

Doc Ref: **2951-BCL-00-XX-RP-S-0001**

Date: **31st March 2024**

Rev: **P01**

Client

Cardinal Partnership Ltd
Leestone Road
Sharston Industrial Estate
M22 4RB

Site Address

Cardinal Partnership
Harling Road
Wythenshawe
M22 4UZ

Document Title

Structural Inspection Report



Contents

1.0	Introduction.....	3
2.0	Survey Information.....	3
3.0	Location and setting	4
4.0	Observations.....	5
4.1	External Observations.....	5
4.2	Internal Observations	16
5.0	Structural Appraisal	19
6.0	Conclusions and Recommendations	22
	Appendix A – Brennan Consult Drawing	23

Revision History

Issue	Date	Status	Prepared By	Signature
P01	31.03.24	First Issue	Lee Meadowcroft BSc(Hons) PgDip MScCHE CEng MStructE MICE IHBC	

Disclaimer

This report is the property of Brennan Consult Ltd and is confidential to the Client designated in the report. Whilst it may be shown to their professional advisers, the contents are not to be disclosed to, or made use of, by any third party, without our express written consent. Without such consent we can accept no responsibility to any third party. Any third parties to which our responsibility is extended are stated below:

This report is made on behalf of Brennan Consult. By receiving it and acting on it, the Client – or any third party relying on it – accepts that no individual is personally liable in contract, tort or breach of statutory duty (including negligence).

1.0 Introduction

- 1.1 Brennan Consult Ltd was appointed by Craig Mansfield-Perry to carry out a structural inspection of the north-west external wall of the Grade II* listed Wythenshawe Bus Depot building, of which Cardinal Partnership own the northern warehouse referred to as the Repair Hall and washing bays.
- 1.2 The principal aim of the structural inspection report is to advise on the structural condition of the window surrounds, lintels, parapet wall and rendered masonry elevation.

2.0 Survey Information

- 2.1 A representative of Brennan Consult Ltd visited the property on 12th January 2024 to carry out an internal visual inspection and on 12th February 2024 to carry out an external visual inspection. High-level access was made available during both inspections to allow an up-close inspection of the structure, whilst builders attendance was available during the external inspection to facilitate removal of loose material to look at the underlying structure.
- 2.2 The weather at the time of our inspections was mild and dry.
- 2.3 The inspections comprised an internal and external visual inspection of all reasonably accessible areas. This report is not a full record of all aspects of the building fabric and relates only to items of structural significance, as set out within our brief. We have not inspected aspects of the structure that are covered or otherwise inaccessible, and are therefore unable to confirm that these elements are free from defect.
- 2.4 Photographs were taken and are included throughout this report.

3.0 Location and setting

- 3.1 The property considered in this report is a large high-bay concrete and masonry warehouse building located to the east of Harling Road, Wythenshawe (Photo 1).



Photo 1. Aerial view of survey area

- 3.2 The property is listed at Grade II* on the National Heritage List for England (ref 1389256) as a former bus garage now warehouse, dated 1939-42. The northern portion of the building, outlined red above, is referred to as the Repair Hall and washing bays, constructed of rendered brick with repair hall roof formed of seven longitudinal shell cylinders with rigid end frames and deep beams.
- 3.3 At the time of our inspection the property was occupied as a storage warehouse with high-bay racking present throughout the building, accessed via forklift trucks off the concrete ground-floor slabs.
- 3.4 Concerns have been raised regarding the structural condition of the concrete lintels and window surrounds to the 8 No east-facing windows that have now been infilled with a metal cladding system, along with the render coating to the brickwork that has been falling from the building in recent years.
- 3.5 This report looks to consider the structural form of the window surrounds and lintels, and the general condition of the elevation, with a record provided of the existing condition and outline repair recommendations proposed for further discussions with the conservation architect and Local Authority.

4.0 Observations

4.1 External Observations

- 4.1.1 The north-west elevation was a large rendered masonry elevation with 8 No large windows, parapet and rainwater hoppers and downpipes at each end of the elevation (Photo 2).



