

Entrances Lodges at Reading Old Cemetery
Cemetery Junction
Reading

Structural Inspection

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1. Introduction

1.1 Appointment and brief

Clive Hudson Associates Ltd were commissioned by Reading Borough Council to undertake:

- a structural inspection of the Entrance Lodges at Reading Old Cemetery, and
- provide a structural report summarising our findings and outline proposals for possible remedial works and further investigations, if deemed necessary.



Figure 1. Principal (west) elevation of the Entrances Lodges at Reading Old Cemetery.

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2. The Site

2.1 Location

Reading Old Cemetery is situated on the east side of Reading between the A4 (London Road) and the A329 (Wokingham Road) (Figs. 2 & 3). The Entrance Lodges are on the west side of the cemetery at 'Cemetery junction' - the junction between Kings Road, London Road, and Wokingham Road (National Grid Reference SU73189 731185)

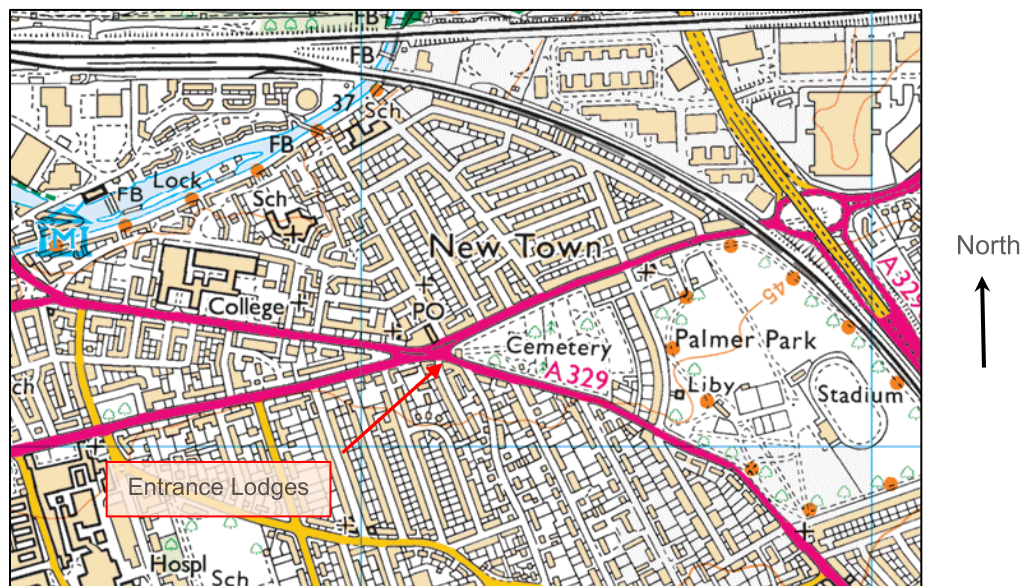


Figure 2. Location of the Entrance Lodges at Reading Old Cemetery
(Extracted from www.streetmap.co.uk)

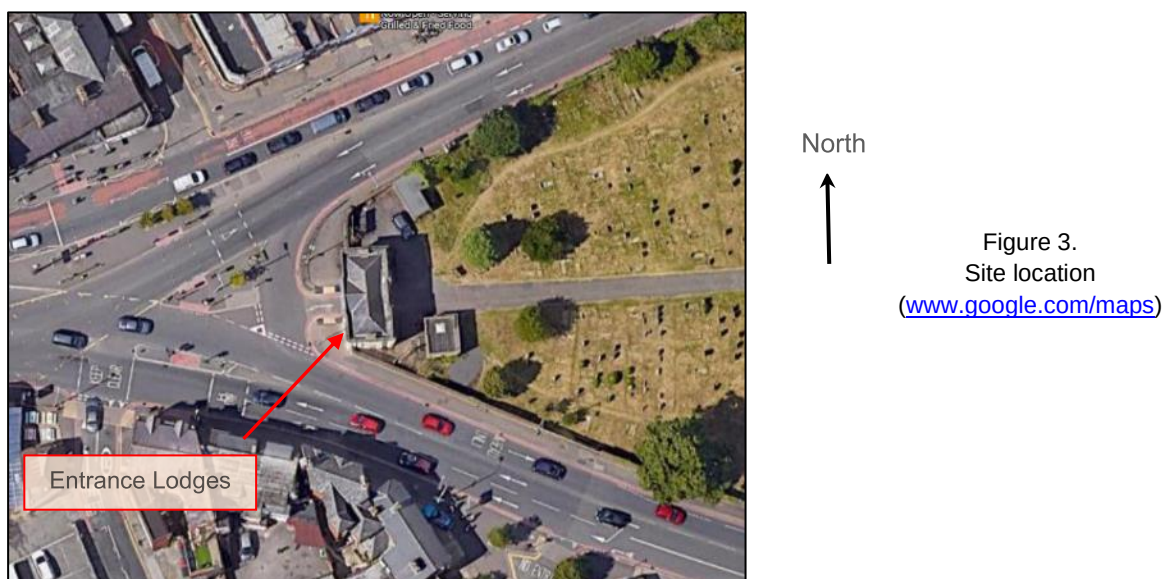


Figure 3.
Site location
(www.google.com/maps)

