat to consolidate stone face.			Item		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
4.0	East Boundary Wall - Section 2					
4.1	Removal of biological growth - full extent of wall	3.2	37.00	m ²		
4.2	Careful cataloguing of construction and positions of materials in construction	1.0		Item		
3.3	Create replica arched formwork for each lancet window	3.3		Item		
4.3	Dismantle and store all material to be reused in construction	1.0		Item		
4.4	Disposal of all waste materials			Item		
4.5	Rebuild the wall plumb but to match the original construction detail, retain the pier adjacent to the gate and allow for:	2 & 3		Item		
4.5.1	Replacing 3x damaged/dripless copings		3.00	No.		
4.5.2	Replace 5 no. damaged stones		5.00	No.		
4.6	Remove all loose and delaminating material and apply colour matched shelter-coat to consolidate stone face.			Item		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
5.0	East Boundary Wall - Section 3					
5.1	Removal of biological growth - full extent of wall	3.2	45.00	m ²		
5.2	Replace defective bricks with like-for-like replacements – allow for 50 bricks	3.9	50.00	No.		
5.3	Rake out and repoint	3.5	10.00	m ²		
5.4	Allow for 45no. flints to be re-bedded.		45.00	No.		
5.5	Insert drip edge into 4no. copings.		4.00	No.		
5.60	Consolidate spalling stone on gablets with shelter-coat			Item		
5.7	Dispose of all waste materials			Item		
To collection						

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
~~6.0~~	~~Western Boundary Wall – Southern Elevation (Interior), Copings and Rails~~					
6.4	Removal of biological growth	3.2				
	Full extent of wall		330.00	m ²		
	Copings		25.00	m ²		
6.2	Drill out remove and dispose of iron nail fixings and repair holes	3.10.1	1050.00	No.		
6.2.1	Cut out and replace damaged bricks to buttresses	3.10.4	100.00	No.		
6.3	Remove and dispose of iron railings and wall straps to full length wall, treat out ends of retained iron, remove straps and bolts from wall and repair holes	3.10.2	76.00	m		
6.4	Repair of Chases in Brick Buttresses	3.10.3	12.00	No.		
6.5	Localised replacement of brick and terracotta units, allow:	3.10.4				
6.5.1	100 bricks		100.00	No.		
6.5.2	20 terracotta units		20.00	No.		
6.6	Raking out and Repointing	3.10.5				
6.6.1	Allow 100% of walls above string course (Total Area Approx. 52.5m ²)		52.5	m ²		
6.6.2	Allow 100% of joints in plinth course (Total Area Approx. 26.3m ²)		26.30	m ²		
6.6.3	Allow 20% of joints in wall panels and buttresses (Total Area Approx. 330m ²)		66.00	m ²		
6.7	Repair and replacement of copings	3.10.6				
	Replace		40			
	Re bed		20.00			
	Repoint		25.00	m ²		
6.8	Remove and set aside brick stretchers to allow installation of dowells required to implement buttress repairs as detailed on Drawing 22438 R1. 28 bricks to be removed and 28 dowels installed on each of 24 buttresses. Reinstall removed bricks on completion and set in NHL 3.5 mortar.	3.11.1 & Drawing 22438 R1	24.00	No.		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
~~7.0~~	~~Western Boundary Wall – Northern Elevation (Exterior)~~					
~~7.1~~	~~Removal of biological growth~~	~~3.2~~				
	~~Full extent of wall~~		~~330.00~~	~~m²~~		
~~7.2~~	~~Localised replacement of bricks, allow:-~~	~~3.6, 3.10.4~~				
~~7.2.1~~	~~250 bricks~~		~~250.00~~	~~No.~~		
~~7.3~~	~~Raking out, Repointing and Re bedding~~	~~3.11.3~~				
~~7.3.1~~	~~Allow 100% of joints in plinth courses top and bottom of piers~~		~~14.5~~	~~m²~~		
~~7.3.2~~	~~Allow 20% of joints in wall panels and buttresses (Total Area Approx. 330m²)~~		~~66.00~~	~~m²~~		
~~7.3.3~~	~~Re bed upper plinth bricks in two piers~~		~~2.00~~	~~Item~~		
~~7.4~~	~~Crack Stitching~~					
	~~Repair single crack~~	~~3.11.2~~		~~Item~~		
~~7.50~~	~~Gap broken terracotta pipes after vegetation removal~~	~~3.11.5~~	~~24.00~~	~~No.~~		
~~7.60~~	~~Excavate around base of buttress, clean up and grout seperated joint between buttress and wall. Construct 'C' shaped foundation, dowelled into existing wall. Backfill and remove excess soil. Leave site as found.~~	~~3.11.1 & Drawing 22138 R1~~	~~24.00~~	~~No.~~		
	~~To collection~~					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
8.0	Below Ground Arches					
8.1	Removal of biological growth - full extent of wall	3.20				
	Abutments		9.00	m ²		
	Piers		6.00	m ²		
	Arch soffits		27.00	m ²		
8.2	Excavate 3 no. trial pits to establish foundation details to abutments and piers. Allow 0.5m square x 1m deep	3.12.2	3.00	no		
8.3	Rake out and repoint with NHL 3,5 mortar	3.5				
	Abutments		9.00	m ²		
	Piers		6.00	m ²		
	Arch soffits		27.00	m ²		
	Flank Wall		20.00	m ²		
	Dismantle and rebuild top 3 courses of parapet over vault entrance		5	m		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
9.0	Concrete Slab Over Below Ground Arches	3.13 & Drawings 22138-S1 and S2				
9.1	Ground Works					
9.1.1	Excavation of existing paving using hand tools only down to formation levels shown on drawings. Dispose of all arisings. Show clean edges of the arch structure at the abutments.		28.00	m ²		
9.1.2	Dismantle and store steel railings and reinstall on completion of landscaping			Item		
9.1.3	Excavation of trenches to allow construction of stub walls		4.00	No.		
9.1.4	Cut to length and install resin anchored dowels into top of masonry 4 x 14no.		56	No.		
9.1.5	Construct stub walls with tops of walls set to receive slab following levels as drawn and provide slip membranes between tops of walls and new slab		4	No.		
9.1.6	Construct edge supports to slab along boundary wall as shown on Figures 1 and 2 of Drawing 22138-S2		2.00	No.		
9.1.7	Install Comflor Formwork F100, 1.2mm Thick as permanent shuttering to Details on Drawings 22138-S1 and S2		28.00	m ²		
9.1.8	Install loose bar in troughs of formwork, cut and fit mesh top steel and install fibre board joint isolations around periphery of slab			Item		
9.1.9	Cast new slab in PAV1 concrete, cover and cure			Item		
9.1.10	Seal peripheral joints with Sika Flex Pro 3		25.00	m		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
10.0	Landscaping - In Vicinity of Eastern Wall	3.14 &				
<u>10.1</u>	<u>Suds System - Clearstone Spec 5 - Resin Bound System</u>	Drawing				
10.1.1	Excavate to formation level and remove and dispose of all arisings in area to receive SUDS Pavement System (approximately 300mm Deep)	22138-L1	145.00	m ²		
10.1.2	Install Everedge Steel Lawn Edging		46.00	m		
10.1.3	Install brick paving to clients choosing of brickwork (215mm wide)		3.50	m		
10.1.4	Install MOT Type 1 Sub Base 200mm Min Depth		145.00	m ²		
10.1.5	Install AC20 Open Binder Course - 40mm Min Depth		145.00	m ²		
10.1.6	Install AC10 Open Surface Course Macadam - 30mm Min Depth		145.00	m ²		
10.1.7	Install Clearstone Resin Bound Gravel - size and colour to Client requirements - 18mm Thick. Final levels to match existing.		145.00	m ²		
<u>10.2</u>	<u>Suds System - Clearstone Spec 6 - Resin Bound System</u>					
10.2.1	Install Clearstone Resin Bound Gravel - size and colour to Client requirements - 18mm Thick on Newly Cast Slab Final levels to match existing except where shown.		28.00	m ²		
10.3	Drainage					
10.3.1	excavate for and Install new ACO drains MD150 D400 2 x 2.5m runs		2.00	No.		
10.3.2	Refurbish existing ACO adjacent to Kiosk (x 2 no. drains)		12	m		
10.3.3	Refurbish existing ACO adjacent to main entrance		3	m		
10.3.4	Remove and dispose of existing ACO to southern side of new slab		3	m		
10.3.5	Excavate 3 x pits for soakaway 1.2 long x1.2 wide by 1.8m deep		3	No.		
10.3.6	Excavate 1 x pit for soakaway 1.2 x 2.2 x 1.8m deep		1	No.		
10.3.7	Install sharp sand leveling, 1x1x1.2m Soakaway crates (PSM1A), wrapped in geotextile (PVTS1000), pea shingle side and top fill (100mm) and make pipe connection with PSMFA flange adaptor. Backfill, compact, turf over and remove and dispose of excess spoil		3	No.		
	Carried Forward					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
	Brought Forward					
10.3.7	Install sharp sand leveling, 2x1x1.2m Soakaway crates (PSM1A), wrapped in geotextile (PVTS1000), pea shingle side and top fill (100mm) and make pipe connection with PSMFA flange adaptor. Backfill, compact, turf over and remove and dispose of excess spoil		1	No.		
10.3.8	Excavate trenches, install EN1401 160 dia pipe to falls connect ACOs to Soakaways to include all connection pieces, bedding materials and temporary supports. Provide 100mm concrete encasement and flexcell soft joints in encasement at each pipe joint, backfill on completion, remove excess soil and provide turf.		25	m		
10.3.9	Move stone block shown on Drawing 22138-L1 prior to works commencing			item		
10.3.10	Excavate 750mm deep trench x 300mm wide and install root barrier along full length of Sections 1 and 2 on the road side of the wall. Backfill, compact and make good to finishes on completion. Remove and dispose excess spoil.		13	m		
	To collection					

ITEM	DESCRIPTION	SPEC CLAUSE	QTY	UNIT	RATE £	AMOUNT £
11.0	Provisional Sum Items					
11.1	Allow for minor foundation modifications to Eastern Wall Sections 1 and 2 following engineer assessment prior to rebuilding			Prov Sum		3,000.00
11.2	Allow for underpinning abutments and piers to below ground masonry vaults if trial pits show inadequate foundations			Prov Sum		3,000.00
	To collection					



APPENDIX 3
KRP REPORT
(KRP CCG Report 0922_Final)



KENNETH R. PAUL
CONSULTING ENGINEERS

Structural & Civil

KRP CCG Report 0922_Final

3rd October 2022

Streetscene/Neighbourhood Services
Reading Borough Council
Floor 1, 19 Bennet Road
Reading
Berkshire
RG2 0QX

For the attention of; Bridget Hickey

Dear Bridget,

Caversham Court Gardens – Structural Assessment of Garden Walls and Below Ground Vaults

Further to your recent instruction, we have now completed our desk top review of an earlier report produced by Clivedon Conservation Workshop Ltd on the condition and repair needs of the eastern and western boundary walls to Caversham Court Gardens. We also attended site on the 20th September 2022 to carry out a structural assessment of the portion of the eastern wall that Clivedon identified as requiring assessment by a structural engineer due to concerns as to their stability.

During our site visit we reviewed the condition of the walls against the Clivedon report and expanded on the extent of the condition survey by including the southernmost portion of the western boundary wall between the entrance to the Reading Canoe Club and the River, which is not included in the Clivedon report. Otherwise the extent of the walling assessed by KRP is the same as that covered in the Clivedon Report.

During the course of our assessment we excavated two trial pits to in an attempt determine the foundation details and ground conditions in order to better understand the mechanisms leading to movement of the walls. One excavation was formed on each of the eastern and western walls, the locations of which were selected by our engineers on site.

Whilst on site the scope of our investigations were extended to include an assessment as to the integrity of three below ground vaults beneath an area of pavement running along the eastern boundary wall.

The results of our on and off site studies of the wall construction, condition and stability are presented as set out in the table of contents overleaf. A selection of photographs and sketched are included throughout our report to help illustrate the findings of the survey.

Registered in England and Wales under Company Number 0731442

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The **Institution**
of **Structural**
Engineers

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1. Desk Study/Clivedon Report Review

We have reviewed the Clivedon Report, which we find to be clear, thorough and accurate in the capturing of defects to the surveyed portions of the wall and, by and large, we concur with the recommendations regarding the repairs, which are clearly set out and sympathetic to the materials used in the construction, the historic importance of the structure and its Grade II* listed status. We expand or suggest adjustments to certain repair recommendations below, or provide our own view on the repair options presented by Clivedon, all alongside extracts of the recommendations from the report.

a. '3.1 East Boundary Wall-Section 1'

We concur with the defects identified and the repairs presented, however, we note that there is a severe lean of the wall to the South of the gated entrance, with the wall leaning towards the garden. In our opinion this requires temporary stabilisation through the installation of a system of raking timber props installed and secured in place with cleats fixed into/through the wall, sole plates fixed into the ground and with lateral bracing provided between shores. The shores should be provided to both sides of the wall.

The lean is such that the correct remedial action is to take the wall down carefully and rebuild it, cataloguing the materials in advance, to a system and standard agreed in advance with Historic England to ensure that the wall is reconstructed to match the existing. The extent of rebuild required should include the full extent of Section 1 to the South of the recently rebuilt gated entrance up to the junction with Section 2. Sampling and testing of the mortar is recommended to enable a suitable matching mix to be selected for the rebuilding.

The lean is greater towards the northern end of the wall in the vicinity of where a large Lime tree once stood that we understand was removed in 2020. It would appear that the tree was removed as it was damaging the wall and a new Lime tree planted in its place, but set 1-2m from the face of the wall.



Elevation 2 looking North showing the lean of the wall into the garden



July 2019



October 2020



September 2021

Elevation 2 images from Google Maps Street View in 2019, 2020 and 2021 showing a large Lime tree having been removed.

We have reviewed the existing foundations – see below under the heading of '*Geotechnical Investigation*' and conclude that the existing foundations can be utilised in the reconstruction of the wall.

b. '3.2 East Boundary Wall – Section 2'

'Because of the severe lean and unstable nature of this section of wall, we would recommend the consultation of a structural engineer and a geological survey to help formulate a suitable solution.'

We have carried out a review of the structural stability of this section of the wall and have completed a geotechnical investigation in the form of a trial pit (Trial Pit 1). This is reported under the heading of 'Geotechnical Investigations' below.

'In the short term, it has been recommended that the wall be propped from the exterior to prevent damage to persons or property; the instability is such that sections of flint could be expected to start falling in the next 6-12 months.'

We concur with the requirements for temporary shoring of the wall. The shoring should be carried out from both sides of the wall, with raking timber shores installed and secured in place with cleats fixed into/through the wall, sole plates fixed into the ground and with lateral bracing provided between shores.

'It is our opinion that the section of the wall between from window 2 to approx. 1 m past window 4 should be carefully recorded, dismantled and rebuilt. Options such as wall ties, buttressing and metalwork within the window openings should be considered to aid increasing the structural integrity of the wall.'

There is a large Lime tree located between the first and second lancet window south of the gated entrance from the main road. To the South of this tree the wall tilts towards the road. To the North of the tree the wall towards the garden, apparently hinging around the tree. There is less of a lean to the North of the first lancet window as the wall approaches the pier between elevations 2 and 3.

The tree is applying load to the wall and unless removed the wall will continue to be loaded by the tree and will deteriorate as a result. We therefore recommend that the tree is removed to preserve the integrity of the wall post reconstruction.

c. '3.3 East Boundary Wall – Section 3'

We concur with the repair recommendations

d. '3.4 Western Garden Wall'

Metal fixings - Options for intervention:

- *Remove all iron fixings and make good brickwork. Investigate alternative espalier support techniques.*
- *Remove only obsolete iron fixings, make good brickwork, treat remaining fixings with rust inhibitor*
- *Leave all iron fixings in situ and treat with rust inhibitor.'*

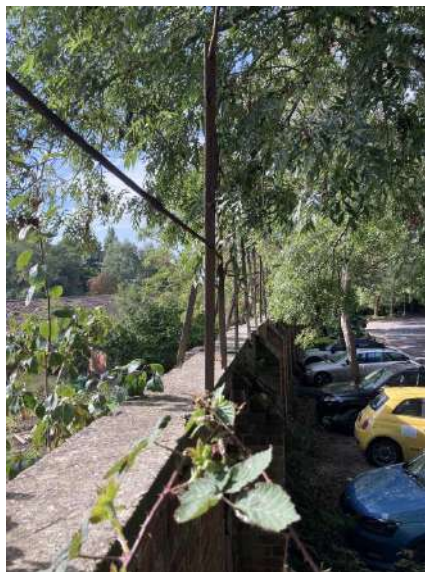
Of these, we recommend that the removal of all iron fixings is the most appropriate and robust repair solution. We have established through our own inspections that the fixings are embedded at least 100mm into the wall. The treatment of only the external portion of the fixings will not prevent corrosion of the embedded portions so the fixings can be expected to continue to corrode and cause further damage. There are migrating corrosion inhibitors available that can penetrate concretes and mortars and protect embedded ironwork, however we do not consider MCI's to be appropriate here.