Photo 2. North-west elevation

- 4.1.2 For reference purposes, the windows have been numbered 1-8 from north-to-south as shown in Photo 2 above. A drawing is included in Appendix A that shows the general arrangement of the elevation along with existing details as recorded during the inspection works.
- 4.1.3 Each window surround consisted of what appeared to be a precast concrete cill, jambs and head all of which were of a similar profiled appearance (Photo 3).



Photo 3. Typical window detail with profiled surround and head

- 4.1.4 Each window had been infilled with profile metal cladding and a pressed-metal cill flashing over the original cill section, meaning it was not possible to inspect the cill element (Photo 4).



Photo 4. Typical window cill with pressed-metal flashing

- 4.1.5 The window surround profile was typically 120mm wide and projected from the face of the profile metal cladding by 190mm. The outer projection from the rendered face measured circa 70mm wide with a 10mm recess to the face of the surround. The overall section size ran into the core of the wall and could not be measured.
- 4.1.6 The external inspection proceeded from south to north, starting with window 8, with the worst condition of the structure appearing to be at the south end of the elevation when viewed from ground level.

- 4.1.7 At the top right-hand corner of window 8, there was loose material around the window surround and the end of the concrete lintel and so this location was used to remove loose material to inspect and understand the core of the structure (Photo 5). The structure consisted of a 420mm deep concrete lintel with 100mm bearing on to the masonry wall at the window reveal. Above the lintel was a 140mm deep projecting stone band in segments that ran continuously above all 8 windows. The head of the window surround was integral with the concrete lintel and there was cracking between the projecting window surround and the concrete lintel. The window jambs were segmental and in separate pieces to the window head and lintel.



Photo 5. Top right-hand corner of window 8 showing structural arrangement

- 4.1.8 Closer inspection of the window head revealed the lintel and window head to be a single element of cast-stone construction with 30-40mm cast stone surface finish and aggregate concrete core (Photo 6). A single reinforcing bar was visible within the concrete core and was visibly corroded. There was no reinforcement present within the projecting window surround and no clear evidence of any links within the lintel.



Photo 6. Integral window head and lintel

- 4.1.9 Inspection of the lintel from below showed there to be a continuous longitudinal crack at the junction between the deep concrete lintel and the projecting window surround profile (Photo 7). This location coincided with the corner reinforcing bar within the lintel.



Photo 7. Longitudinal crack to soffit of concrete lintel

4.1.10 One of the right-hand window jamb sections of window 8 also showed signs of spalling (Photo 8), and closer inspection of this section revealed the same cast stone construction with aggregate concrete core (Photo 9). The connection between the window jamb sections nor between the window jamb and masonry wall could not be determined without removal of a section of the jamb.



Photo 8. Spalling window jamb to right-hand side of window 8



Photo 9. Cast stone window jamb section

- 4.1.11 Between windows 7 and 8, the extent of spalling was less severe, however there was visible cracking and spalling of the render at the interface between the end of the concrete lintel and the supporting masonry wall (Photo 10).



Photo 10. Cracking and spalling between windows 7 and 8

- 4.1.12 The left-hand side of window 7 was in a similar condition to the right-hand side of window 8, with cracking between the concrete lintel and the projecting window surround (Photo 11). It appeared there were inherent defects in the form of construction of the lintels and window surrounds, though the severity of the corrosion and thus the extent of cracking and spalling varied at each location.



Photo 11. Cracking to left-hand side of window 7

- 4.1.13 The head of window 6 was the most severely affected of the 8 No windows, with clear daylight present between the concrete lintel and the projecting window surround, and large sections being at imminent risk of falling from the building (Photo 12).



Photo 12. Head of window 6 with severe spalling and risk of debris falling

- 4.1.14 Two bottom reinforcing bars were visible at the head of window 6, with the outside bar being in the same location as seen at window 8 (Photo 13). The long lengths of reinforcing bar visible confirmed there to be no link reinforcement in the lintel and no reinforcement between the lintel and window surround profile.