2.2 Brief description & background

Reading Old Cemetery was set up by a private act of Parliament in 1842 with the first internment in 1843. The Entrance Lodges and Gates were first listed as Grade II in March 1967, and are described in the listing description as:

Entrance Lodges and gates to Cemetery (Formerly listed under Cemetery) SU 7373 8/77 22.3.57. II 2. Circa 1840 by William Brown (local architect). (Attributed to Nathaniel Briant however). 2 storeys. Bath stone. Arched entry with moulded architrave and keystone in centre of rectangular block with Doric pilasters with moulded entablature and pediment over. Flanking lodges with entablature and blocking course. Hipped slate roof with flanking chimneys. Each lodge 1 window, glazing bar sashes, with architrave surround. Rear: parapet; recessed centre; sides have shallow pediments to parapets. Contemporary gates, cast iron with a row of roses below spearhead rails.

(L.E.N. 1113512)

The Entrance Lodges are orientated on an approximate north/south alignment with the principal (front) elevation facing west with the rear elevation facing east onto the cemetery. The building comprises two two-storey lodges flanking a central archway.

From a structural point of view, the Entrance Lodges appear to be of brick construction faced with Bath Stone (oolithic limestone). The roof is hipped and is covered in slate with lead-lined gutters behind the parapet. The roof structure generally comprises 3no. timber trusses with metal tie-rods, timber purlins and rafters. It is evident the roof has been recovered recently with extensive repairs also noted to the timbers within the roof.

We would assume the first floors comprise timber joists spanning between the walls. The ground floors are solid, and we assume bear directly onto the ground.

At a point in time, a series of vertical steel channel sections have been inserted on the inner face of the brickwork to provide additional restraint to the brickwork and potentially the Bath Stone. Unfortunately, we are not in receipt of details relating to their insertion, and the drawing provided within KRP's 'Structural Inspection' report (dated August 2020) does not accurately reflect their positions.

2.3 Geology & Topography

Preliminary studies of the British Geological Survey's online 'Geology Viewer' indicate the site geology comprises Taplow Gravel (sand and gravel) superficial deposits overlying a bedrock of Seaford Chalk Formation and Newhaven Chalk Formation. However, intrusive investigations will be needed to confirm the actual ground conditions.

The ground immediately surrounding the Entrance Lodges is generally level.



Figure 4. General view from the south-west.

2.4 Drainage

There are downpipes on the north and the south elevations that discharge via open shoes into drains at the base of the walls, except on the south-west corner where the shoe discharges straight onto the ground. It was not possible to identify where the below-ground runs were during the inspection.

2.5 Trees

There are presently no trees near the Entrance Lodges that could have contributed to/caused the cracking in the Bath Stone or the brickwork.

2.6 Other

The Entrance Lodges lie close to a heavily trafficked junction and are probably susceptible to dynamic effects associated with heavy traffic and decay associated with air pollution / exhaust fumes.

Clive Hudson Associates Ltd are in receipt on:

- KRP Consulting Engineers' "Structural Inspection" report, dated August 2020, and
- AF Jones Stonemasons Ltd' (Stonemasonry) "Condition Survey" report dated September 2023.

3. Structural Observations & Recommendations

3.1 Introduction

The visual inspection was carried out by David Evans on the morning of Monday, 6th November in dry and bright conditions.

The external elevations were inspected from ground level with limited access to the high-level masonry on the west and east elevations via a mobile elevated working platform (M.E.W.P.). The roof was inspected from both the M.E.W.P. and from the parapet gutter (on the perimeter of the building).

The inspection of the roof space was limited to what could be viewed using torchlight from the access hatches in each lodge.

No opening-up works were undertaken, and no detailed tests/analyses were performed on the construction materials used. Structural elements that were covered, unexposed or inaccessible could not be inspected. Once all structural elements are exposed / made accessible, further remedial works may be required.

Digital photographs were taken to record areas of interest and are included in the report for reference.

It should be documented:

- Guidance is given in the Buildings Research Establishment (BRE) Digests 251, 359, and 361, as to the significance of different levels of cracking and the causes of cracks in buildings. This guidance is well-trying but cannot be relied upon in isolation. It is, for instance, possible for masonry to be placed under stress by movement which does not cause immediate cracking but leaves it liable to sudden and unpredictable failure or instability. Similarly, successive crack repairs and re-plastering may conceal the true magnitude of overall movement. It must also be understood there is no fixed point at which a line can be drawn separating damage as a result of 'normal' building movement and damage caused by ground movement alone.
- Most historic buildings do move / distort to some degree during their life, but this movement may not be a problem. It is only when the movement is on-going and progressive and threatens the structural integrity of the building that one should be seriously concerned.
- Traditional buildings and their materials were built to be 'breathable' – allowing moisture to penetrate the fabric and then evaporate when the conditions were appropriate. The

application of non-porous, cement-rich mortars, renders, plasters, and modern impermeable paints to historically 'breathable' surfaces can cause moisture to become trapped, which in turn can cause decay to the underlying material. This decay is not always evident until the mortar / render / plaster / paint has been removed.