Metal railing — *A specialist metal conservator should be consulted to confirm suitability of works*

- *Remove railings entirely and make good fixing points.*
- *Remove severely damaged northern sections, make good fixing points, conserve and treat stable sections with rust inhibitor.*
- *Replace severely damaged northern sections with new, conserve and treat remaining original sections with rust inhibitor.*

The masonry does not provide adequate corrosion protection to the ironwork. The ironwork is damaged, severely in places and the railings would be best removed from the wall in their entirety. Alternatively, the embedded portions could be cut back to at least 50mm below the top of the wall and the cut ends prepared by mechanically removing any corrosion product back to reveal shiny steel and treated with bituminous paint or similar before repairing the brickwork and replacing the copings.

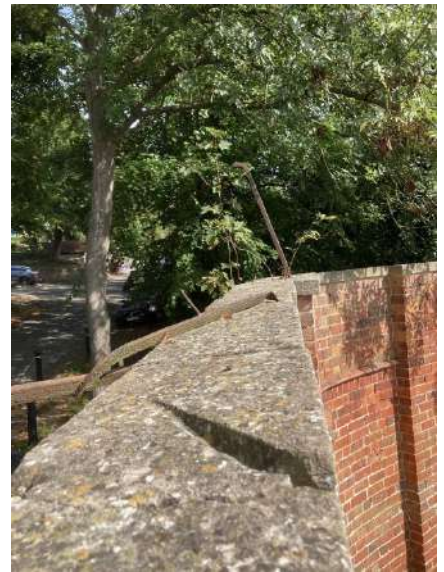


Buttresses

Make good 12no. chases in brickwork where greenhouses once stood (approx. 60 bricks) – up to boundary with canoe club. - Rake out and repoint 30% brick joints

There are embedded iron fixings in from the railings within the chases. Ideally, the facing brickwork should be removed sufficient for the iron work to be removed in its entirety.

Alternatively, the exposed ironwork should be prepared by mechanically removing any corrosion product back to reveal shiny steel and treating with bituminous paint or similar before repairing the brickwork. If the ironwork is not removed in its entirety, further damage to the brickwork can be expected as any residual iron corrodes.



2. Geotechnical Investigation

a. Eastern Garden Wall

A single trial pit as excavated against a pier on the eastern garden wall on the Caversham Court Gardens side. The pit location was selected to include the junction between the two wall elevations identified within the Clivedon Report as Sections/Elevations 1 and 2, as indicated on the marked up satellite image (Google Earth) below:

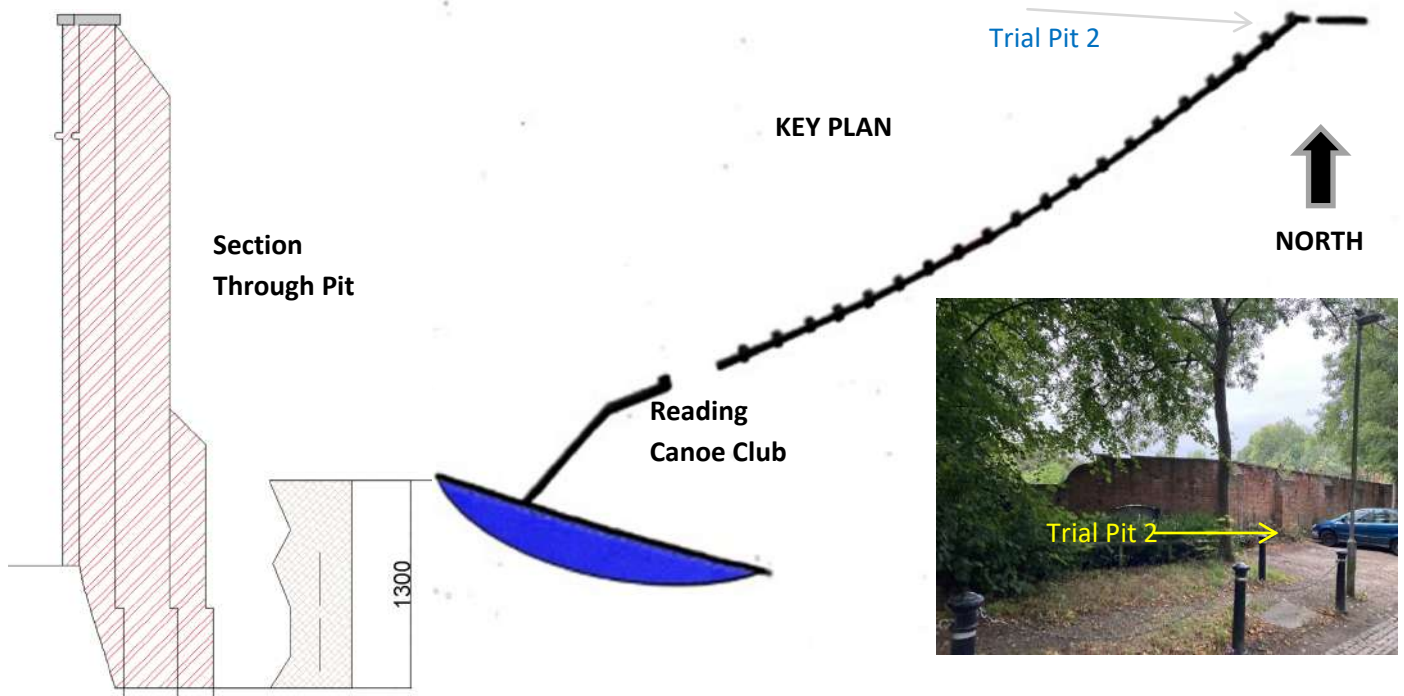


The trial pit showed that the stone to the pier and the flint-knapp wall extends approximately 100mm below the local ground level before we encounter the solid red-brick and apparent lime mortar foundation which extends to 770mm below local ground level where it is founded on weathered chalk.



b. Western Garden Wall

A single trial pit was excavated down the back of the western garden wall on the side of The Warren. The pit was positioned to allow the investigation of the wall and a pier at the location of a separation between the two wall components.



We observed that the pier at the investigation location had become separated from the wall and a 25-30mm gap existed between the pier and the wall panel. On closer inspection we note that the separation begins immediately below a horizontal clay pipe extending out from the northern side of the pier. We further note that below the location of the pipe the pier is not toothed into the wall panel as it should be. Above the pipe the pier appears to be toothed in. The pier steps out by 50mm at 800mm below ground level.

The trial pit was excavated to a total depth of 1.3m. Within the depth of the pit we observed what appears to be an Ivy root has penetrated the joint between the pier and the wall panel. The growth of the root to a size of approximately 200mm high x 50mm wide has clearly increased the separation between the two elements.

The base of the foundation was not proven within the depth of the trial pit, which could not be safely excavated beyond a depth of 1300mm.

The rear of the wall steps out by 50mm at 800mm below ground level.

Inspection of the remaining piers along The Warren showed a similar separation between the piers below the horizontal clay pipe penetrations to the five northernmost piers. The remaining piers did not show any separation.

The wall is some 2.85m high on the Warren side, retaining approximately 600mm of soil from the allotments on the Caversham Court Gardens side. The separation of the piers reduces the stiffness of the wall and its ability to withstand lateral loads. There doesn't appear to be any significant distortion of the wall as a result of the absence of a mechanical connection between the piers and the wall. Nonetheless, the buttressing of the wall by

the inclusion of piers is part of the structural design of the wall and as such the mechanical connection between the piers and wall panels should be reinstated.

With regards to repairing the wall, the options are to excavate each of the piers on the side of The Warren, and rebuild the portions that are not toothed in with matching brickwork correctly bonded by brick interlock into the rear face of the wall panels.

The remedial works should be carried out to all piers irrespective of whether damage is currently showing or not, unless further inspections can show that they are adequately connected to the wall.

Tying the wall together by drilling through the piers on the CCG side and installing steel rods is an option, however the rods and connections must be sufficiently stiff to both carry compression and tension loads as wind action is reversible.



3. Vaults Beneath Pavement

Three joined vaults exist beneath the pavement leading from the gated entrance to the gardens, off of Church Road, down towards the river, below the eastern boundary wall.

When entering the vault via the gated entrance from the garden, the first vault is believed to have been a store, the second vault in to the South was a Boiler Room, which led to a coke passage that passed through the boundary wall to the Rectory next door.

The passage out from the Rectory has been bricked up and we understand the passage itself was backfilled in-behind the bricked up entrance.

The pavement is wide enough for vehicular traffic, although we understand that only pedestrian foot traffic and ride-on mowers are currently permitted to pass over the vaults.

The arch over vault one appears to be a single brick thick (215mm). There is a 240mm high upstand along the edge of deck over the vaults. By indirect measurement, we estimate that the deck is approximately 315mm thick over the crown of the arches, but the build-up of the deck is currently unknown.

Vault 1 (The Store) shows historic repairs to the intrados of the vaulted arch and a longitudinal crack along the centre of the arch, effectively creating hinge point. There are diagonal cracks extending from the junctions between the springing points of the arch and the front and rear vault walls, in to meet the crack along the intrados. There are also a number of loose bricks in the vicinity of the damage.

The crack patterns strongly suggests past overloading the arch structure. The damage is such that the load carrying capacity has been affected. Temporary measures are necessary to stabilise the arch to the Store pending repair / replacement. The pavement over the vault has been fenced off with Heras fencing and we understand that the Client has instructed propping to be installed to the failing arch.

As discussed on site with the Client and their maintenance contractor, three lines of four Acrow props should be installed with one line along the intrados of the arch and then a further line at each of the third points of the arch. Scaffold boarding should be provided top and bottom to spread the loads. The props should be braced in each direction with scaffold tubes and swivel couplers.





4. Western Boundary Wall – Severely Leaning Wall

The southern portion of the western boundary wall shows a significant lean and requires immediate intervention. On one side of the wall the land is occupied by the Reading Canoe Club, but is under the ownership of Reading Borough Council. It is not known who owns the land on the other side of the wall towards which the wall leans. The wall needs to be immediately propped on the adjoining owner's side with a system of raking timbers to provide temporary stabilisation.

The upper portion of the wall should be taken down, probably to the level of the bullnose brick course. This should be done along the full length of the wall within the adjoining owner's side and should extend up to, but not beyond, the second full height brick pier to the South of the gated entrance into the Canoe Club from the Warren, adjacent to an old timber door.



Please do not hesitate to contact us should you have any queries regarding this report.

Compiled by: Chris Olton CEng MICE

Reviewed by: Kenneth R Paul CEng MStructE

KRP CONSULTING ENGINEERS LTD



APPENDIX 4
CLIVEDON CONSERVATION WORKSHOP LTD REPORT
(Caversham Court Gardens – ‘Condition Survey’, April 2022)

Caversham Court Gardens

Condition Report

April 2022



East Boundary Wall & West Garden Wall Survey Report and Recommendations

Report prepared for

Reading Borough Council

CLIVEDEN CONSERVATION WORKSHOP LTD
THE TENNIS COURTS, CLIVEDEN ESTATE, TAPLOW
MAIDENHEAD, BERKSHIRE SL6 OJA

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CONDITION REPORT

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Job No.	Issue No.	Description	Issue Date
22054	1	Condition report	1 July 2022

PROJECT SUMMARY

REGION: London and South-East

PROPERTY: Caversham Court Gardens

LOCATION: Reading, Berkshire

OBJECT: East Boundary Wall & West Garden Wall

MATERIALS: Flint, Brick, Limestone, Mortar

SURVEYED BY: Amelia Morrison & Claudio Costantino

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1.0 INTRODUCTION

1.1 DESCRIPTION

The East Boundary Wall is made up of several different sections, each with a different style of construction:

1. Eight bays of flint panels, framed with dressed stone and buttresses, flanking the main gate, which was rebuilt in 2009.
2. An uninterrupted stretch of flint-built wall, featuring four lancet windows with brick surrounds, stone copings, and occasional gablets. On the west side at the southerly end, the lower portion of this wall is made up of brick courses.
3. Flint with brick lacing and edgings, stone copings.

On the internal, western side of this wall, a sloping path leads down through the gardens. On the external, eastern side, there are two large lime trees and one newly planted lime tree. The ground directly adjacent to sections 2 and 3 has been asphalted and marked up with blue badge parking bays to the north and forms the private driveway access to The Rectory to the south.

The West Garden Wall is built of brick with buttresses on both sides, a terracotta bullnose stringcourse, stone copings and an iron railing system running the whole length of the top of the wall. On the internal, eastern side there is evidence of the greenhouses which once stood against the wall; checks cut out of the brickwork, and metal eye fixings, some of which still support espaliered fruit trees. The northern section of land to the east is now allotments. The southern section, next to the river, is home to the Reading Canoe Club. On the external, western side, the buttresses house terracotta pipes which were once part of a greenhouse heating system. There are a number of large trees on this side, and the strip of land directly adjacent to the wall is used for parking.

2.0 CONDITION SUMMARY

2.1 EAST BOUNDARY AND WEST GARDEN WALL

2.1.1 East Boundary Wall - Section 1

Note: please reference drawing no. 002 for marked up repair items and areas.

Interior

Flint wall faces

- Historic vertical crack, previously made good, but appears to have continued movement. Left hand of panel pushing forward.
- Some mortar recession around flints – particularly the lower sections and where flints meet stone ashlar – approx. 20% overall.
- Ashlar dressings and buttresses –
- Approx 50% failed/open stone ashlar joints overall.
- 5no. stones cracked
- Several areas of spalling and delamination <1m2 total area.

Copings

- 2no. copings identified without drip.
- 1no. coping with damaged arris.

Exterior

Flint wall faces

- Panel A crack also evident from this side; Flints to the left are bulging and hollow sounding (approx. 1m2). Some flints loose towards the bottom.
- A large lime tree was previously encroaching on this section of wall but was removed in 2020.

- Three further areas of hollow sounding and bulging flints approx. 1.5m² total area. Very mossy with ivy-leaf toadflax growth indicating high moisture content.
- Ashlar dressings and buttresses –
- Approx 25% failed/open stone ashlar joints overall.
- 4no. stones cracked or sheared off.
- Several areas of spalling and delamination <1.5m² total area.
- South-most buttress stones have shifted forward approx. 20mm with visible void behind.

2.1.2 East Boundary Wall - Section 2

Note: please reference drawing nos. 003 for marked up repair items and areas.

Interior

Flint wall face

- This section of wall is leaning and curving significantly, in an 's' shape.
- Mortar is soft and easily raked out with a small tool.
- Small areas of recessed flint pointing across the whole wall face – approx. 15%.
- Extensive moss growth in several areas, indicating high moisture levels. Possibly caused by the wall leaning backwards, and water hitting and running down the face.

Brick wall face

- The lower brick portion of the wall features sections of modern repair/rebuild. 9no. bricks are recessed significantly.
- Some joints at ground level are open - <5%.

Copings

- The copings are significantly weathered, with pitted and troughed areas where water can collect on the sky-facing surfaces. They have been re-bedded and cut out to allow for exterior tree action. 4no. have lost arrisses. 2no. identified without drip. The wall is leaning to such an

extent that the projection of the coping from the wall face is no longer going to have any significant effect in throwing water away from the wall face.

Window openings

- Approx. 30 bricks in the reveals are significantly recessed. The pointing mortar is soft and easily raked out.
- Joints in cills all open
- Lime mortar render in reveals soft and cracking.
- Grey cement in glazing bar cracked and lifting. Fragments of green glass visible.
- Pointing mortar soft and easily raked out.
- Approx. 50% joints open, including 100% of cill joints.
- Extensive moss growth on cills indicating high moisture levels.

Gablet –

- 4no. bricks recessed significantly below capping stone.
- All brick joints to south-west corner open (approx. 0.5 linear metre)
- Crack running vertically through 3no. lowest bricks south-west corner.
- Crack running vertically through ashlar stone north-west corner.