Photo 13. Reinforcing bars visible to underside of window 6 lintel

- 4.1.15 Window 5 was in a similar condition to the other windows, with continuous longitudinal cracks visible above and below the projecting window head section. In addition, there was spalling at the bottom left-hand corner of the window surround (Photo 14).



Photo 14. Spalling to bottom left-hand corner of window 6 surround

- 4.1.16 A large section had already fallen from the building at the head of window 4 (Photo 15) and there was a large open joint at the interface between the lintel and the head of the right-hand window surround.



Photo 15. Large section fallen from the lintel of window 4

- 4.1.17 Investigation of the open joint at the head of the window surround revealed there to be slate pins between the adjacent cast stone sections (Photo 16). There was no other evidence of any connection between adjacent units, for example dowels, straps or other reinforcement.



Photo 16. Slate pins between adjacent window surround panels

- 4.1.18 Window 3 was in a relatively good condition, with limited longitudinal cracking, however the front face of the lintel had spalled at the left-hand support and revealed the hooked end of the lintel top reinforcing bar (Photo 17).



Photo 17. Hooked end of reinforcing bar visible to window 3 head

4.1.19 Window 2 was generally in a similar condition to window 3 however there was spalling to at least one of the left-hand side panels similar to that seen on window 8.

4.1.20 Window 1 had longitudinal cracking similar to seen on other windows, and the bottom reinforcing bar was visible and confirmed a similar hooked end to the top reinforcing bars (Photo 18).



Photo 18. Exposed bottom reinforcing bar to left-hand side of window 1 lintel

4.1.21 The parapet was inspected at high level and there was significant delamination or loss of the render coating to the majority of the parapet extent (Photo 19). The render below parapet level also showed widespread evidence of delamination, decay and missing sections.



Photo 19. Delamination of render coating to parapet

4.1.22 A bitumen DPM ran longitudinally at roughly the level of the roof structure to the far side of the parapet, and was visibly decayed, with longitudinal cracking visible in the render/masonry (Photo 20).



Photo 20. Decayed bitumen DPM to parapet wall

4.1.23 The alignment of the parapet was viewed from above and found there to be a reasonable external bow at around the window 3/4 position (Photo 21). The inside face of the parapet had been tanked and there was a pressed metal flashing above the parapet gutter.

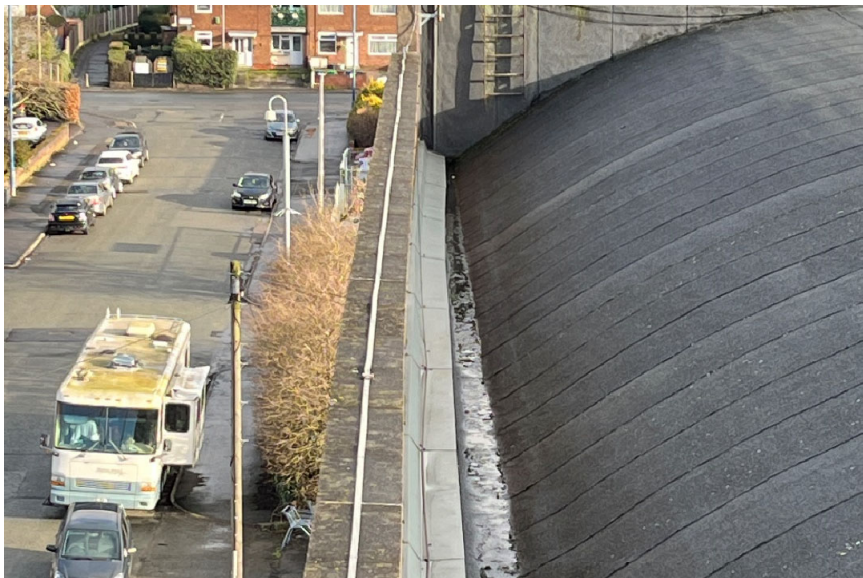


Photo 21. External bow of parapet wall visible from above

4.2 Internal Observations

- 4.2.1 Internally there was high-bay racking present alongside the north-west elevation. All storage was removed from the top shelf to allow visual inspection from the aisle (Photo 22).