For reference, we have included Table 1 from BRE Digest 251: Assessment of damage in low-rise buildings (Revised 1995) below.

Table 1 - Classification of visible damage to walls with particular reference to ease of repair of plaster and brickwork or masonry.

Category	Description of typical damage of damage
	<i>Ease of repair in italic type</i>
0	<i>Hairline cracks of less than about 0.1 mm which are classed as negligible. No action required.</i>
1	Fine cracks which can be treated easily using normal decoration. Damage generally restricted to internal wall finishes; cracks rarely visible in external brickwork. Typical crack widths up to 1 mm.
2	Cracks easily filled. Recurrent cracks can be masked by suitable linings. Cracks not necessarily visible externally; some external repointing may be required to ensure weather-tightness. Doors and windows may stick slightly and <i>require easing and adjusting</i> . Typical crack widths up to 5 mm.
3	Cracks which require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced. Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired. Typical crack widths are 5 to 15 mm, or several of, say, 3 mm.
4	Extensive damage which requires breaking-out and replacing sections of walls, especially over doors and windows. Windows and door frames distorted, floor sloping noticeably*. Walls leaning or bulging noticeably*, some loss of bearing in beams. Service pipes disrupted. Typical crack widths are 15 to 25 mm, but also depends on number of cracks.
5	Structural damage which requires a major repair job, involving partial or complete rebuilding. Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25 mm but depends on number of cracks.

The following is therefore an opinion based on our experience of buildings of a similar age and construction.

Please note: any references to the "left" and "right" are taken when facing the elevation / structural element being described.

3.2 Observations & Recommendations

EXTERIOR

3.2.1. West (front) elevation



Figure 5. General view of the west elevation.

- i. The west elevation is faced in ashlar (Bath Stone) and comprises the pedimented arched opening with the two lodges on each side of the arch.

The Bath Stone on all the elevations is in varying states of repair and reflects the building's age, environment, and past interventions.

- ii. There is a structurally significant tapered crack at the southern end of the architrave (Figs. 6-8). The crack runs from below the capital up the wall and through the raking cornice with the crack getting wider as it progresses up the wall.

Evidence of minor differential lateral movement was also noted in the cornice with the section of cornice to the north of the crack proud of the section to the south of the crack.

Based on the inspection, it would appear the movement is a relatively long-standing issue with the vertical movement noted in KRP's 2020 report and evident in Google's Street View image of the building in July 2014. Attempts have been made to monitor the movement with

three Demec studs on the raking cornice, and two Demec studs on the architrave. Unfortunately, while crack monitoring records are included in KRP's 2020 report, there are no references as to where these crack monitoring locations are on the building.

Based on the Google Street View images, the movement does not appear to have deteriorated significantly since 2014. Nevertheless, we would recommend the cracked stone is stabilised and subject to improved access within the roof space, is tied back to the brickwork using Helifix Cemties and grout, or similar, and the cracks/open joints are pointed using an appropriate lime mortar mix and made weathertight.

(For reference, the crack width at the Demec studs on the architrave was c.12mm, which based on Table 1 of BRE Digest 251 could be classified as a "Moderate" crack bordering on "Severe".)



Figure 6. Tapered crack at the southern end of the architrave over the archway.



Figure 7.
Close-up view of the crack
at the Demec Studs.



Figure 8.
View of the crack in the
top of the pilaster's
capital.

- iii. The pilasters on either side of the archway are not plumb with both appearing to lean outwards at a high level. We would postulate that the majority of any movement probably occurred shortly after the building was constructed with the movement to the southern pilaster causing the crack discussed in (ii) to develop.
- iv. It is clear the pediment leans outwards at a high level (Fig. 9). Again, this appears to be a relatively long-standing issue and is noted in KRP's 2020 report. Unfortunately, it appears no attempts have been made to measure/monitor the movement in the past. At this stage, we would recommend the out-of-plumbness is confirmed, and subject to this, the pediment is tied back to a new structure provided within the roof space over the arch.

Figure 9.
Leaning pediment.



- v. It appears the edge of the cornice on both sides of the archway has been repaired in the past. A section of the repair (possibly concrete) to the south of the archway has come away from its parent stone leaving a 10-15mm horizontal gap between the repair and its parent material (Figs. 10-11). At this stage, we would recommend the whole of the cornice on the west elevation be re-inspected off a more secure/stable tower scaffolding and a provisional sum is allowed for repairs/renewal. While the partially detached repair did not appear to be unstable, we would recommend debris netting is installed to minimise the risk of pieces of stone/the repair failing/falling until the cornice can be inspected in more detail.

We would assume the Bath Stone on the south and the west elevations are more susceptible to decay due to these elevations receiving the worst of the weather (driving wind and rain from the south-west).



Figure 10. Partially detached section of repair (over the south lodge).



Figure 11.
View of the soffit

- vi. A slight, near vertical crack/scar and the opening-up of joints were observed on the south-west corner with a crack running from to the left of the capital up the wall through the architrave, frieze, and the cornice (Fig. 12) . The movement is evident in the 2014 Google Street View image and the crack has been repointed and monitored in the past, indicating the movement is a relatively long-standing issue. At this stage, we would recommend the cracked mortar is carefully removed and open joints/cracks are repointed using an appropriate lime mortar, and the cracked stones are tied back to the brickwork using Helifix Cemties and grout, or similar, and the situation is monitored as part of the building's maintenance strategy.