Exterior

Flint wall face

- This section of wall is leaning and curving significantly, in an 's' shape.
- Large lime tree is encroaching on wall between windows 2 & 3 and coping has been cut to allow for burr.
- Mortar is soft and easily raked out with a small tool.
- The area at the centre of the lean, between windows 2 & 3 is bulging, hollow sounding, with loose flints and powdery mortar. The lean and curve of the wall are causing the flintwork to open.

Window openings

- This Stone jambs are loose in windows 2, 3 and 4. Left jamb has fallen from Window 4 and fragments are being stored by gardeners.

2.1.3 East Boundary Wall - Section 3

Note: please reference drawing no. 004 for marked up repair items and areas.

Interior

- 20no. recessed bricks
- Mortar soft and easy to rake out.
- Very little recession to mortar.
- 5no. new copings identified without drip.

Gable

- Stone spalling <0.5m²

External

Note: due to access restrictions it was not possible to make a visual survey of the external elevations.

2.1.4 West Garden Wall

Note: please reference drawing nos. 005 – 017 for marked up repair items and areas.

Interior

- Metal railings at the top of the wall are deteriorating, particularly at the northern end where there appears to have been some damage caused by trees on the external side.
- 75% brick joints above terracotta string course open.

- 4no. bricks missing from each buttress where greenhouses once engaged.
- 90% brick joints in plinth courses open.
- Approx. 60no. pieces of terracotta string course missing or damaged.
- Crack running vertically down centre of buttresses where iron fixings for espalier trees have blown bricks.
- Bricks in good condition <1% need replacing.
- Mortar moderately hard.

Exterior

- The wall is in fair condition with defects which are generally consistent across all bays and buttresses.
- The metal railing fixed to the copings is rusting and the sections at the Northern end have been severely damaged, possibly by trees which stand, or stood, on this side of the wall. The rust action is continuing to cause damage to the stone copings, and the brickwork where supporting bars are fixed at intervals in each bay.
- Many of the coping stones are cracked and/or missing arrisses, and >90% of the joints are missing mortar.
- The buttresses have some well-established vegetation growing from within the terracotta pipes and from empty joints in the chamfered brickwork at the top. This is causing some movement and loss in the chamfered brickwork.
- The four northernmost buttresses are showing some movement at their bases, where the brickwork is not engaged with the wall itself. These have moved forward by approx. 15-20mm leaving a void behind. This movement does not appear to have had any significant impact on the rest of the structure however.
- The buttress faces and flanks are in generally sound condition, with <5% of bricks requiring replacement, and <30% pointing needing replacing.
- The buttress plinth courses are missing approx. 90% mortar joints and have extensive mossy and other vegetative growth.
- The wall faces have a great deal of green organic staining, particularly towards the top, corresponding with the open coping joints.

- Bay 1, to the north, has a crack running vertically the whole height of the wall, between the garden door and buttress 1.
- There are various iron fixings across the wall faces which are rusting and causing the bricks to blow.
- There are several swathes of ivy creeping up the wall, although this does not seem to be well established in most areas.

3.0 RECOMMENDATIONS

Note: The following set of recommendations outline details for the proposed conservation and repair of the East Boundary and West Garden Wall following the on-site survey of the fabric in April 2022 by Cliveden Conservation. The following recommendations are to be read in conjunction with the survey drawings provided in Appendix A.

3.1 EAST BOUNDARY WALL – SECTION 1

Note: please reference drawing no. 002 for marked up repair items and areas.

Interior

Copings

- Remove all moss and vegetation from stones.
- Replace minimum 3 damaged / dripless copings
- Rake out and repoint 100% joints.

Flint wall face –

- Remove all vegetation.
- Remove mortar from repaired crack in Panel A and make good. Insert tell-tales for movement monitoring.
- Carefully rake out and repoint 20% of flint joints with lime mortar

Ashlar dressings and buttresses –

- Repoint all open joints (approx. 50%)
- Pin and make good 5no. cracked stones.
- Remove all loose and delaminating material and apply colour matched sheter-coat to consolidate stone face.

Exterior

Copings –

Note: See interior

Flint wall face –

- Remove all vegetation.
- Carefully dismantle areas of unstable flint, insert basalt bars and rebuild using lime mortar (approx. 2.5m² total area)
- Repoint open flint joints across wall face; approx. 20%
- Allow for 30no. flints to be re-bedded.

Ashlar dressings and buttresses

- Rake out and repoint all open joints (approx. 25%)
- Pin cracked stones and make good with lime mortar.
- Remove all loose and delaminated material and apply shelter-coat to consolidate stone face (approx. 1.5m² total area)
- Carefully dismantle shifting section of buttress to investigate structure. Rebuild and make good pending investigations.

3.2 EAST BOUNDARY WALL - SECTION 2

Note: please reference drawing no. 003 for marked up repair items and areas.

Interior and exterior

Structural Stability

- Because of the severe lean and unstable nature of this section of wall, we would recommend the consultation of a structural engineer and a geological survey to help formulate a suitable solution.
- In the short term, it has been recommended that the wall be propped from the exterior to prevent damage to persons or property; the instability is such that sections of flint could be expected to start falling in the next 6-12 months.

- It is our opinion that the section of the wall between from window 2 to approx. 1 m past window 4 should be carefully recorded, dismantled and rebuilt. Options such as wall ties, buttressing and metalwork within the window openings should be considered to aid increasing the structural integrity of the wall.

3.3 EAST BOUNDARY WALL - SECTION 3

Note: please reference drawing no. 004 for marked up repair items and areas.

Interior

- Replace defective bricks with like-for-like replacements
- Isolated areas of repointing to brick and flintwork.
- Allow for 45no. flints to be re-bedded.
- Insert drip edge into 4no. copings.
- Consolidate spalling stone on gablets with shelter-coat

3.4 WEST GARDEN WALL

Note: please reference drawing nos. 005 – 017 for marked up repair items and areas.

Interior

Note: due to occupation of the south-most section of the wall by the Reading Canoe Club, only a limited visual assessment of the wall face was possible. No major deterioration of the fabric was observed, although for a comprehensive assessment, arrangements would need to be made for the removal furniture and equipment.

Copings

Note: due to lack of high-level access to the wall head it will be necessary on commencement of works to review the condition of the coping stones. For the purposes of pricing works an allowance should be made for the

replacement of 40no. copings, the rebedding of 20no. copings and repointing of all the remaining joints.

Wall Faces

- Replace 60no. sections of terracotta string course
- Rake out and repoint 75% brick joints above string course
- Rake out and repoint 100% brick joints in plinth courses
- Rake out and repoint 30% brick joints in wall face
- Allow for 85 like-for-like brick replacements

Metal fixings

- Options for intervention:
 - Remove all iron fixings and make good brickwork. Investigate alternative espalier support techniques.
 - Remove only obsolete iron fixings, make good brickwork, treat remaining fixings with rust inhibitor
 - Leave all iron fixings in situ and treat with rust inhibitor.

Buttresses

- Make good 12no. chases in brickwork where greenhouses once stood (approx. 60 bricks) – up to boundary with canoe club.
- Rake out and repoint 30% brick joints

Exterior

- Remove all vegetation and organic growth by hand and with gentle steam cleaning.

Metal railing –

- A specialist metal conservator should be consulted to confirm suitability of works
 - Remove railings entirely and make good fixing points.
 - Remove severely damaged northern sections, make good fixing points, conserve and treat stable sections with rust inhibitor.
 - Replace severely damaged northern sections with new, conserve and treat remaining original sections with rust inhibitor.

Wall Faces –

- Pin vertical crack in bay 1 and make good.
- Allow for like-for-like replacement of approx. 120 defective bricks.

- Rake out and repoint open joints <30%
- Remove obsolete iron fixings make good all holes and defects, subject to recommendations by metal conservator and/or historical significance designated by appropriate authorities.

Buttresses –

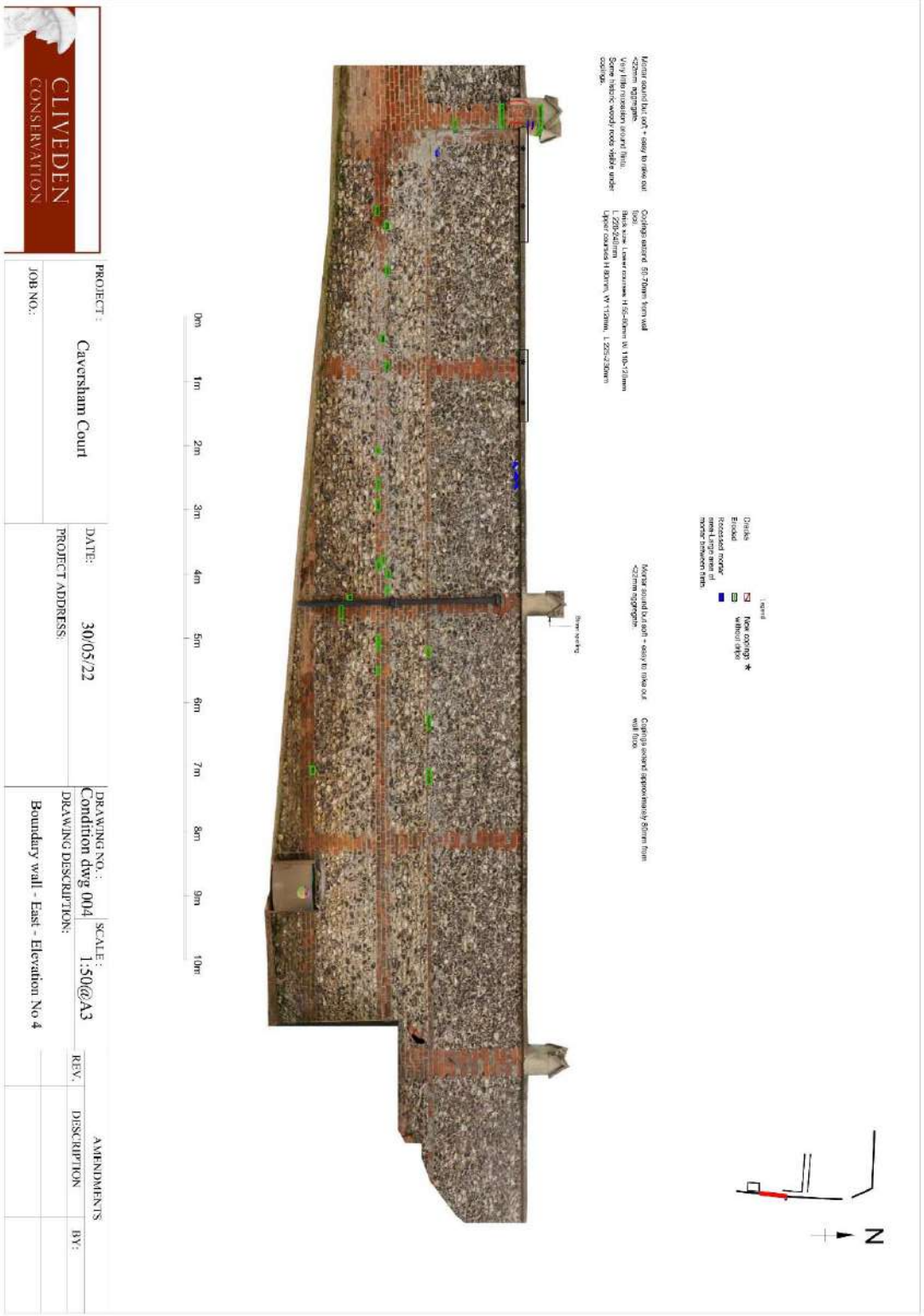
- Replace approx. 70no. defective bricks to tops and plinths and repoint 100%.
- Rake out open joints and repoint <30%
- Make good gaps behind lower sections of buttresses 1-4 with lime mortar and insert tell-tales to monitor movement.
- Cap terracotta pipes to prevent ingress of vegetation.

4.0 APPENDICES

APPENDIX A









PROJECT :

Caversham Court

JOB NO.:

DATE:

30/05/22

PROJECT ADDRESS:

Church Rd, Reading RG4 7AD

DRAWING NO.:

Condition dwg 005

SCALE:

Scale 1:30@A3

DRAWING DESCRIPTION:

The Warren Boundary wall - Car Park side Elevation 1

REV.

DESCRIPTION

BY:

- ① Crack extending full height of wall

② Large area of recessed pointing

③ Sky facing joints recessed
- 0m

1m

2m

3m

4m

5m



- All pinnis need re-pointing 100%

Legend

Cracks

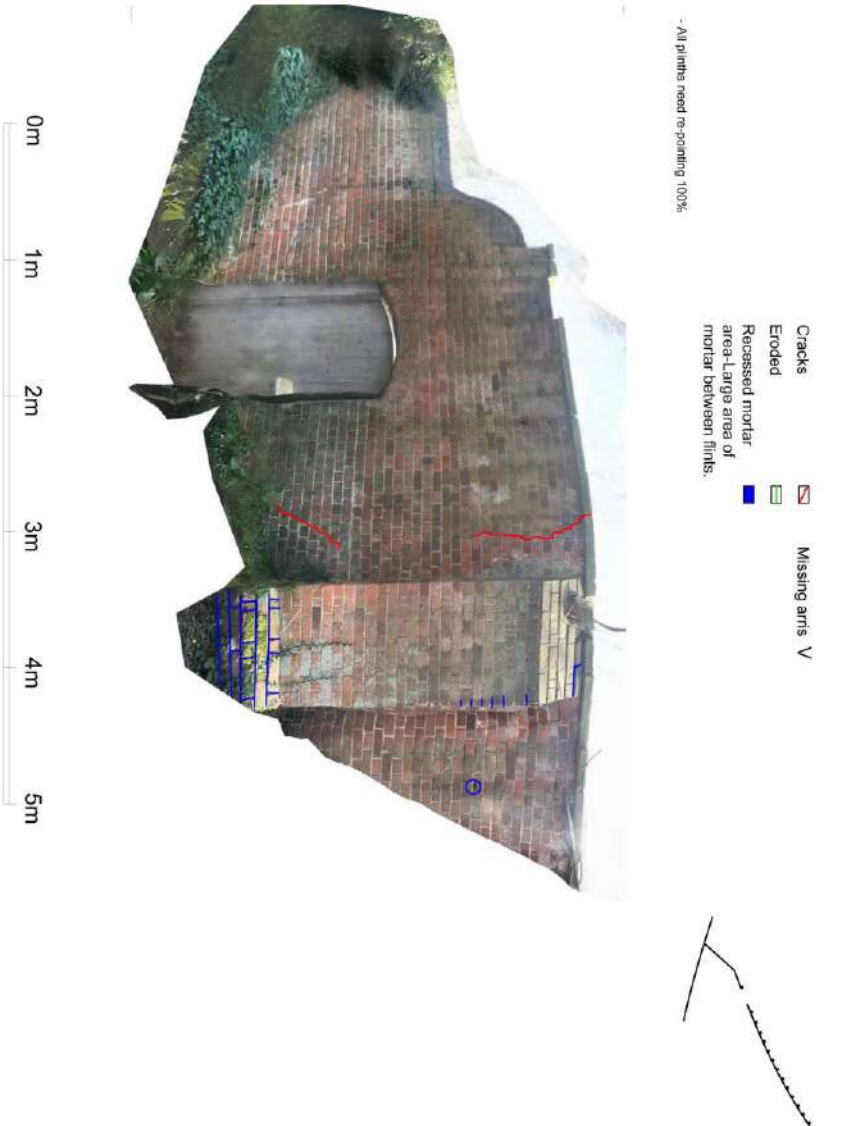
Missing annis V

Eroded

Recessed mortar area-Large area of mortar between flints.