Photo 22. High-bay racking to internal face of north-west elevation

- 4.2.2 The structure generally consisted of concrete lintels spanning across each window opening and supported on masonry piers. The internal lintels appeared to be of solid concrete construction and was different to the appearance of the external lintels. There appeared to be a cavity between the internal and external lintels. It was not possible to confirm the overall wall construction thickness from either the internal or external inspections.
- 4.2.3 Sprinkler pipework was also present to the inside face of the external wall, with some pipe runs across the aisle.

- 4.2.4 Each lintel was inspected from ground-floor level looking up, and face-on at high level. The underside of the concrete lintel to window 8 showed there to be longitudinal cracking to the inside face, where the corner reinforcing bar was visible and the concrete had spalled along part of the lintel length (Photo 23).



Photo 23. Underside of internal lintel to window 8

- 4.2.5 The same lintel viewed at high-level showed the concrete to be of more traditional reinforced concrete with brick aggregate (Photo 24). A large section of lintel had spalled and there was minor corrosion of the underlying corner reinforcing bar. No link reinforcement was present.



Photo 24. Spalling of internal face of window 8 internal lintel

- 4.2.6 The remaining internal lintels were free from concrete spalling, however there was minor longitudinal cracking to the soffit of the window 5 (Photo 25) and window 3 lintels.



Photo 25. Minor longitudinal cracking to soffit of window 5 internal lintel

- 4.2.7 Full record photographs of the internal and external inspections of each window lintel are available on request and have been provided to the client by way of a Dropbox link ahead of the issue of this report.

5.0 Structural Appraisal

- 5.1 The north-west elevation of the warehouse is of loadbearing masonry cavity wall construction with 8 No large windows and a parapet wall above the level of the concrete vaulted roofs.
- 5.2 The overall wall construction thickness is not known, however the wall above the windows appears to be constructed off two independent concrete lintels. The inner lintel is of a traditional reinforced concrete construction with brick aggregate and longitudinal reinforcing bars without links. The external lintel is of cast stone construction with a 30-40mm layer of cast stone and a weak aggregate concrete core, giving an outward appearance of stone whilst having a reinforced concrete core to act as a lintel to support the masonry wall and parapet above.
- 5.3 The internal lintels were generally found to be in a reasonably sound condition with limited evidence of structural defects. Three internal lintels had been affected by minor corrosion of the embedded reinforcing bar to the internal corner, and concrete had spalled and fallen from the window 8 lintel.
- 5.4 The condition of the internal lintels was not considered to impair the structural performance, however concrete remedial works would be recommended in the medium term, as well as removal of any immediately loose material in the short term to prevent risk of falling debris. The repairs to these lintels would involve removal of any loose material, exposing any corroding reinforcing bars, cleaning and painting the reinforcing bars with a suitable reinforcement protection system, followed by reinstatement of the concrete using a concrete repair mortar such as Fosroc Renderoc.
- 5.5 The condition of the external lintels was much poorer than the internal lintels, with widespread evidence of reinforcement corrosion that had caused large sections of the window heads to become unstable with a risk of large sections of concrete falling from the building.
- 5.6 There was a strip of land at the base of the windows, separated from the footpath by a dwarf masonry wall, thus any falling debris would be unlikely to risk injury to persons using the footpath. However, there is no secure separation between the footpath and strip of land and so there would be a risk to any personnel who access the strip of land adjacent the windows.
- 5.7 The external window surrounds were of cast stone construction with reinforcement within a weak concrete core. The construction of the lintel is considered not to offer the same protection to the embedded reinforcement as traditional concrete. Over the life of the building, the reinforcement has begun to corrode and has caused the outer cast stone section of the elements to separate from the concrete core. No reinforcement was found to be present within the concrete core and there was no transverse tying to prevent the face of the stone from falling from the building.
- 5.8 The main lintels themselves were of concrete construction and the defects were not considered to impair the structural performance of the lintels at the time of our inspection. There was no evidence of cracking or structural movement of the lintels, or cracking in the masonry walls above the lintels; the defects appeared to be isolated to the projecting window surround and the concrete immediately adjacent the reinforcing bars.