Figure 12.
Cracking on the
south-west corner.

- vii. Fairly extensive weathering and poorly executed repairs were noted at the northern end of the pediment's cornice. Subject to a more detailed inspection, we would allow a provisional sum for repairs in this location.
- viii. Very slight, near-vertical cracks were observed in the architrave over the keystone (Fig. 13). Again, these appear to be a relatively long-standing issue and can be seen in Google's Street

View of the building in 2014. At this stage, we would recommend the cracks are repointed using an appropriate lime mortar mix and the cracks are monitored as part of the building's maintenance strategy.



Figure 13. Near-vertical cracks and open joints in the architrave.

- ix. A very slight, vertical crack was observed in the stone lintel over the first-floor window on the north lodge (Fig. 14). While the crack does not warrant immediate structural concern, the location of the crack (at midspan) would suggest the movement has been caused by excessive tensile stresses developing in the stone or reflect inherent defects in the original construction or a past repair. At this stage, we would recommend:
- the crack is repointed using an appropriate lime mortar mix, and
 - the crack is monitored on a 6-monthly basis for 2-3 years to establish whether the movement is significantly active.

While it is not a structural issue per se, the moulding over the window has eroded.



Figure 14. Very slight, vertical crack in the stone lintel.

- x. Localised fissures/fractures were noted on the southern corner of the arch's northern pilaster (Fig. 15). Subject to discussions with a competent stone mason, we would allow a provisional sum to undertake repairs in this location.

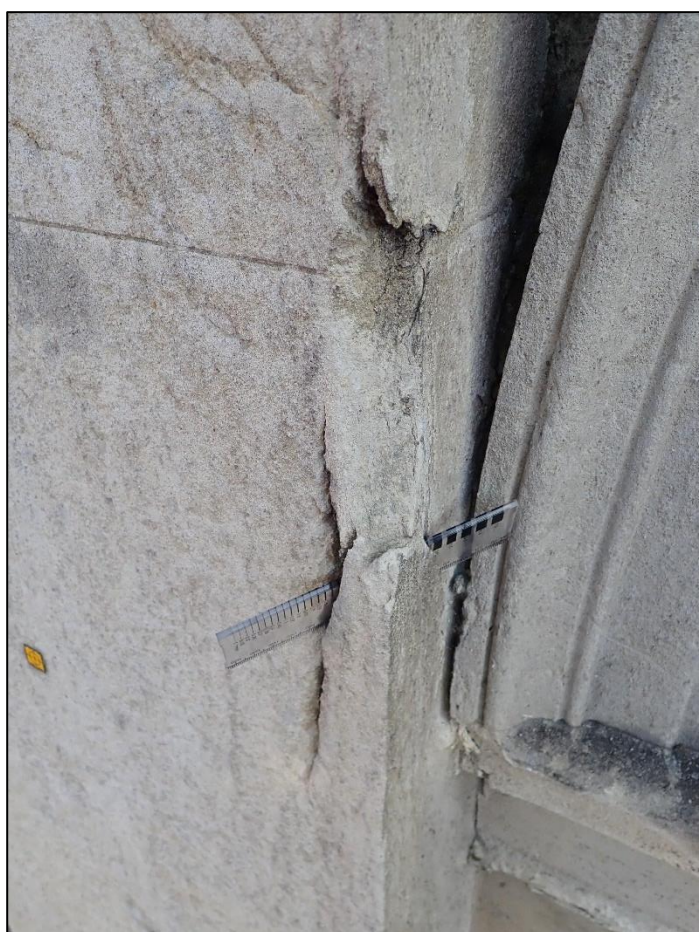


Figure 15.
Localised fissure/fracture
on the southern arris of
the pilaster.

- xi. While they are not considered structural issues per se, localised and severe erosion was noted on the southern pilaster, to the moulding on the north side of the southern ground-floor window, and to the Bath Stone to the north of this window (Figs. 16 & 17). Subject to discussions with a competent stone mason, we would allow the worst-affected stones to be repaired/renewed.



Figure 16.
Erosion/weathering on
the southern pilaster.



Figure 17.
Erosion of the stone
moulding and ashlar to
the north of the window.

- xii. Localised erosion and damage were noted to the feet of the pilasters across the elevation (Fig. 18). While it does not warrant immediate structural concern, we would allow a provisional sum to repair/stabilise the stonework in these locations.



Figure 18.
Erosion and damage to
the pilaster on the north
side of the archway.

3.2.2. North (London Road) elevation



Figure 19. General view of the north elevation.

- i. The north elevation is faced in ashlar (Bath Stone) masonry.
- ii. Slight cracks and open joints were observed at a high level between the two central pilasters and in the cornice. These do not warrant structural concern, but we would recommend the cracks are pointed using an appropriate lime mortar mix and that the open joints in the cornice are made weathertight.
- iii. Localised erosion was noted to the moulding over the architrave, but this does not warrant structural concern and reflects general wear and tear on the Bath Stone.