PROJECT :	Caversham Court		DATE:	30/05/22	DRAWING NO. :	SCALE :	AMENDMENTS		
JOB NO.:			PROJECT ADDRESS:	Church Rd, Reading RG4 7AD	Condition dwg 006	Scale 1:30@A3			
					DRAWING DESCRIPTION:		REV.	DESCRIPTION	BY:
					The Warren Boundary wall - Car Park side Elevation 2				

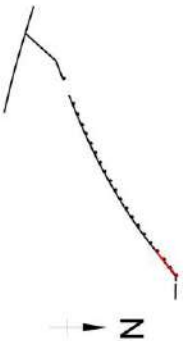


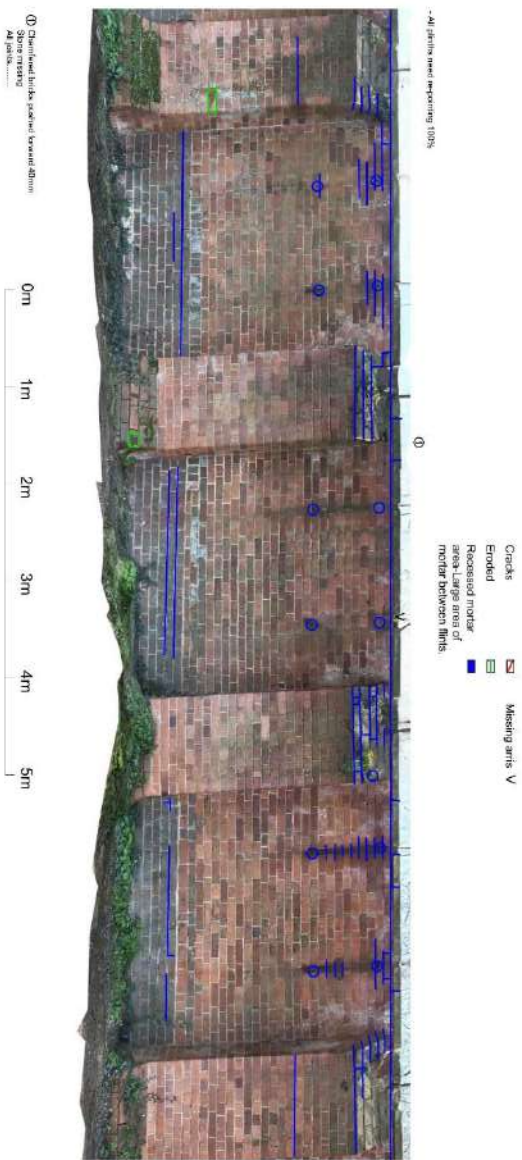
PROJECT : Caversham Court		DATE: 30/05/22	DRAWING NO. : Condition dwg 007	SCALE : Scale 1:40@A3	AMENDMENTS		
JOB NO:		PROJECT ADDRESS: Church Rd, Reading RG4 7AD	DRAWING DESCRIPTION: The Warren Boundary wall - Car Park side Elevation 3		REV.	DESCRIPTION	BY:

- ① Metal fixing rubbing + existing bricks
- ② Bricks missing surface joints
- ③ Lower section of wall has been moved forward approximately 15mm



- All joints need re-pointing 100%
- Old metal fixing showing bricks
- Mortar bed
- Cracks
- Eroded
- Recessed mortar areas - Large area of mortar between flights.
- Missing bricks V





CLIVEDEN CONSERVATION	
PROJECT : Caversham Court	
DATE: 30/05/22	DRAWING NO.: SCALE: 1:40@A3
PROJECT ADDRESS: Church Rd, Reading RG4 7AD	DRAWING DESCRIPTION: Condition dvrg 010
JOB NO.:	REV. DESCRIPTION BY:
	The Warren Boundary wall - Car Park side Elevation 6

PROJECT:	Caversham Court	DATE:	30/05/22	DRAWING NO.:	Condition dwg 011	SCALE:	Scale 1:40 @ A3	REV.	DESCRIPTION	BY:
JOB NO.:	Church Rd, Reading RG4 7AD	PROJECT ADDRESS:		DRAWING DESCRIPTION:	The Warren Boundary wall - Car Park side	Elevation 7				



PROJECT:	Caversham Court		DRAWING NO.:		SCALE:	AMENDMENTS	
	DATE:	30/05/22		Condition dwg 012	Scale 1:40@A3		
	PROJECT ADDRESS:	Church Rd, Rensding RG4 7AD		DRAWING DESCRIPTION:	The Warren Boundary wall - Car Park side Elevation 8		
JOB NO.:			REV.	DISCUSSION	BY:		





CLIVEDEN

CONSERVATION

PRODUCT:

Caversham Court

DATE:

30/05/22

DRAWING NO.:

Condition dwg 013

SCALE:

Scale 1:40@A3

JOB NO.:

Church Rd, Reading RG4 7AD

DRAWING DESCRIPTION:

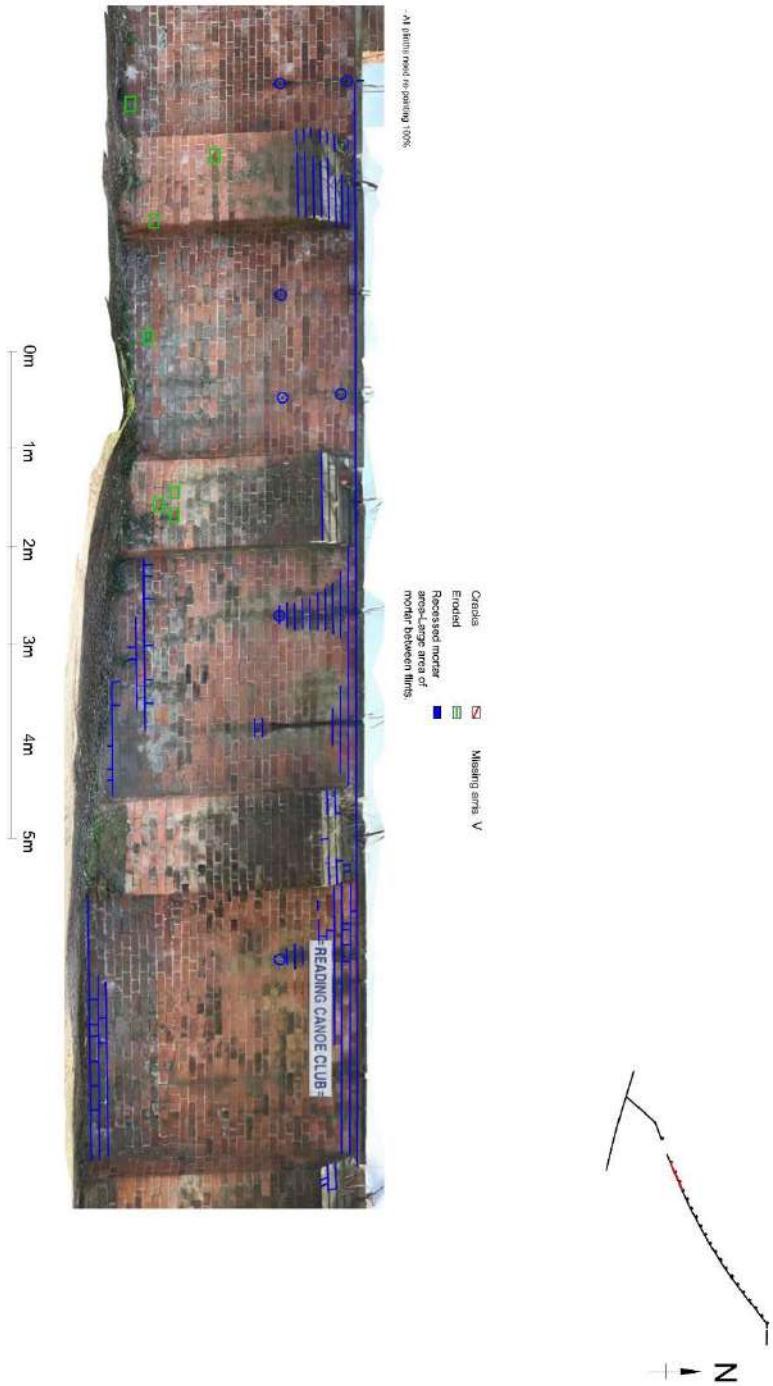
The Warren Boundary wall - Car Park side

REV.

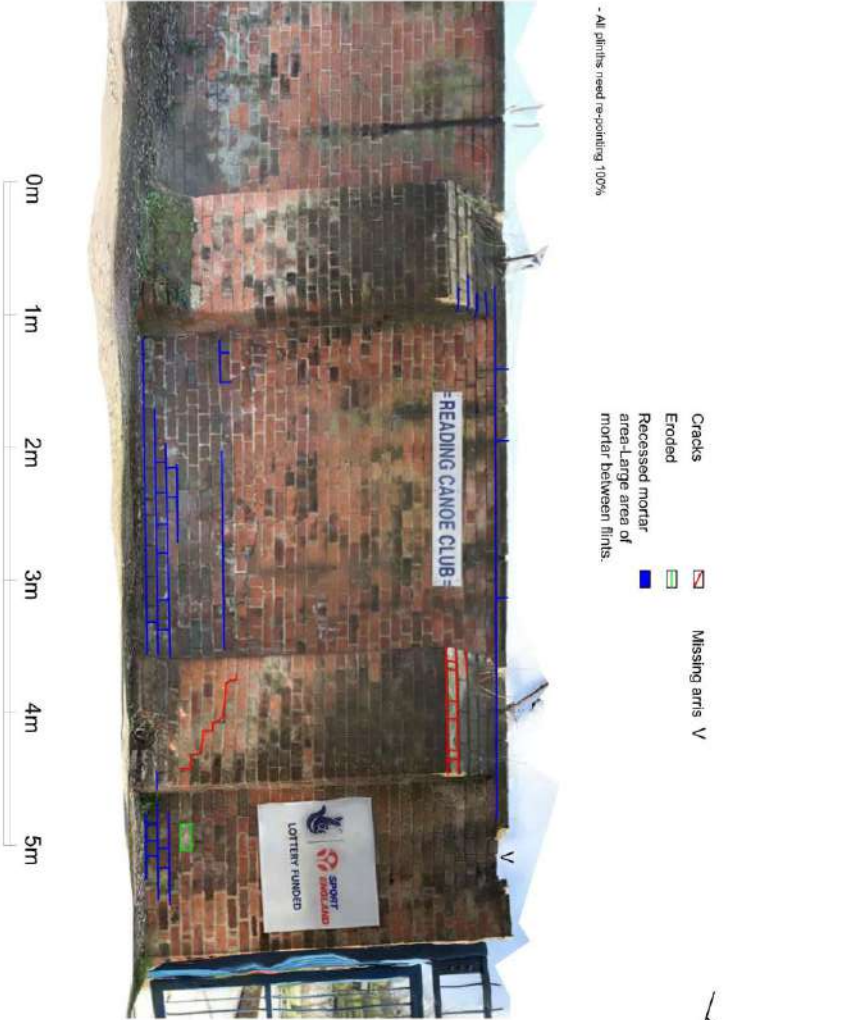
DESCRIPTION

BY:

AMENDMENTS



PROJECT :		DATE:		DRAWING NO. :		SCALE:		AMENDMENTS	
Caversham Court		30/05/22		Condition dwg 014		Scale 1:30@A3		REV.	DESCRIPTION
JOB NO.:		PROJECT ADDRESS:		DRAWING DESCRIPTION:		BY:			
		Church Rd, Reading RG4 7AD		The Warren Boundary wall - Car Park side Elevation 10					





DRAFT



**APPENDIX 5
MATERIAL DATA SHEETS**



Microtech Biocide

DRY ROT TREATMENT



SPECIAL PROPERTIES

- Unique micro emulsion system.
- Instantaneous action against dry rot.
- Deep penetration in masonry.
- Non-flammable.
- HSE 1 Hour re-entry classification.

DESCRIPTION

Microtech Biocide is a unique formulation containing 'Polyphase' (a carbonate fungicide) for the control of dry rot (*Serpula lacrymans*) in walls and the removal and prevention of moulds, algae, mosses and lichens from interior/exterior surfaces. The special properties of this unique micro emulsion system give fast action and excellent absorption rates in walls when sprayed or injected.

Approved under the Control of Pesticides Regulations 1986.

FOR USE ONLY BY PROFESSIONAL OPERATORS FOR USE ONLY AS A SURFACE BIOCIDES



PRODUCT DATA

Appearance

Clear, straw coloured liquid.

Coverage

1 litre/2.5m², 10 litres/m³ (diluted solution).

Shelf Life

Concentrate: 12 months in sealed containers Dilute solution: Use within one month of preparation

Storage

Protect concentrate and dilute solution from extremes of temperature (store at 5° - 25° C). Keep away from food, drink and animal feeding stuffs. Keep out of reach of children.

Packaging

1 litre containers only
(makes 25 litres diluted)

Cleaning

All equipment should be thoroughly cleaned and rinsed out in water after use (keep for subsequent dilutions or dispose of safely). Wash hands and exposed skin before and after use.

Safety

Concentrate – Irritating to eyes and skin (not classified after dilution). Certain statutory regulations apply to this product – read the label before use (and see above). More detailed information for hazard assessment, emergency procedures, etc. are available in the Microtech Biocide

Material Safety Data Sheet.

Treatments prior to painting/mould control PREPARATION AND APPLICATION

Removal of all organic growth from plaster and masonry surface is an essential pre-requisite for the successful performance of decorative coatings. For Exterior Coatings proceed as above. For interior work, most traces of mould, algae, etc. should be removed initially by normal cleaning methods, followed by an application of Microtech Biocide solution. On relatively non-porous surfaces such as painted plaster or ceramic tiles the application rate can be reduced and the treating solution applied by fine mist spray.

N.B. Mould etc. colonies can cause damage to underlying substrates (paint, wallpaper). Care should be taken to ensure damaged decorations are removed prior to treatments and/or new coatings being applied.

FINISHING

As soon as the surface is dry the decorative finish can be applied. Advice on suitable paints and their application can be obtained from the Wykamol Technical Department.

TECHNCIAL INFORMATION

This data sheet is intended for the use of Professional remedial operators and is Compiled accordingly. Further guidance On the use of masonry biocides as part of a strategy for the control of dry rot can Be found in Remedial timber treatment in Buildings (HSE Books, ISBN 0-11-885987-0) And the BWPDA Code of Practice for Remedial Timber Treatments. In the area Of external biocide treatments, consult BRE Digest 370.

For further advice on the Use of Wykamol products, contact the Technical Department.



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www.wykamol.com

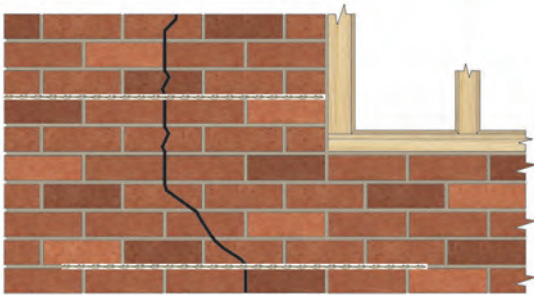


Crack Stitching

A reliable and cost-effective means of repairing and stabilising cracked masonry

Applications

- Rapid and permanent solution to cracked masonry
- Suitable for all forms of masonry structure



Over 100 standard repair specifications are available online, covering all common structural faults.
Relevant Repair Details: RDs CS01 to CS14



For full Product Information, Case Studies and downloadable Repair Details go to:

www.helifix.co.uk/products/remedial-products/crack-stitching/



Features

- Fully concealed, non-disruptive repair solution
- More reliable than crack injection methods
- HeliBond cementitious grout is injectable and rapidly produces high compressive strength
- HeliBars and HeliBond grout combine to create excellent tensile strength within the masonry
- No additional stresses are introduced during installation
- Masonry remains flexible enough to accommodate normal building movement
- Tensile loads are redistributed
- Reduces likelihood of further cracking nearby
- Avoids costly and disruptive taking down and rebuilding



HeliBar is inserted into HeliBond grout within a cut slot

Installation Procedures

1. HeliBar to be long enough to extend a minimum of 500mm either side of the crack or 500mm beyond the outer cracks if two or more adjacent cracks are being stitched using one rod.
2. Where a crack is less than 500mm from the end of a wall or an opening, the HeliBar is to be continued for at least 200mm around the corner and bonded into the adjoining wall or bent back and fixed into the reveal, avoiding any DPC.
3. For solid masonry in excess of 300mm thick and in a cavity wall where both leaves are cracked, the wall must be crack stitched on both sides.
4. If there is render, this thickness must be added to the depth of slot. Crack stitching must be installed in the masonry and never in the render.
5. Ensure the masonry is well wetted or primed to prevent premature drying of the HeliBond due to rapid de-watering, especially in hot conditions. Ideally additional wetting of the slot should be carried out 1 to 2 minutes prior to injecting the HeliBond grout.
6. Do not use HeliBond when the air temperature is +4°C and falling or apply over ice. In all instances the slot must be thoroughly damp or primed prior to injection of the HeliBond grout.