-
- 5.9 The vertical window jamb elements were not considered to be loadbearing, only supporting the weight of the elements directly above them, however the tying of the window jambs to the masonry walls / piers could not be determined and there only appeared to be nominal slate pinning between adjacent side window jamb panels.
- 5.10 The required concrete repairs to the concrete core of the lintels above the windows would be the same as the internal lintels i.e. remove loose material, expose the corroding reinforcing bars, clean and paint the bars before carrying out a concrete repair. However, in order to carry out these repairs it would be necessary to remove the stone face and the subsequent reinstatement of this stone face following the concrete repair would be difficult to achieve.
- 5.11 Discussions would be necessary with a conservation architect and the local authority conservation officer in terms of the methodology for repairing the cast stone, the materials and workmanship to be used and the final appearance of the window surrounds. As the building is listed at Grade II* it will be necessary to obtain both planning permission and listed building consent for the works, and it is intended that this report be used to inform initial discussions between the conservation professionals and local authority regarding the best course of action going forwards.
- 5.12 Initial thoughts in terms of the lintel repair is that the projecting window surround element be vertically cut off at the face of each lintel to facilitate the repair of the underlying concrete core, before installing a new cast-stone facing material pinned back to the outside face of the lintel. It is considered necessary for these works to be carried out to each of the 8 No external lintels.
- 5.13 The side window jambs were generally found to be in a reasonable structural condition, however some localised panels had suffered damage and spalling and would require replacement. Further careful intrusive investigations would be necessary to understand the connectivity between adjacent side jambs and between those and the masonry piers between the windows. It is necessary to understand whether removal of a single panel could be carried out without losing support or causing damage to the immediately adjacent panels. Again, further discussions are necessary with the conservation architect and conservation officer to develop the most suitable solution for these elements.
- 5.14 The external render coating was in a poor condition throughout and had delaminated from the underlying brickwork, particularly at parapet level where large sections of render were at risk of falling from the building. The poor condition of the render is not of an immediate structural concern, however is a health & safety risk and its repair would assist in limiting the extent of water entering the core of the wall and the associated increased risk of further reinforcement corrosion in the medium to long term.
- 5.15 The parapet wall was in a reasonable structural condition though there was visible evidence of outward movement above window 3 and 4. A measured verticality survey of the wall from window head level up to top of parapet by a building surveyor would be recommended to understand the magnitude of the outward movement. Replacement of the decayed DPM course at the base of the
-

parapet wall would be recommended as part of any proposed remedial works, to remove the potential for movement of the wall above this level and cracking in any new render coating.

- 5.16 A drawing is included in Appendix A showing the general arrangement of the elevation, the location of defects discussed in this report and typical section through the lintels. The drawing is intended to facilitate further discussions with the conservation architect and conservation officer regarding the condition of the existing structure and the possible solutions to be developed ahead of a planning and listed building consent application.