3.2.3. East (rear) elevation



Figure 20. General view of the east elevation.

- i. The east elevation is faced in ashlar (Bath Stone) and comprises the arched opening and the two lodges.
- ii. Similar to the front elevation, the pilasters on each side of the archway are not plumb but lean outwards at a high level. While it was not observed/accessed during the inspection, images from KRP's 2020 report (dating to 2016) indicate there is a discontinuity/gap in the brickwork behind the pilaster to the south of the arch and that the pilaster may not be tied to the brickwork. As part of the next phase, we would recommend investigations are undertaken to confirm how the ashlar is tied back to the brickwork in this location, and whether the discontinuity in the brickwork still exists.



Figure 21. Tapered crack/open joint in the frieze to the north of the keystone.

- iii. A tapered, vertical crack/open joint was noted at the northern end of the frieze to the north of the keystone, where the stone to the left of the crack has dropped ever so slightly (Fig. 21). The movement appears to be a relatively long-standing issue as two Demec studs have been installed to monitor the movement in the past.

At this stage, the movement does not warrant immediate structural concern; however, we would recommend the crack is repointed using an appropriate lime mortar, and that the crack is monitored as part of the building's maintenance programme. (For reference, the crack has been noted as location "3" which in 2010 was recorded as having a crack width of c.5mm. Based on the inspection, it would appear the movement has not deteriorated significantly since 2010).

- iv. Fractured and loose sections of stone were observed in the cornice at the southern end of the north lodge (Fig. 22). Due to its location and proximity to a public right of way, we would recommend the loose stones are removed and/or debris netting is installed as soon as possible, and a provisional sum is set aside to repair the cornice of the east elevation.



Figure 22.
Loose stones on
top of the cornice.

- v. A horizontal crack has opened up in the mortar bed below the cornice where the southern lodge meets the arch (Fig. 23). While the crack does not warrant immediate structural concern, the horizontal nature of the crack could indicate the presence of embedded metal that is corroding. At this stage, we would recommend localised opening-up works/investigations are undertaken to investigate the cause of this movement.



Figure 23. Horizontal gap in the mortar below the cornice.

- vi. Severe erosion/weathering was noted to stones in the frieze and to the moulding above the architrave on the south lodge (Fig. 24). While this does not warrant immediate structural concern, we would allow a provisional sum to repair/renew the stone in this location.



Figure 24. Erosion in the frieze on the south lodge.

- vii. Similar to the front elevation, diagonal cracks were observed in the architrave over the keystone (over the arch) (Fig. 25). Subject to a more detailed inspection, we would recommend the cracks are repointed and the Bath Stone is tied back to the underlying brickwork using Helifix Cemties and grout, or similar.



Figure 25. Diagonal cracks in the architrave over the keystone.

- viii. Very slight, vertical cracks and open joints were noted in the Bath Stone to the north and south of the keystone where the arch has dropped ever so slightly. At this stage, the movement does not warrant immediate structural concern. However, we would recommend the cracks/open joints are repointed using an appropriate lime mortar mix and are monitored as part of the building's maintenance programme.
- ix. Further open joints and slight cracks were observed in the architrave and the frieze on the north lodge (Fig. 26). At this stage, the movement does not warrant immediate structural concern. However, we would recommend the cracks/open joints are repointed using an appropriate lime mortar, and the crack is monitored as part of the building's maintenance programme.



Figure 26.
Open joints and
slight cracks in the
architrave and frieze
on the north lodge.

- x. A series of rectangular indent repairs (at first-floor level) and vertical indent repairs (on the north corner) were observed on the north lodge where we assume steel ties/plates have been installed to tie the brickwork and possibly the Bath Stone to the steel channels on the inside of the building. Similar, but less extensive indent repairs were also noted on the south lodge.
- xi. A very slight, tapered crack was observed over the head of the ground-floor window on the southern lodge (Fig. 27). The crack ran from the corner of the first-floor windowsill down the wall to the right of the ground-floor window with the crack getting wider as it progressed down the wall. At this stage, the crack does not warrant immediate structural concern and is most-likely associated with when the ground-floor window was reduced in width.



Figure 27.
Partial view of south
lodge's ground-floor
elevation.

- xii. There are the remains of a previous accretion at the southern end of the elevation, with cementitious mortar repairs/facings observed around the former door opening. From an aesthetic perspective, this detracts from the building's aesthetic qualities. From a historic building's point of view, the application of non-permeable materials (cementitious mortars, plasters, renders and paints) to traditional, "breathable" materials is not ideal as it will trap moisture within the historic fabric, which could cause them to degrade. Depending on the Council's plans for the building, we would recommend the cementitious mortar is removed and replaced with more permeable materials and that repairs are also undertaken to the southern pilaster where brick have been inserted into the pilaster (Fig. 28).
- xiii. Minor corrosion was noted on the steel plates that tie the Bath Stone and the brickwork to the steel channel. While it does not warrant immediate structural concern, we would recommend the plates and threaded bars are re-coated as part of any work to the building.



Figure 28.
View of the
brickwork within the
southern pilaster

3.2.4. South (Wokingham Road) elevation

- i. The south elevation is faced in ashlar (Bath Stone) masonry with a cementitious-mortar facing over a historic doorway.