1. Rake out or cut slots into the horizontal mortar beds, a minimum of 500mm either side of the crack



4. Using the HeliBar Insertion Tool, push one HeliBar into the grout to obtain good coverage



2. Clean out slots and flush with clean water and thoroughly soak the substrate within the slot



5. Insert a further bead of HeliBond over the exposed HeliBar, finishing 12mm from the face, and 'iron' firmly into the slot using the HeliBar Insertion Tool



3. Using the Helifix Pointing Gun, inject a bead of HeliBond along the back of the slot



6. Re-point the mortar bed and make good the vertical crack with CrackBond TE3

Slot Depth and Spacing

	Single skin/ Cavity wall	Solid Masonry		
		Up to 102.5mm	102.5mm to 225mm	Over 225mm
Depth of slot	25 – 35mm	25 – 40 mm	25 – 40 mm	25 – 40mm On both sides
Vertical Spacing	Every 4 – 6 courses, 300 – 450mm			

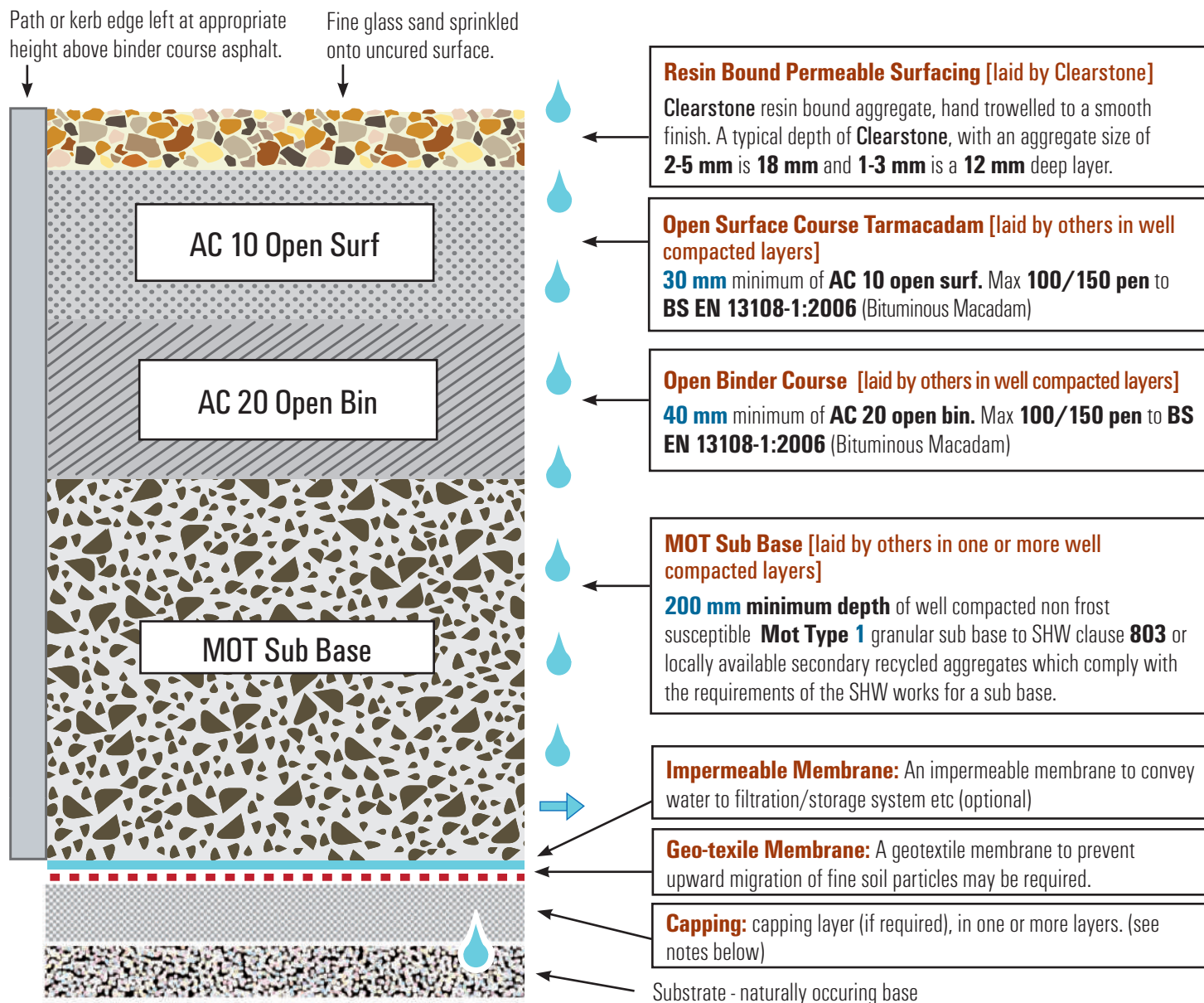
Technical Specifications

Material:	Austenitic stainless steel Grade 304 (1.4301) or 316 (1.4401)
Diameter:	6mm (or 4.5mm for thin mortar joints)
Tensile strength (6mm HeliBar):	10 kN
0.2% Proof stress (6mm HeliBar):	900 N/mm ²
Length:	To extend 500mm either side of the crack or outer cracks, if more than one
Standard lengths:	1m, 1.5m and 2m – in packs of 10. May be cut to length on site
Height of slot:	Full height of mortar bed or approx. 10mm if cut through the masonry unit
Bonding agent:	HeliBond cementitious grout. 1 x 3ltr HeliBond = 10 linear metres of crack stitching
RECOMMENDED TOOLING	
For cutting slot up to 40mm deep:	Twin-bladed cutter with vacuum attachment or angle grinder or hammer and mortar chisel
For mixing HeliBond grout:	3-jaw-chuck drill with mixing paddle
For injection of HeliBond into slots:	Helifix Pointing Gun CS with mortar nozzle
For smoothing pointing:	Standard finger trowel
For inserting HeliBar:	HeliBar Insertion Tool

Spec 5.

Specification advice for a resin bound surfacing system (surface dressing)

Urban Permeable Public Paving - occasional maintenance vehicles & SuDS compliant



Please note: New asphalt and concrete surfaces need a minimum of two weeks curing time, before resin bound paving can be laid upon it.

Tel: 01273 358 177 www.clearstonepaving.co.uk



Planning Permission SuDS: Resin bound surfacing creates an attractive, permeable and durable surface which avoids the need for planning permission under the 2008 SuDS Planning Order 1998 on the paving of front gardens. NOTES:

- If there is a probability of standing water, then this may soften the substrate, therefore a nominal fall to an out-fall or soakaway should be considered.
- If water recycling is a requirement then an impermeable membrane should be used in conjunction with a water harvesting system
- Areas that could be trafficked by heavy vehicles should have layers designed according to Highways Agency requirements.
- If the substrate is silty, then this may need to be stabilised or partially removed and replaced with sub-base/granular capping, in accordance with Highways Agency design manual for roads and bridges.
- The maximum deviation of the binder course should not exceed 3mm under a 1m straight edge.
- Total sub-base thickness will be dependant on expected loading, water storage capacity, and sub-base strength.
- **This specification is based on normal good practice for resin bound surfacing, and does not absolve the specifier from designing a base construction suitable for the expected loadings of traffic and ground conditions existing on a given site.**

Disclaimer: Whilst Clearstone Paving Ltd. endeavours to ensure that advice, specifications, recommendations and information given is correct, it cannot have control over how substrates constructed by others are done and will not accept liability, directly or indirectly, arising from poor workmanship.

Any advice, recommendation or information given by Clearstone Paving Ltd. is based on practical experience and is believed to be accurate at the time of publication, no liability or responsibility of any kind including liability for negligence is accepted in this respect by the company.

The figures quoted do not constitute a specification, they represent typical values obtained for the substrate of the product.

Product design and specifications are subject to change without further notice.

Updated April 2021 v8

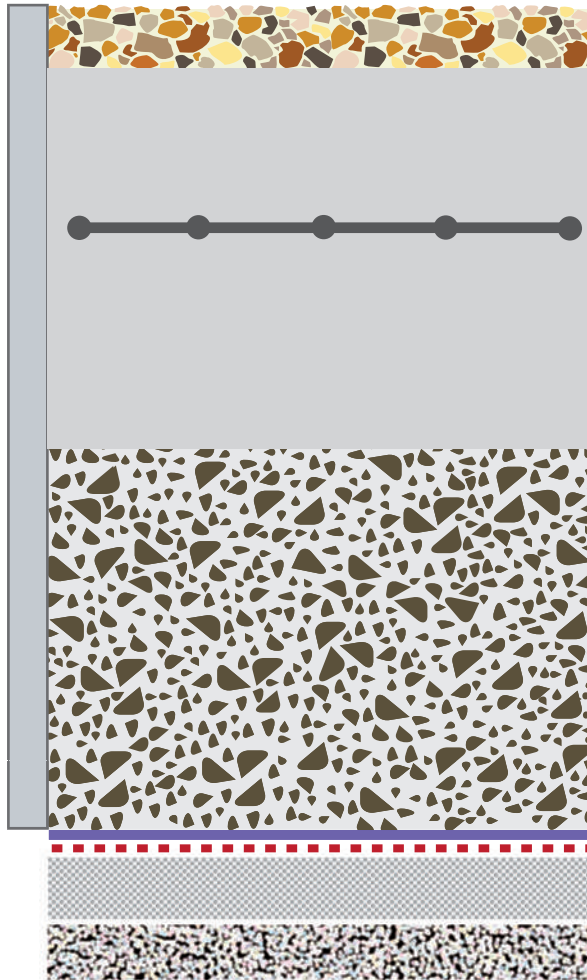
Spec 6.

Specification advice for a resin bound surfacing system (surface dressing)

New Concrete Private Driveway base (non-porous)

Path or kerb edge left at appropriate height above binder course asphalt.

Fine glass sand sprinkled onto uncured surface.



Resin Bound Permeable Surfacing [laid by Clearstone]

Clearstone resin bound aggregate, hand trowelled to a smooth finish. A typical depth of Clearstone, with an aggregate size of 2-5 mm is 18 mm and 1-3 mm is a 12 mm deep layer.

Steel reinforcing (optional)

Concrete base [laid by others]

New concrete base laid to a depth of 150-250mm minimum, to conform to BS EN 206-1 and BS 8900-2.
Laid with 12mm steel reinforcing sheets (optional)

MOT Sub Base [laid by others in one or more well compacted layers]

170-230mm minimum depth of well compacted non frost susceptible Mot Type 1 granular sub base to SHW clause 803 or 4/40mm, 4/20mm graded crushed concrete aggregate to EN12620 or locally available secondary or recycled aggregates which comply with 2/6.3 graded crushed concrete aggregate to EN12620

Impermeable Membrane: An impermeable membrane to convey water to infiltration/storage system etc (optional)

Geo-textile Membrane: A geotextile membrane to prevent upward migration of fine soil particles may be required.

Capping: capping layer (if required), in one or more layers. (see notes below)

Substrate - naturally occurring base

Please note: New asphalt and concrete surfaces need a minimum of two weeks curing time, before resin bound paving can be laid upon it.

Tel: 01273 358 177 www.clearstonepaving.co.uk



Planning Permission SuDS: Resin bound surfacing creates an attractive, permeable and durable surface which avoids the need for planning permission under the 2008 SuDS Planning Order 1998 on the paving of front gardens. NOTES:

- If there is a probability of standing water, then this may soften the substrate, therefore a nominal fall to an out-fall or soakaway should be considered.
- If water recycling is a requirement then an impermeable membrane should be used in conjunction with a water harvesting system
- Areas that could be trafficked by heavy vehicles should have layers designed according to Highways Agency requirements.
- If the substrate is silty, then this may need to be stabilised or partially removed and replaced with sub-base/granular capping, in accordance with Highways Agency design manual for roads and bridges.
- The maximum deviation of the binder course should not exceed 3mm under a 1m straight edge.
- Total sub-base thickness will be dependant on expected loading, water storage capacity, and sub-base strength.
- **This specification is based on normal good practice for resin bound surfacing, and does not absolve the specifier from designing a base construction suitable for the expected loadings of traffic and ground conditions existing on a given site.**

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Updated April 2021 v8

PRODUCT DATA SHEET

Sikaflex® PRO-3

Polyurethane sealant for floor joints and civil engineering applications

PRODUCT DESCRIPTION

Sikaflex® PRO-3 is a 1-part, polyurethane, tough, coloured, elastic joint sealant for sealing many types of joint configurations in floors and civil engineering structures. It provides a waterproof seal with good mechanical properties, is resistant to chemicals and remains elastic over a wide range of temperatures.

USES

Horizontal and vertical interior and exterior sealing joint applications:

- Food industry
- Cleanrooms
- Sewage treatment plants
- Tunnels

Sealing horizontal and vertical joints for:

- Floors
- Pedestrian and traffic areas
- Car park parking decks
- Warehouse and production floor areas

CHARACTERISTICS / ADVANTAGES

- Movement capability $\pm 35\%$
- Good mechanical and chemical resistance
- Bubble-free curing
- Over-paintable
- Good adhesion to defined construction materials
- Very low emissions

ENVIRONMENTAL INFORMATION

- Conformity with LEED v4 EQc 2: Low-Emitting Materials
- VOC emission classification GEV-Emicode EC1^{PLUS}, license number 3206/20.10.00

APPROVALS / STANDARDS

- CE Marking and Declaration of Performance to EN 15651-4 - Sealants for non-structural use in joints in buildings - Sealants for pedestrian walkways. Classification: PW EXT-INT CC 25 HM
- CE Marking and Declaration of Performance to EN 14188-2 - Joint fillers and sealants - Cold applied joint sealants
- Chemical Resistance. DIN EN 14187, SKZ, Test report No. 127980/17-IV
- Performance Test EN 15651-4, SKZ, Report, 94931/11-I-E
- Biological Resistance, ISO 846, Fraunhofer, Certificate, No SI 1103-544
- Cold applied sealants, EN 14188-2, SKZ, Report, No 94931/11-IV
- Determination of staining, ASTM C 1248-04, SKZ, Report, No 98947/11-V
- Determination of staining, ISO 16938-1, SKZ, Report, No 98947/11-II
- ISO 11600 F-class 25 HM, SKZ, Report, No 94931/11-II
- Standard specification for elastic joint sealants, ASTM C920-11 Class 35, ASTM, Report, No 0314920-SIKA
- Migration behaviour EN 1186, EN 13130, CEN/TS 14234, ISEGA, Certificate No. 48644 U 18
- Outgassing TVOC, CSM procedures, Fraunhofer, Certificate, No SI 1103-544
- Resistance against diesel and jet fuel, DIBt Guidelines, SKZ, Test report No. 94931/11-V
- Sealants in waste water systems, DIBt Guidelines, SKZ, Report, No 94931/11-III



PRODUCT INFORMATION

Chemical Base	Polyurethane i-Cure® Technology	
Packaging	300 ml cartridge	12 cartridges per box
	600 ml cylindrical foil pack	20 foil packs per box
	Refer to current price list for packaging variations	
Colour	Colour range to be defined by local sales organisation	
Shelf Life	15 months from date of production	
Storage Conditions	The product must be stored in original, unopened and undamaged sealed packaging in dry conditions at temperatures between +5 °C and +25 °C. Always refer to packaging.	
Density	~1,35 kg/l	(ISO 1183-1)
Product Declaration	EN 15651-4: PW EXT-INT CC 25 HM EN 14188-2 - Joint fillers and sealants - Cold applied joint sealants	

TECHNICAL INFORMATION

Shore A Hardness	~37 (after 28 days)	(ISO 868)
Secant Tensile Modulus	~0,60 N/mm ² at 100 % elongation (+23 °C) ~1,10 N/mm ² at 100 % elongation (-20 °C)	(ISO 8339)
Elastic Recovery	~90 %	(ISO 7389)
Elongation at Break	~600 %	(ISO 37)
Tear Propagation Resistance	~8,0 N/mm	(ISO 34)
Movement Capability	± 25 % ± 35 %	(ISO 9047) (ASTM C 719)
Chemical Resistance	For chemical resistance refer to the following report: Chemical Resistance. DIN EN 14187, Sikaflex® PRO-3 (SL), SKZ, Report, 127980/17-IV For resistance against water and salt water refer to the following report: Performance Test EN 15651-4, Sikaflex® PRO-3, SKZ, Report, 94931/11-I-E	
Service Temperature	-40 °C to +70 °C	

Joint Design

The joint width must be designed to suit the movement capability of the sealant. The joint width must be ≥ 10 mm and ≤ 40 mm. A width to depth ratio of 1:0,8 must be maintained (for exceptions, see table below).

Typical joint widths for joints between concrete elements for interior applications

Joint distance [m]	Minimum joint width [mm]	Minimum joint depth [mm]
2	10	10
4	10	10
6	10	10
8	15	12
10	18	15

Typical joint widths for joints between concrete elements for exterior applications

Joint distance [m]	Minimum joint width [mm]	Minimum joint depth [mm]
2	10	10
4	15	12
6	20	17
8	28	22
10	35	28

All joints must be correctly designed and dimensioned in accordance with the relevant standards and codes of practice before their construction. The basis for calculation of the necessary joint widths are the type of structure, dimensions, technical values of the adjacent building materials, joint sealing material and the specific exposure of the building and the joints. For larger joints, contact Sika® Technical Services for additional information.