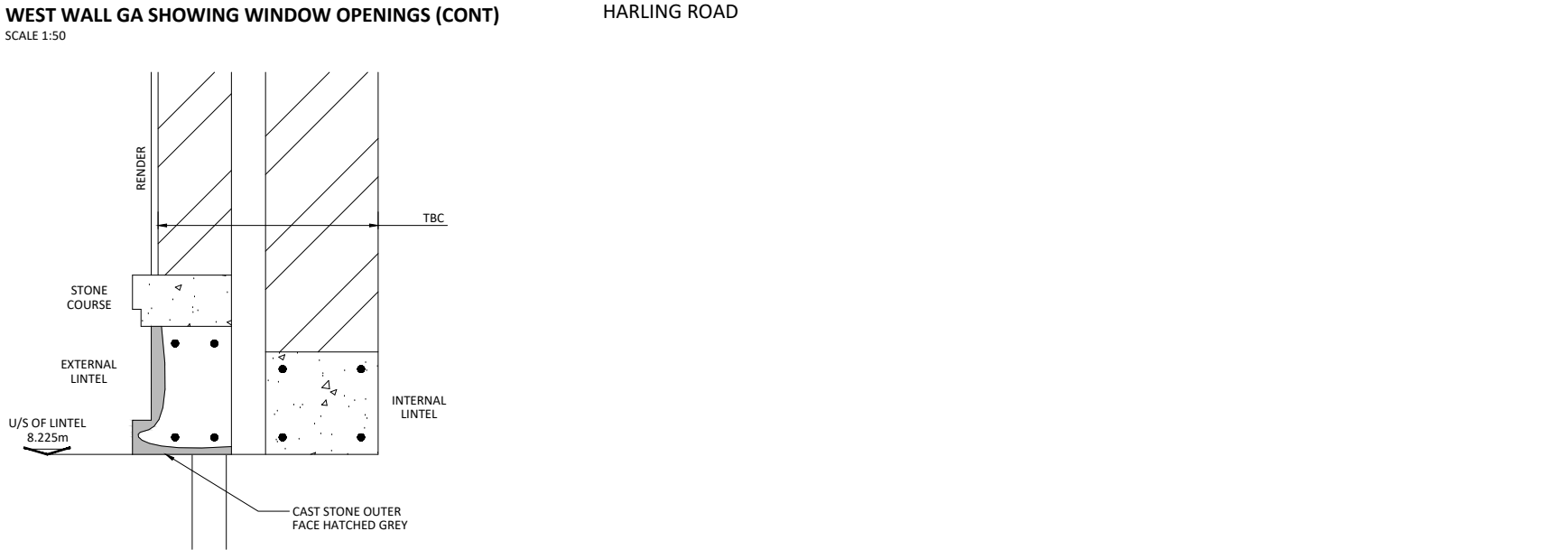
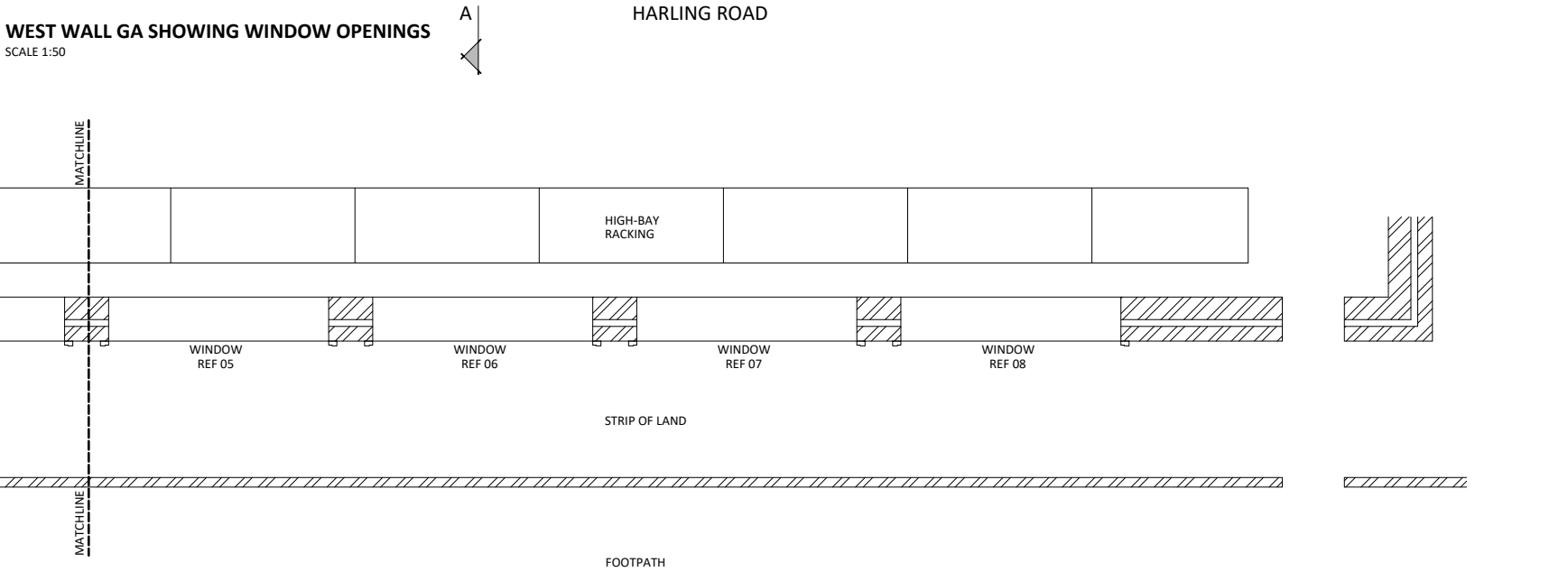