Figure 29. General view of the south elevation.

- ii. Very slight cracks and evidence of brick repairs were observed over the historic door opening, and on the south-east pilaster. At this stage, they do not warrant immediate structural concern. Nevertheless, we would recommend:
 - the cementitious-mortar facing, and the brick repairs are replaced with more appropriate materials,
 - the cracks/open joints are repointed using an appropriate lime mortar, and
 - the cracks are monitored as part of the building's maintenance programme.
- iii. A historic crack was noted to the capital at the top of the south-west pilaster with damage also noted to the mouldings at the top of both the south-west and the south-east pilasters. We would recommend these are inspected close up before confirming the nature of any remedial works required.
- iv. While it is not a structural issue, it should be noted the south-west downpipe discharges straight onto the ground (Fig. 30). This is not a good detail and can cause damp issues

internally, decay to the low-level stone and subsidence. We would recommend this is reviewed by a competent architect/surveyor.



Figure 30.
Partial view of the
downpipe on the
south-west corner.

3.2.5. Roof

- i. The roof is hipped and is covered in Welsh slate with lead parapet gutter and valley gutter. As previously documented it would appear the slates and the leadworks have been renewed relatively recently.
- ii. While it is not a structural issue, a slipped tile was noted on the eastern roof slope, and a buddleia is growing out of the east parapet (over the south lodge) (Figs. 31-32). As a matter of good practice, we would recommend the slate and the leadwork is inspected by a competent architect/surveyor/roofer who should advise on any remedial works deemed necessary.



Figure 31.
Buddleia and slipped
slate on the east
elevation.



Figure 32.
Slipped slate on the
east roof slope.

- iii. While it is not a structural issue per se, it should be noted that the parapet stones appear to be cast/reconstituted stone with non-ferrous cramps linking the stones together.

Unfortunately, the majority of the cramp slots have been left exposed to the weather and not all of the joints between the stones have been pointed. This should be reviewed by a competent architect/surveyor.

- iv. Significant deterioration/fragmentation was noted to one of the stones and the cementitious render on the west side of the southern lodge with the debris filling up the parapet gutter (Figs. 33 & 34). While some deterioration/fragmentation is documented in KRP's 2020 report with a photograph from 2016, it is clear the situation has deteriorated. Based on the inspection, we would consider this to require urgent attention.



Figure 33. Fragmentation of the render and stone on the west



Figure 34.
View of the debris in the
parapet gutter

- v. Stone deterioration/fragmentation was also noted on the east side of the roof at the junction of the south lodge and the archway (Fig. 35). Subject to discussions with a competent stone mason, we would allow a provisional sum to repair this stone.

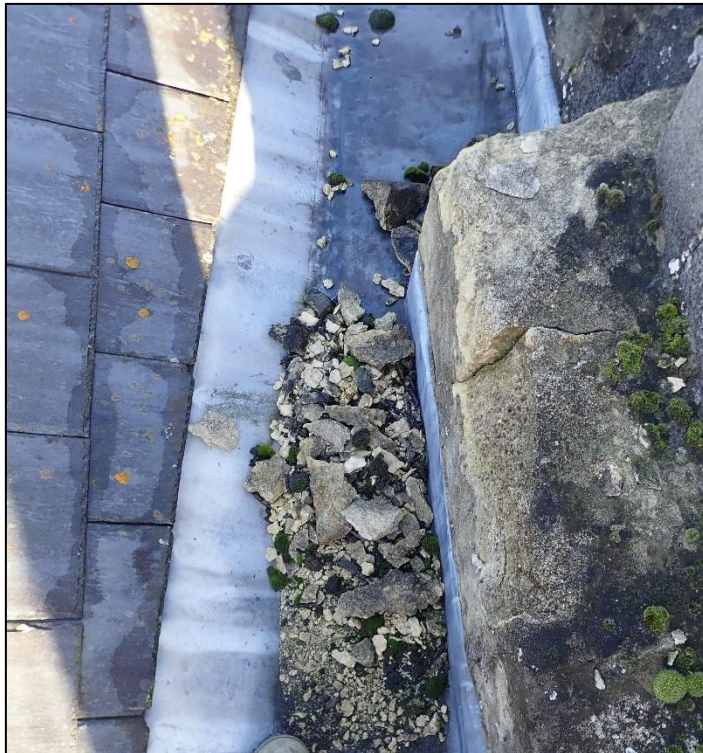


Figure 35.
View of the debris in the
parapet gutter and a
cracked stone on the east
side of the roof.

- vi. As observed from the M.E.W.P., it was clear the pediment leans outwards. While there was a gap between the last ridge tile and the leadwork on the inside face of the parapet (Fig. 36), we would assume the ridge tile was laid like this, and that the gap is not a result of recent movement. Unfortunately, there are no photographs of the ridge in KRP's 2020 report to corroborate this assumption. Nevertheless, we would recommend the out-of-plumbness is confirmed, and if possible, enquiries are made with KRP to see whether they have any photographs of the ridge. Subject to the above, we would recommend the pediment is tied back to a new structure provided within the roof space (over the archway).