APPLICATION INFORMATION

Consumption	Joint length [m] per 600 ml	Joint width [mm]	Joint depth [mm]
	6	10	10
	3,3	15	12
	1,9	20	16
	1,2	25	20
	0,8	30	24
Backing Material	Use closed cell, polyethylene foam backing rod		
Sag Flow	0 mm (20 mm profile, +50 °C)		(ISO 7390)
Ambient Air Temperature	+5 °C min./+40 °C max.		
Substrate Temperature	+5 °C min./+40 °C max. Minimum +3 °C above dew point temperature		
Curing Rate	~3,5 mm/24 hours (+23 °C / 50 % r.h.) * Sika Corporate Quality Procedure		(CQP* 049-2)
Skin Time	~60 minutes (+23 °C / 50 % r.h.)		(CQP 019-1)
Tooling Time	~50 minutes (+23 °C / 50 % r.h.)		(CQP 019-2)

VALUE BASE

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

FURTHER DOCUMENTS

- Pre-treatment Sealing and Bonding Chart
- Sika® Method Statement: Joint Sealing
- Sika® Method Statement: Joint Maintenance, Cleaning and Renovation

LIMITATIONS

- Sikaflex® PRO-3 can be over-painted with most conventional facade paint coating systems. However, paints must first be tested to ensure compatibility by carrying out preliminary trials (e.g. according to ISO technical paper: Paintability and Paint Compatibility of Sealants). Optimum results are obtained when the sealant is allowed to fully cure first. Note: non-flex-

ible paint systems may impair the elasticity of the sealant and lead to cracking of the paint coating. Depending on type of paint used, plasticiser migration may occur causing the paint to become surface 'tacky'.

- Colour variations may occur due to the exposure in service to chemicals, high temperatures and/or UV-radiation (especially with white colour shade). This effect is aesthetic and does not adversely influence the technical performance or durability of the product.
- For application on reconstituted, cast or natural stone, preliminary trials must be carried out to check if the stone experiences plasticiser migration. For a suitable primer to prevent plasticiser migration, contact Sika® technical services.
- Do not use on bituminous substrates, natural rubber, EPDM rubber or on any building materials which might leach oils, plasticisers or solvents that could degrade the sealant.
- Do not use to seal joints in and around swimming pools.
- Do not expose uncured Sikaflex® PRO-3 to alcohol

containing products as this may interfere with the curing reaction.

ECOLOGY, HEALTH AND SAFETY

User must read the most recent corresponding Safety Data Sheets (SDS) before using any products. The SDS provides information and advice on the safe handling, storage and disposal of chemical products and contains physical, ecological, toxicological and other safety-related data.

APPLICATION INSTRUCTIONS

SUBSTRATE PREPARATION

The substrate must be clean, dry, sound and free from oils, grease, dust, cement laitance and loose or friable particles.

Removal techniques such as wire brushing, grinding, grit blasting or other suitable mechanical tools can be used.

Damaged joint edges can be repaired with suitable Sika repair products

Where joints in substrate are saw cut: after sawing, all slurry material must be flushed away and joint surfaces allowed to dry.

All dust, loose and friable material must be completely removed from all surfaces before application of any activators, primers or sealant.

For optimum adhesion, joint durability and critical, high performance applications such as joints on multi-storey buildings, highly stressed joints, extreme weather exposure or water immersion / exposure, the following priming and/or pre-treatment procedures must be followed:

Non-porous substrates

Aluminium, anodised aluminium, stainless steel, PVC, galvanised steel, powder coated metals or glazed tiles: slightly roughen surface with a fine abrasive pad.

Clean and pre-treat using Sika® Aktivator-205 applied with a clean cloth.

Before sealing, allow a waiting time of > 15 minutes (< 6 hours).

Other metals, such as copper, brass and titanium-zinc: clean and pre-treat using Sika® Aktivator-205 applied with a clean cloth. After a waiting time of > 15 minutes (< 6 hours). Apply Sika® Primer-3 N applied by brush.

Before sealing, allow a waiting time of > 30 minutes (< 8 hours)

PVC has to be cleaned and pre-treated using Sika® Primer-215 applied with a brush. Before sealing, allow a waiting time of > 30 minutes (< 8 hours).

Porous substrates

Concrete, aerated concrete and cement-based renders, mortars and bricks surfaces must be primed using Sika® Primer-3 N or Sika® Primer-210 applied by brush.

Before sealing, allow a waiting time of > 30 minutes (< 8 hours).

Adhesion tests on project specific substrates must be performed and procedures agreed with all parties before full project application.

Note: Primers and activators are adhesion promoters and not an alternative to improve poor preparation / cleaning of the joint surface. Primers also improve the long-term adhesion performance of the sealed joint. Contact Sika® Technical Services for additional information.

MIXING

1-part ready to use

APPLICATION METHOD / TOOLS

Strictly follow installation procedures as defined in method statements, application manuals and working instructions which must always be adjusted to the actual site conditions.

Masking

It is recommended to use masking tape where neat or exact joint lines are required. Remove the tape within the skinning time after finishing.

Joint Backing

After the required substrate preparation, insert a suitable backing rod to the required depth.

Priming

If required, prime the joint surfaces as recommended in substrate preparation. Avoid excessive application of primer to avoid causing puddles at the base of the joint.

Application

Sikaflex® PRO-3 is supplied ready to use.

Prepare the end of the foil pack or cartridge, insert into the sealant gun and fit the nozzle. Extrude Sikaflex® PRO-3 into the joint ensuring that it comes into full contact with the sides of the joint and avoiding any air entrapment.

Finishing

As soon as possible after application, sealant must be firmly tooled against the joint sides to ensure adequate adhesion and a smooth finish.

Use a compatible tooling agent (e.g. Sika® Tooling Agent N) to smooth the joint surface. Water can be used. Do not use tooling products containing solvents.

CLEANING OF TOOLS

Clean all tools and application equipment with Sika®

Remover-208 immediately after use. Hardened material can only be removed mechanically. For cleaning skin, use Sika® Cleaning Wipes-100.

LOCAL RESTRICTIONS

Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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Product Data Sheet

Sikaflex® PRO-3
July 2021, Version 03.03
020515010000000011

SikaflexPRO-3-en-GB-(07-2021)-3-3.pdf

Dry rot treatment

PREPARATION

All bats are protected under the Wildlife and Countryside Act. Rectify the defects contributing to the damp conditions which caused the outbreak (e.g. repair rain water drainage systems, roof leaks, etc. Improve sub-floor ventilation, install DPC).

Expose the full extent of the outbreak, including a margin of clearance beyond the last visible signs of growth in all directions, remove all mycelium, built-in timber lintels, wall plates, bonding timbers and plugs from the affected walls and clearance areas and dispose of by burning. N.B. If it is considered impractical to remove all timber from infected walls etc., it may be possible to protect the in-situ depending on the precise conditions prevailing etc. For further advice, consult the Wykamol Technical Department.

Dilution - In a clean plastic drum add one litre of concentrate to 24 litres of clean water (makes 25 litres of final solution; rinse container prior to disposal). Once diluted, the Microtech Biocide solution remains stable for at least 7 days but should be agitated before use after lengthy storage. Drums of diluted material must be clearly labelled with the HSE number etc. Before starting work ensure the following statutory precautions are observed.

Wear suitable protective clothing (coveralls) and synthetic rubber/PVC gloves plus eye protection when diluting or spraying overhead. Avoid excessive contamination of overalls and launder regularly. Cover water storage tanks before application. Do not breathe spray mist. When using, do not eat, drink or smoke. Do not contaminate watercourses or ground. Prevent any surface run-off from entering drains. Dispose of waste material or container safely.

APPLICATION

Walls

Walls should be treated in depth with diluted Microtech Biocide at the rate of 10 litres per m³ of brickwork masonry.

4.5" (115mm) brick walls can normally be treated by generous low pressure spray application (at 1 litre per 2m²) to both sides of the wall. Thicker walls will need to be drilled at approximately 230mm staggered intervals over the area to be treated (12-16mm drill bit). Holes should be angled downward between 30° and 45° to facilitate filling them with the treatment solution.

When the walls are drilled from both sides, the depth of the hole should reach the centre of the wall. If the walls are drilled from one side only, the depth of the holes should extend to within approximately 50mm of the reverse face of the wall. Such treatments should be completed by surface application to both faces of the walls, although external walls need not be sprayed from the outside.

11" (280mm) cavity walls can be treated as two separate 4.5" (115mm) walls providing sufficient access at suitable intervals to the cavity has been made to ensure proper application of the Biocide to the faces of the brickwork exposed within the cavity. It should be ensured that the cavity is clear and where possible, ventilated.

Local conditions, wall materials and type of construction would determine any variations which may be necessary to the suggested method of treatment to ensure the correct quantity of fluid (10 litres per m³) is evenly distributed within the mass of brickwork or masonry being treated.

Floors

Where the fungal growth has extended into the subfloor area below a timber ground floor structure, the base of the structural walls, sleeper walls and oversite of the affected area must also be treated with Microtech Biocide. Where the growth has penetrated a concrete oversite or subsoil it should be excavated and the exposed surface treated with Microtech Biocide solution.

Note: areas below ground level (where sources of moisture cannot be isolated) may not be suitable for treatment using the above procedures.

External treatments (algae/moss/lichens)

PREPARATION

In cases of severe moss build up on surfaces, remove as much as possible by physical means or break up the surface before proceeding as below. Observe the general precautions listed under DRY ROT TREATMENTS. Some species of lichens are resistant to treatment due to their impervious surface. To optimize the effect of the biocide solution it is advisable to abrade the face of such growths prior to treatment (e.g. by wire brush).

APPLICATION

Following dilution (see above), application can be either with a low pressure pneumatic sprayer (course spray) or by a watering can with a fine rose attachment. For small items such as headstones, etc.,

Microtech Biocide solution may be applied by brush provided the solution is flooded generously into inscriptions and other cavities. Always direct the spray away from the body; do not spray directly overhead.

For maximum effectiveness Microtech Biocide should be applied when surfaces are reasonably dry and when rain is not imminent. Treatment should take place in wind free conditions to minimise spray drift. Once existing organic growth has been killed by initial application (1-7 days) this should be removed by brushing or power hosing followed by a second application of Microtech Biocide. In the case of roof treatments temporary wire netting guards should be provided over down pipes and the gutters cleared of dead moss, etc. once all the debris has been removed.

Retreatment will be necessary at intervals to prevent growth becoming re-established. The life of treatments may be considerably shortened on

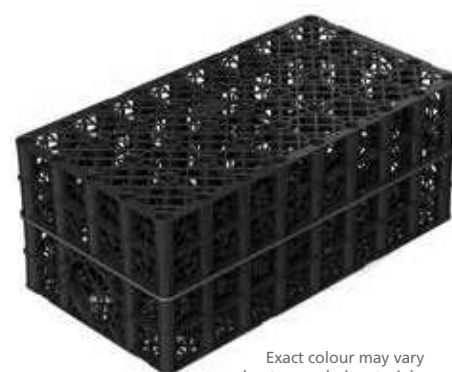
- a. surfaces subject to excessive mechanical wear
- b. very dense substrates which do not absorb much fluid
- c. surfaces where dirt etc. is allowed to accumulate
- d. persistently damp surfaces.

Note: We do not recommend the use of this product on asbestos cement surface due to the risk of fibre release and dispersal during cleaning.

Product code: PSM1A

The Polystorm-R modular cell is ideally suited for loaded applications at greater depths, such as housing, commercial and infrastructure projects and has a compressive strength of up to 61 tonnes/m². It offers all the proven performance of the Polystorm cell, with the added benefits of being manufactured from over 90% recycled material content.

Wherever performance criteria and standards allow, we will always maximise the sustainability of our products by using post consumer plastics in their manufacture. By sourcing and carefully controlling the quality of the recycled material we use our precision injection moulding. Therefore we are able to guarantee consistent quality in our recycled plastic, giving you the confidence and the performance levels you expect from the market leader.



Exact colour may vary due to recycled materials.

Key Benefits

- Made from specially selected and controlled recycled materials
- Environmentally friendly, sustainable solution
- Has undergone stringent testing to ensure product performance
- Compressive strength of 61 tonnes/m²
- Ideal for retention, attenuation and infiltration applications with a suitable geomembrane or geotextile
- BBA approved
- Allow flexibility of shape - ideal for shallow excavation systems, narrow strips or use in restricted areas
- Can be used as part of a value engineered hybrid system with Polystorm, Polystorm Lite and Polystorm Xtra
- Integrated inlet and outlet
- 3D flow throughout the structure
- 95% void ratio
- Light weight yet robust - excellent Health and Safety and installation benefits
- 60 years creep limited life expectancy

Technical Support

Detailed guidance and assistance is available.

For further information, please contact our Technical Team on **+44 (0) 1509 615100** or email civils@polypipe.com



ELEMENT	VALUE
PHYSICAL PROPERTIES	
Length	1m
Width	0.5m
Depth	0.4m
Total volume	0.2m ³
Unit weight	9kg (approx)
Unit storage volume	0.19m ³ (190 litres)
Void ratio	95%
SHORT TERM COMPRESSIVE STRENGTH	
Vertical	610 kN/m ² **
Lateral	63 kN/m ² **
SHORT TERM DEFLECTION	
Short-term vertical deflection	60 kN/m ² per mm
LONG TERM DEFLECTION	
Estimated long term vertical deflection (creep)	0.2798 Ln (design life in hrs) +0.485 [Based on an applied test load = 162 kN/m ²] Creep data limit 60 years
Estimated long term lateral deflection (creep)	1.0192 Ln (design life in hrs) -3.864 [Based on an applied test load = 30.8 kN/m ²] Creep data limit 60 years

Note: Polystorm-R is ideal for use in trafficked and pedestrian applications subject to a structural design check and suitable installation conditions

* Each unit includes 4 Clips and 2 Shear Connectors.

** Compressive strength at yield, maximum recommended value for design purposes.

RECOMMENDED MAXIMUM DEPTH OF INSTALLATION (to cell invert) [m]

TYPICAL SOIL TYPE	TYPICAL ANGLE OF SHEAR RESISTANCE	SOIL WEIGHT kN/m ³	WITHOUT GROUNDWATER (below base of cells) NORMAL CASE		WITH GROUNDWATER AT 1M BELOW GROUND LEVEL AND UNITS WRAPPED IN GEOMEMBRANE	
			Pedestrian	Trafficked (cars) <3000kg GVW	Pedestrian	Trafficked (cars) <3000kg GVW
Stiff over consolidated clay e.g. London clay	24	20.0	2.2	1.9	1.8	1.6
Normally consolidated silty sandy clay e.g. alluvium, made ground	26	19.0	2.4	2.2	1.9	1.7
Loose sand and gravel	30	18.0	3.0	2.7	2.0	1.9
Medium dense sand and gravel	33	19.0	3.2	2.9	2.0	1.9
Dense sand and gravel	38	20.0	3.7	3.5	2.1	2.0

Note:

1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)

2) Assuming water density = 10.0kN/m³

3) Assumed ultimate limit state (ULS) partial factor of safety applied to: Material = 2.75 Lateral pressure = 1.35

Durability

The polymer material used in the manufacture of the Polystorm-R unit has an adequate resistance to attack from the type and quantities of chemicals that may be expected to naturally occur in uncontaminated soils and rainwater runoff. When installed in accordance with our recommendations, it is expected that the Polystorm-R unit will have a design life in excess of 60 years*. The installer of a proposed geocellular structure should ensure that an appropriate design check has been undertaken, in accordance with the recommended methodology and factors of safety given in CIRIA C680 (2008), Structural Design of Modular Geocellular Drainage Tanks, prior to the commencement of construction activities.

* Derived from long term extrapolated creep testing

Notes

1. Unless stated, all values are nominal and may vary within normal production tolerances.
2. The characteristic unit parameters stated have been based on Polypipe BBA certificate N° 06/4297, sheet 3.
3. Polypipe reserve the right to change product specifications without prior notice.
4. This document is uncontrolled and updates will not be issued automatically.