Figure 36.
The gap between the
leadwork and the ridge
tile.

While it is not a structural issue per se, open joints were also noted between the coping stones. This should be reviewed by a competent architect/surveyor, and the open joints made weathertight. On a similar basis, we would recommend the redundant chimney stacks are appropriately vented to prevent the build-up of moisture (Fig. 37).



Figure 37.
View of the capped
southern chimney.

3.2.6. Inside the archway

- i. There is a significant, tapered gap between the plastered barrel-ceiling and the rear of the front arch, where the arch is leaning outwards (Fig. 38). While it is evident the pediment is leaning outwards and that the brickwork on the front elevation has become detached from the brick walls within the archway, there were no signs that the truss had disengaged from its support (a timber beam/plate) within the roof space. At this stage, we would recommend the roof space is re-inspected with improved lighting and if possible improved access.



Figure 38.
View of the gap between
the rear of the arch and
the plastered barrel
ceiling.

- ii. Stepped cracks that have previously been repointed in cementitious mortar were observed over the door to the south lodge, where the front elevation has become detached from the southern wall within the archway (Fig. 39). It should be noted that significant cracking was also noted in the brickwork in this corner and the other corners of the archway from within the roof space. At this stage, we would recommend the finishes/lining are removed on the first-floor level to allow a better inspection of the crack. (While there appears to be a vertical

steel channel in this location, it is providing restraint in the north-south direction and not the east-west direction where the brickwork has cracked.)



Figure 39. Stepped crack/scar between the door and the arch.

- iii. Indent repairs were observed on both sides of the archway where we assume steel ties/plates have been installed to tie the brickwork and possibly the ashlar to the steel channels. We would recommend the position of these indent repairs are recorded on a drawing as part of the building's maintenance programme.
- iv. The northern gate is damaged and is hanging off the upper hinge. We would recommend the gate is carefully removed and stored in a safe location until it can be repaired to prevent undue stresses on the upper hinge/surrounding masonry.

3.2.7. Roof space

- i. As previously documented, the inspection of the roof space was limited to what could be seen from the two loft hatches under torchlight.
- ii. The roof structure comprises cut rafters, purlins and 3No trusses, with the purlins also propped off the brick walls on either side of the archway. The roof structure has been subject to extensive remedial works relatively recently with repairs to the tie-beams, rafter feet and

the valley gutter timber work observed. While there were no signs of significant structural distress to the roof structure, we would question how the timber beam/plate that supports the west end of the central truss is supported; i.e., is it supported off a brick ledge or partially embedded within the brickwork or propped off the arch? We would recommend this is investigated as part of the next phase of investigations, and an allowance is made to tie the brickwork to the ends of the central truss (Fig. 42).



Figure 40. General view of the roof structure (Looking south from the northern access hatch).

- iii. Significant structural cracking was observed at the junction of the front wall and the southern archway wall, and over the door to the south lodge (Fig. 41). Similar cracking was also noted in the other corners. At this stage, we would recommend the finishes/lining are removed in each of these locations, the cracks are re-inspected, and a provisional sum is allowed to re-instate the bond between the front and rear walls and the walls on each side of the archway, and to stitch the cracks over the door.

It should be noted the movement is documented in KRP's 2020 report with photographs of the movement dating back to 2016; i.e. the movement would appear to be a relatively long-standing issue.



Figure 41. Cracking and dis-engagement of the brickwork in the south-west corner of the archway.



Figure 42. Cracking on the north wall of the archway.

- iv. Significant vertical cracks were observed in the brickwork on the north side of the archway to the east of the two steel channels (Fig. 42). At this stage, we would recommend the finishes/lining are removed and the brickwork inspected close up and a provisional sum to stitch the cracks is allowed for.

- v. As previously stated, we would recommend the verticality of the pediment is confirmed and subject to this the pediment is tied back to a new roof structure over the arch.
- vi. Similarly, we would recommend whether the discontinuity in the brickwork behind the pilaster to the south of the arch on the east elevation has been repaired (Fig. 43). If so, we would recommend remedial works are undertaken to restore the connectivity between the brickwork.