RECOMMENDED MINIMUM COVER LEVELS [m]

LIVE LOAD CONDITIONS	PEDESTRIAN	LIGHT TRAFFICKED	
		Car park with vehicle mass <GVW	
Minimum cover depth required (m)	0.50	<3000kg 0.50	<9000kg 0.65

Note

1) Stated depths based on the calculation methodology detailed within CIRIA C680 (2008)

2) Assumed serviceability limit state (SLS) partial factor of safety applied to: Material = 1.5 Live load = 1.0 Dead load = 1.0

3) Shallower minimum burial depths may be applicable subject to an assessment of the specific site conditions. For further details please consult our Technical Team on 01509 615100.

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Polypipe Civils

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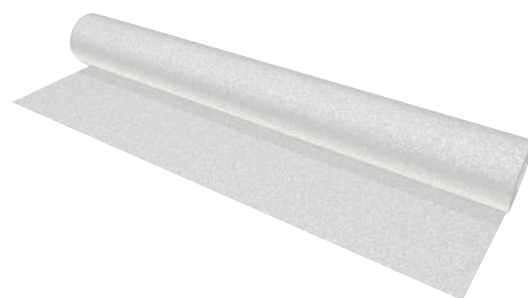
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com

www.polypipe.com/wms



Product code: PVT51000

Polystorm Soakaway Geotextile PVT51000 is a UV stabilized, polypropylene continuous filament needle-punched non-woven geotextile, designed to complement our existing Polystorm modular geocellular system.



Applications

Polystorm Soakaway Geotextile is suitable for use as part of our Polystorm geocellular system for infiltration applications, and can also be incorporated into drainage trenches.

Key Benefits

- Excellent filtration properties, including high water permeability and optimum soil retention capability
- Offers quick and efficient draining of soil
- Resistant to all chemical and biological media that usually occur in surrounding soils and construction materials
- High mechanical resistance
- 100 year material design life

Installation

Polystorm Soakaway Geotextile will be laid to suit site specific requirements. Overlaps shall be joined together with double sided jointing tape. Ensure geotextile is clean and debris free before installing Polystorm.

Technical Support

Detailed guidance and assistance is available.

For further information, please contact our Technical Team on **+44 (0) 1509 615 100** or email civils@polypipe.com or visit www.polypipe.com/civils-technical-hub

APPLICATION	PRODUCT
LOADING OVER TANK	TS1000
Landscape (min cover 0.5m)	✓
Car parks (min cover 0.6-1.0m+)	✓
HGV (min cover 1.0m+)	✗

ELEMENT	VALUE
PHYSICAL PROPERTIES	
Nominal Thickness	0.8mm
Weight	105g/m ²
Roll Width	4.5m
Roll Length	100m
Opening Size	0.12mm
MECHANICAL PROPERTIES	
Tensile Strength (Machine direction)	8kN/m ²
Tensile Strength (Cross direction)	8kN/m ²
Elongation at max. load (Machine direction)	90%
Elongation at max. load (Cross direction)	75%
Puncture Resistance (CBR)	1500N
Dynamic Puncture Resistance (Cone drop)	26mm
HYDRAULIC PROPERTIES	
Water Permability (Vertical)	130 l/m ² s

Polystorm Soakaway Geotextile can be utilised in these SuDS techniques

TECHNIQUES													
Blue-Green roofs	Podium Decks	Trees	Sports Pitches	Cycle Paths	Permeable Paving (sub base & podium)	Bioretention & Rain Gardens	Attenuation Storage Tanks	Infiltration	Swales	Filter Drains	Detention Basins	Ponds & Wetlands	Filter Strips
								✓	✓	✓	✓		

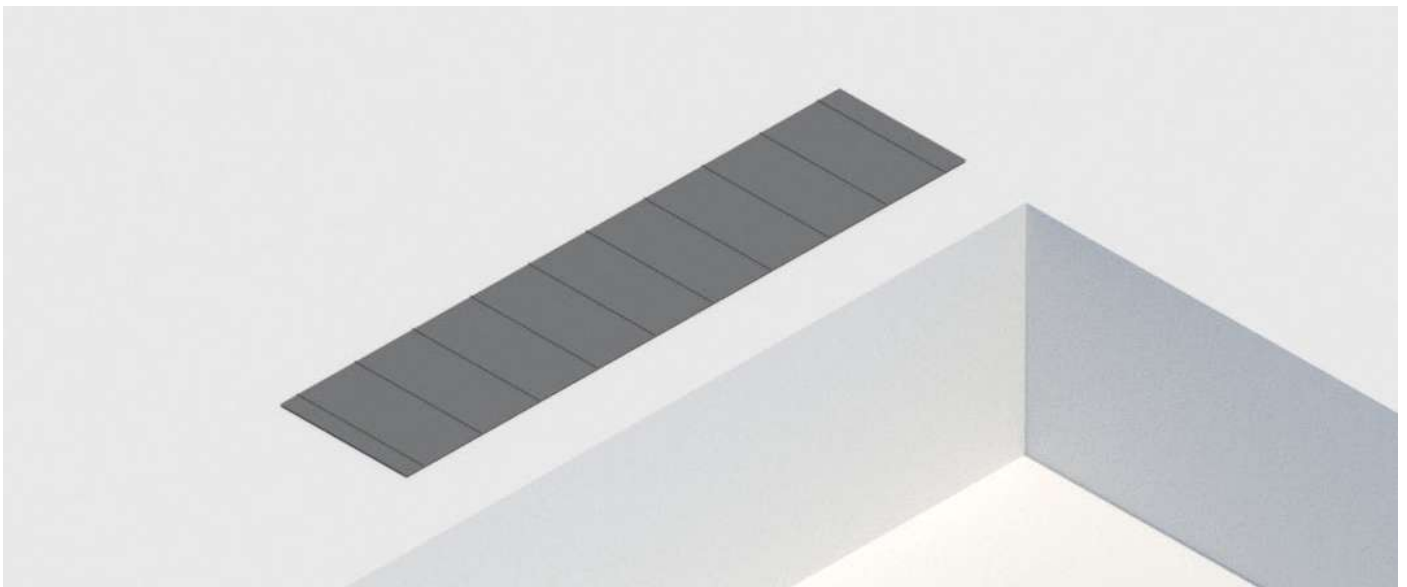
Visit www.polypipe.com/greeninfrastructure

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ReRoot Root Barrier

Installation Instructions

These instructions show the recommended installation procedure for GreenBlue Urban's **RER2000** and **RER Ribbed Root Barrier**.



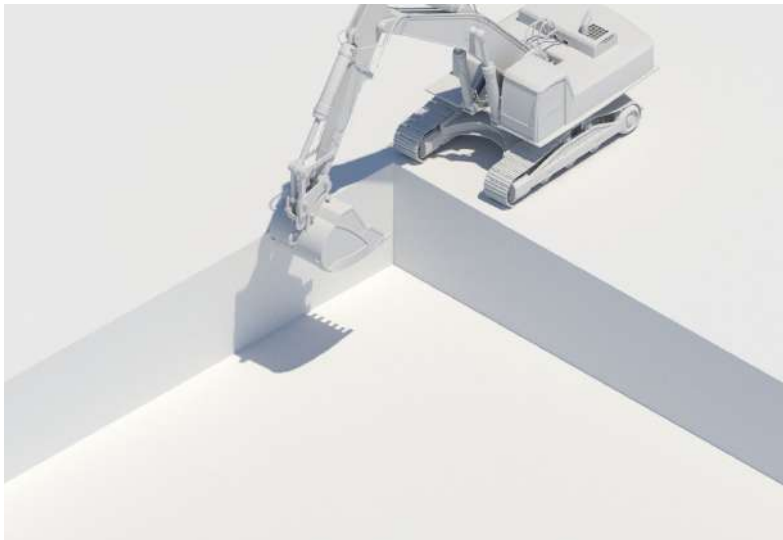
Tools Required

- RERJTA Jointing Tape
- Sharp Knife
- Appropriate PPE - especially cut resistant gloves

Take care

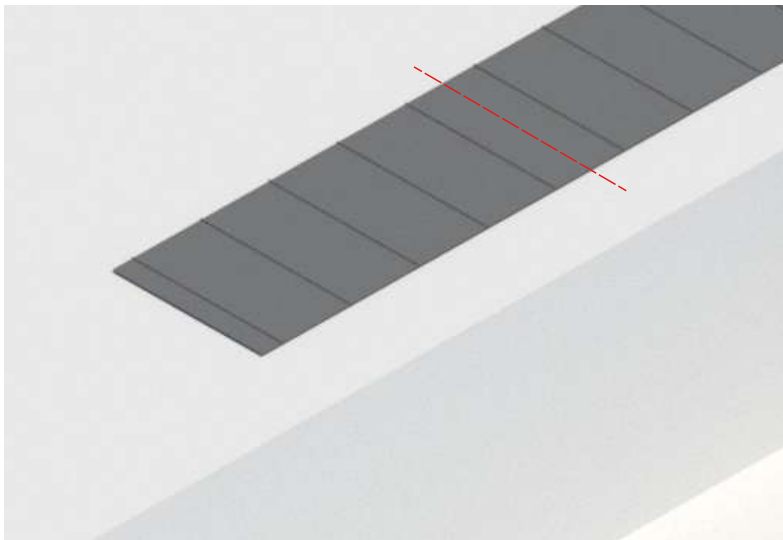
1. **Punctures** - although extremely robust, take care to avoid puncturing root barrier with sharp implements or heavy machinery.
 2. **Keep barrier upright** - if a 'slope' is unavoidable ensure the top edge is closer to the tree than the base of the root barrier.
 3. **Joining** - RERJTA is the only suitable jointing tape to use, ensure root barrier is clean and dry, apply jointing tape and ensure a good joint prior to lowering into trench is sometimes easier
-

1



Excavate trench or tree pit to correct depth

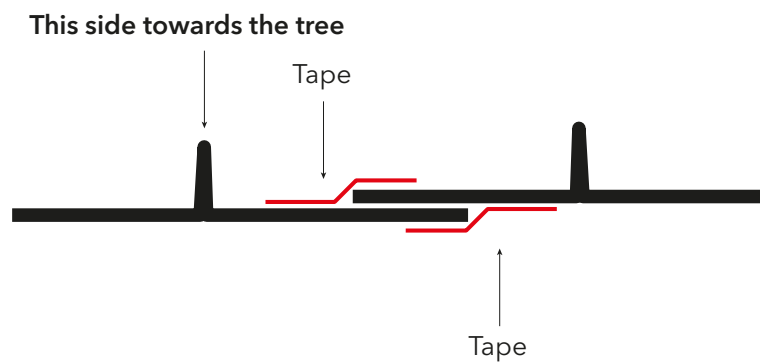
2



Cut to length

Lay root barrier out adjacent to trench or tree pit and cut to length as appropriate with a shark knife.

3

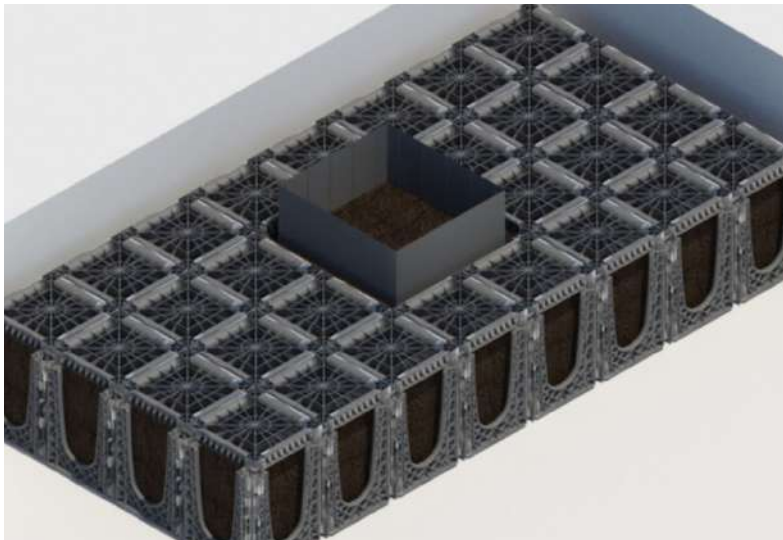


Joining

If required, join two sections of root barrier together using RERJTA Jointing Tape, overlap by at least 300mm, with two continuous strips of RERJTA.

Note: Minimum overlap 100mm

4



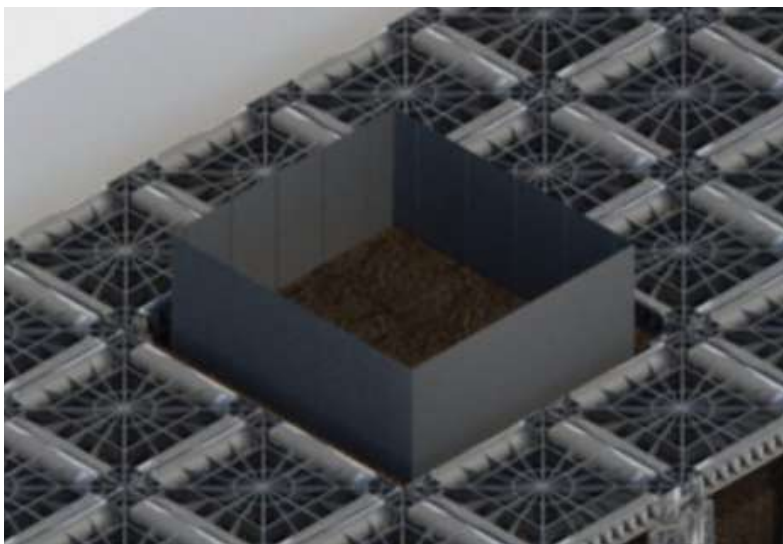
Place in position

Ribbed

Form root barrier around tree pit using road pins or timber formers to hold in position, join both ends together using RERJTA

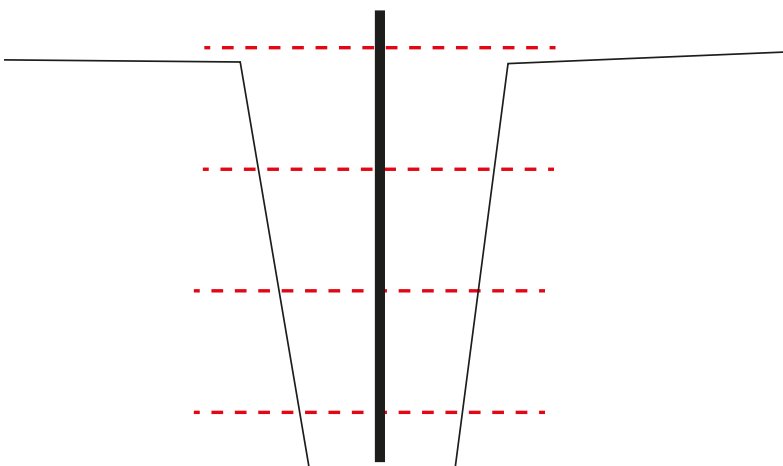
Flat

Slide carefully into trench to correct depth



Note: Ribs must face the tree!

5



Backfill

Ensuring top of root barrier is above finished soil levels - approximately 10mm; compact carefully. Use soil to backfill on the tree side, use soil on the outside unless structural requirements demand use of MOT Type 1 or other stone as specified. Back fill both sides and compact at the same time in lifts of 150mm.

F32



F35



F46



F60



F100



F159



F210



ComFlor® formwork

Permanent non-composite formwork profiles

We manufacture a range of profiles from 32mm to 210mm depths which are used as permanent formwork.

Permanent formwork remains in situ for the life of the building but, unlike composite flooring profiles, it does not act as reinforcement in the concrete slab.

Advantages

- The steel decking supports the wet concrete and construction loads.
- Temporary propping is eliminated and steel lost formwork is left in situ which gives fast, easy construction.
- The concrete slab requires full structural bar or mesh reinforcement.
- The wide range of Tata Steel formwork profiles ensure the optimum solution is available.