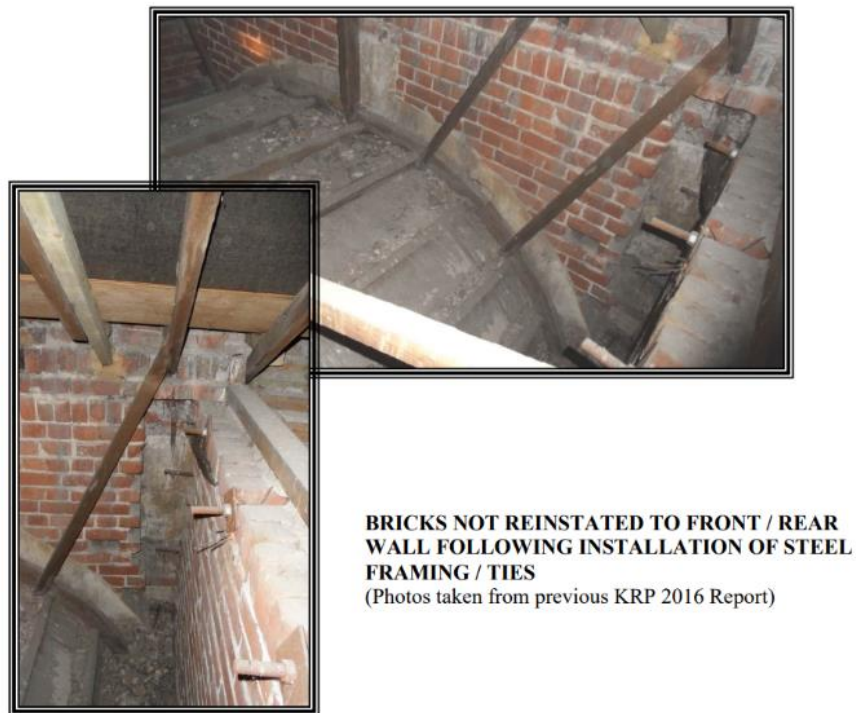


Figure 43. Discontinuity of the brickwork in the south-east corner of the archway.
(Extracted from p15 of KRP's 2020 "Structural Inspection" report.

- vii. There is a gap between the underside of the rear purlin and the principal rafter on the central truss (Fig. 44). While there were no signs of distress/deflection in the rafters in this location, as a matter of good practice we would recommend the connection is reinstated. This was also noted in KRP's 2020 report.



Figure 44.
View of the gap between
the underside of the rear
purlin and the principal
rafter.

- viii. While it is not a structural issue per se, possible evidence of recent water ingress was observed beneath the parapet gutter on the east elevation on both the north and south lodges and on the south-west corner of the south lodge (Figs. 45-46). We would recommend this is investigated.



Figure 45. Possible water ingress on the east side of the roof/to the north of
the northern truss.



Figure 46. Possible water ingress at the southern end of the west elevation.

3.2.8. Internal rooms

- i. No signs of significant structural distress or cracking were noted inside the Entrance Lodge. However, there was evidence of elevated levels of moisture within the finishes on the ground floor in both lodges (Fig. 47). This should be investigated by a competent architect/surveyor and is probably related to the inappropriate use of cementitious plasters on traditionally permeable surfaces, and a lack of heating and ventilation.



Figure 47. Example of blistering in the plaster and paint.

4. Conclusions

From the inspection undertaken, it is clear that the Entrance Lodges have numerous structural and non-structural defects; the majority of which appear to long-standing issues, which have not been addressed in the recent past.

From a structural perspective, we would consider the most pressing issues to be :

- the lean in the pediment on the front elevation and a lack of restraint to the pediment,
- the cracking at the southern end of the architrave over the archway on the front elevation,
- the cracking at the junction of the front and rear walls with the walls on each side of the archway,
- the cracking within the brickwork on the north side of the archway, and
- the fragmentation/deterioration of the stones/render on the roof.

We would also consider the risk of cracked and loose sections of Bath Stone and subsequent repairs falling onto the public to be an unacceptable risk.

At this stage, we would recommend:

- The verticality of the pediment is confirmed, and subject to this, the pediment is tied back to a new structure provided within the roof space over the arch. As part of this, enquiries should be made with KRP Consulting Engineers to see whether they possess photographs of the ridge and the rear of the pediment.
- The architrave over the arch on the front elevation is stabilised and subject to improved access within the roof space, is tied back to the brickwork using Helifix Cemties and grout, or similar, and the cracks/open joints are pointed using an appropriate lime mortar mix and made weathertight.
- The cornice on all the elevations is re-inspected off a more secure/stable tower scaffolding and a provisional sum is allowed for repairs/renewal. Until this point, we would recommend debris netting is installed to minimise the risk of pieces of stone/the repair failing/falling on the west elevation and over the arch on the east elevation.
- The cracked mortar at the southern end of the architrave, frieze, and cornice on the south lodge is carefully removed and the open joints/cracks are repointed using an appropriate lime mortar, and the cracked stones are tied back to the brickwork using Helifix Cemties and grout, or similar, and the situation is monitored as part of the building's maintenance programme.
- Subject to a more detailed inspection, we would recommend the cracks in the architrave over the arch on the east elevation are repointed and the Bath Stone is tied back to the underlying brickwork using Helifix Cemties and grout, or similar.
- Repairs are undertaken to the fragmented/cracked stones on the parapet.

- The roof space is re-inspected with improved lighting and if possible improved access.
- The finishes/lining are removed from the four corners of the archway, from the north wall (to the east of the pair of steel channels) so that the significant cracking in the brickwork can be inspected, and a provisional sum is allowed to re-instate the bond between the front and rear walls and the walls on each side of the archway, and to stitch any cracks within the brickwork.
- Investigations are undertaken to ascertain how the timber plate/beam that supports the eastern end of the central truss is supported, and a provisional sum is allowed to tie the ends of the tie beam to the brickwork.

We would also advise early consultation is made with the Conservation Officer so that he/she is made aware of the situation.

We would also like to highlight the fact that old buildings need to 'breathe' in order to function and are also more flexible when compared to modern buildings constructed out of modern materials. Consequently, any new materials used should be appropriate for use in a building of this age.

Please contact us if you have any questions.

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