Concrete volume (m³/m²)

Profile	Total slab depth (mm)											
F32	82	90	100	110	120	130	140	150	200	250	300	350
	0.058	0.066	0.076	0.086	0.096	0.106	0.116	0.126	0.176	0.226	0.276	0.326
F35	85	90	100	110	120	130	140	150	200	250	300	350
	0.063	0.068	0.078	0.088	0.098	0.108	0.118	0.128	0.178	0.228	0.278	0.328
F46		96	100	110	120	130	140	150	200	250	300	350
		0.069	0.073	0.083	0.093	0.103	0.113	0.123	0.173	0.223	0.273	0.323
F60				110	120	130	140	150	200	250	300	350
				0.076	0.086	0.096	0.106	0.116	0.166	0.216	0.266	0.316
F100								150	200	250	300	350
								0.092	0.142	0.192	0.242	0.292
F159									209	250	300	350
									0.107	0.148	0.198	0.248
F210										260	300	350
										0.092	0.132	0.182

Weight of wet normal concrete (kN/m²)

Profile	Total slab depth (mm)											
F32	82	90	100	110	120	130	140	150	200	250	300	350
	1.46	1.66	1.91	2.16	2.41	2.66	2.91	3.16	4.41	5.66	6.91	8.16
F35	85	90	100	110	120	130	140	150	200	250	300	350
	1.57	1.69	1.94	2.19	2.44	2.69	2.94	3.19	4.44	5.69	6.94	8.19
F46		96	100	110	120	130	140	150	200	250	300	350
		1.73	1.83	2.08	2.33	2.58	2.83	3.08	4.33	5.58	6.83	8.08
F60				110	120	130	140	150	200	250	300	350
				1.91	2.16	2.41	2.66	2.91	4.16	5.41	6.66	7.91
F100								150	200	250	300	350
								2.92	3.54	4.79	6.04	7.29
F159									209	250	300	350
									2.67	3.70	4.95	6.20
F210										260	300	350
										2.30	3.30	4.55

PRODUCT DATA SHEET

Parex Tecgrip S

Cementitious anchoring and stitching grout

PRODUCT DESCRIPTION

Parex Tecgrip S is a cementitious anchor grout requiring only the addition of clean water. The product is based on a Portland cement mix with high quality graded silica sands plus a synergistic blend of admixtures.

The mixed grout is pumped into place using a Pumpable mortar cartridge gun. Each filling of the gun must be used within 5 minutes to avoid thickening. The product in the mixing vessel must be mixed each time a gun filling is carried out.

The injected grout will tighten in the anchor hole and fix the bolt, tie or other unit into the substrate. Tecgrip S is suitable for fixings into most construction materials including concrete, rock, brickwork, masonry blockwork or other substrates capable of carrying the design load.

USES

- Ties into brick arches.
- Overhead rail tracks.
- Starter bars and dowels.
- Brick ties and stitching.
- Anchoring.

CHARACTERISTICS / ADVANTAGES

- Single component, just add water.
- Conforms to EN 998-2.
- Consistency: thixotropic mortar.
- Minimum annular clearance 2mm.
- Hand or mechanical pump placed.
- Suitable for vertical application.

PRODUCT INFORMATION

Chemical Base	Cementitious powder
Packaging	25kg bags
Shelf Life	6 months from date of manufacturing
Storage Conditions	Store properly in dry conditions in undamaged and unopened original sealed packaging.
Appearance / Colour	Grey powder
Maximum Grain Size	1.0mm
Density	~2050kg/m ³
pH-Value	12.5
Total Chloride Ion Content	0.02% (EN 196-2)

TECHNICAL INFORMATION

Compressive Strength	<u>Duration</u>	<u>Compressive Strength</u>	(EN 12190)
	24 hours	~20 MPa	
	7 days	~50 MPa	
	28 days	~60 MPa	
All values tested in lab conditions at 20°C / 90% RH.			
Modulus of Elasticity in Compression	~23 GPa		
Tensile Strength	~3 MPa		
Tensile adhesion strength	≥0.15 MPa		(EN 998-2)
Thermal Conductivity	P=50%1.11 [W/(m.K)] P=90%1.21 [W/(m.K)]		(EN 998-2)
Water Absorption	0.135 kg/(m².min0.5)		(EN 1015-8)
Permeability to Water Vapour	15/35μ		
Reaction to Fire	Euroclass A1		

APPLICATION INFORMATION

Mixing Ratio	1 part water to 5 parts powder (5 litres water per 25 kg bag)
Yield	25kg yields approx. 15 litres mixed material
Layer Thickness	3 mm min.
Ambient Air Temperature	+5°C min. / +35°C max.
Substrate Temperature	+5°C min. / +35°C max.
Open Time	~30 minutes at 20°C

VALUE BASE

All technical data stated in this Product Data Sheet are based on laboratory tests. Actual measured data may vary due to circumstances beyond our control.

LIMITATIONS

- Do not apply outside of temperature range.
- In high temperatures do not allow placed material to dry out in the first three days.
- Safety factors: Critical 2.0, non-critical 1.5.
- Ensure substrate is saturated prior to application achieving a surface saturated dry appearance.
- Once finished protect exposed material from drying conditions.
- Shelf life 6 months from date of manufacture.

ECOLOGY, HEALTH AND SAFETY

User must read the most recent corresponding Safety Data Sheets (SDS) before using any products. The SDS provides information and advice on the safe handling, storage and disposal of chemical products and contains physical, ecological, toxicological and other safety-related data.

APPLICATION INSTRUCTIONS

SUBSTRATE QUALITY / PRE-TREATMENT

Holes should be drilled with rotary percussive drills on air or water flush wherever possible. If fluted drills are used, the holes should be cleaned by wire-brushing and blown out with clean compressed air. The airline should be extended to the bottom of the hole to ensure complete removal of drilling debris and dust. Prior to application the drilled holes should be dampened with water and any excess water blown out.

MIXING

Pour 5 litres of clean water into a clean mixing vessel for each complete bag of Parex Tecgrip S. Slowly add the powder to the water whilst continually mixing. Mechanical mixing should be carried out using a high torque slow speed drill with a Grout Stirrer. Mix material for a further 2 minutes after all powder has been added to achieve a homogeneous mix.

APPLICATION

Load the mixed anchor grout into the cartridge of the injection gun. Use an extension tube for the cartridge to allow filling of the hole from the bottom to the

mouth. Immediately after placing the Parex Tecgrip S, insert the bolt, bar, wall tie, slotting or other fixing. Gently agitate the inserted fixing to ensure complete contact by the anchor grout. Once placed do not disturb before the anchor grout has hardened.

Each cartridge filling should be used within 5 minutes. Prior to each cartridge loading, the material in the pail should be re-mixed to maintain grout workability.

For best tensile anchorage results, a minimum embedment depth of 100mm is recommended. Hole diameters may be varied but a minimum of 3mm all-round clearance should be used. This clearance may be increased for ease of placing fixings into deep holes.

Factors controlling uniaxial pull out load:

- **Type and strength of substrate.**
- **Embedment depth.**
- **Hole preparation.**
- **Type of fixing.**

CURING TREATMENT

Protect all exposed surfaces from premature drying. Standard curing treatments can be utilised such as damp hessian sheets, plastic sheets or suitable curing membrane such as Sika®Antisol MP10.

CLEANING OF TOOLS

Clean all tools and application equipment with water immediately after use. Hardened/cured material can only be mechanically removed.

LOCAL RESTRICTIONS

Please note that as a result of specific local regulations the performance of this product may vary from country to country. Please consult the local Product Data Sheet for the exact description of the application fields.

LEGAL NOTES

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the product's suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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Product Data Sheet

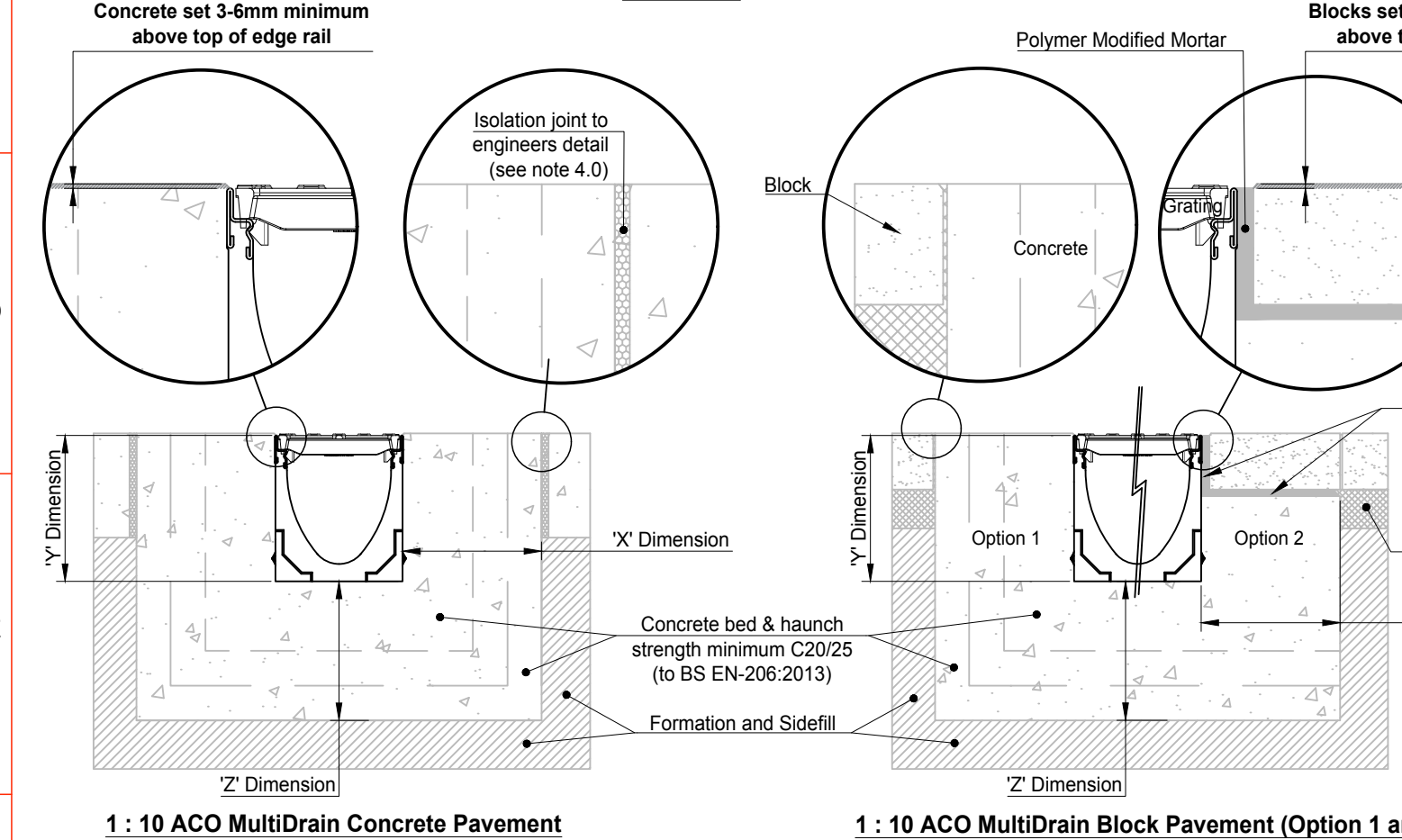
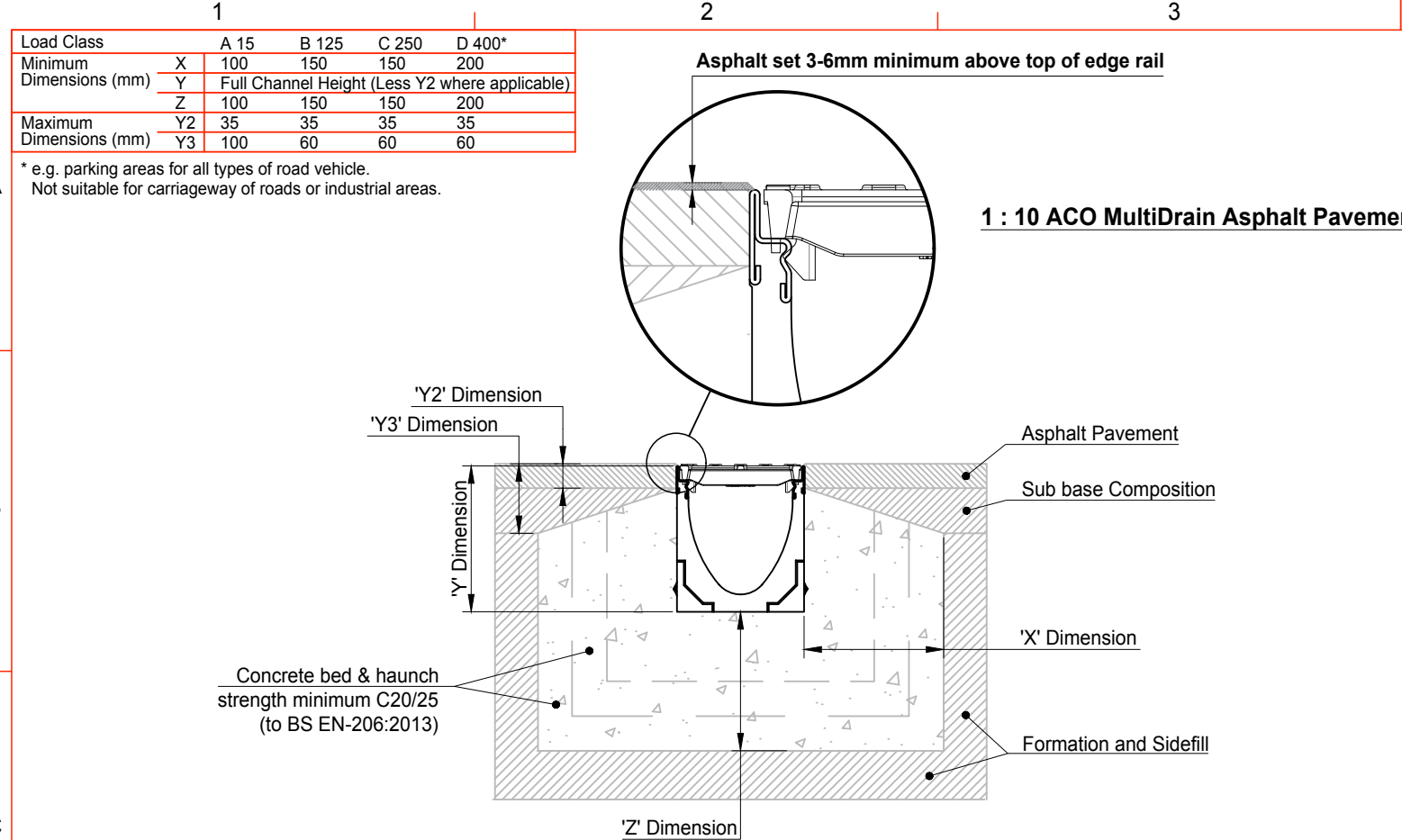
Parex Tecgrip S

July 2022, Version 01.01
020201010010000432

ParexTecgripS-en-GB-(07-2022)-1-1.pdf

1				
Load Class	A 15	B 125	C 250	D 400*
Minimum	X	100	150	200
Dimensions (mm)	Y	Full Channel Height (Less Y2 where applicable)		
	Z	100	150	200
Maximum	Y2	35	35	35
Dimensions (mm)	Y3	100	60	60

* e.g. parking areas for all types of road vehicle.
Not suitable for carriageway of roads or industrial areas.



NBS Specification:
ACO MultiDrain® MD should be specified in section Q10:180. Assistance in completing this clause can be found in ACO Technologies product entries in NBS Plus, or a model specification can be downloaded from www.aco.co.uk. For further assistance, contact the ACO Water Management Design Services Team.

Best Practice and Workmanship:
ACO can give guidance with respect to the most suitable methods of installation for each of the products in the ACO MultiDrain® MD range. ACO MultiDrain® MD should be installed using levels of workmanship that accord with the National Code of Practice (UK: BS8000-0:2014) and in keeping with BS EN 1433:2002 (Drainage channels for vehicular and pedestrian areas).

Detailed installation statements and methodologies will vary for all sites as each will have different aspects deserving particular consideration, consequently the relevant approvals should be sought from the consulting engineer and/or the installer.

1.0 Load Class
Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions
The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Joining
Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.
Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints
The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel. Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ Slab
Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation
A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of edge rail, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

7.0 Block Pavements
The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

8.0 Grate Locking System
Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

9.0 Channel Protection
Avoid contact between compaction equipment and top of ACO channel edge rail. The installer must ensure that the finished surface level lies above the top of the edge rail (by at least 3-6mm). Covering or protecting the grating, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel and grating of cement material and embedded stones. (Please note that ACO channels must be installed with the grating in place to prevent deformation of the channel).

10.0 Watertight Installation to BS EN 1433:2002
Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

For Guidance a typical method of application follows:

- The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
- Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
- Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
- Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
- Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
- The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
- Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
- The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

Note: Galvanised steel and iron products have good corrosion resistance to concrete and mortar products but may experience corrosion if high chloride and/or sulphate content is present. Use only good quality concrete and consider using corrosion inhibitors where necessary. The use of protective coatings, such as paint, can minimise the risk of corrosion.

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