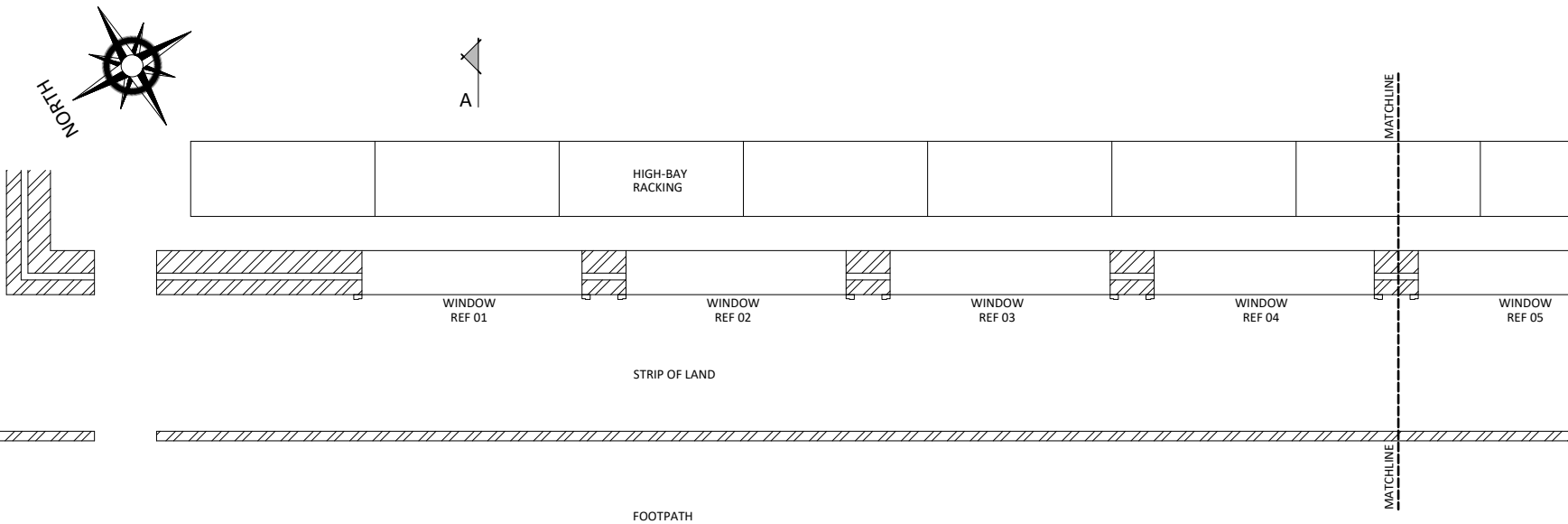
6.0 Conclusions and Recommendations

- 6.1 Brennan Consult Ltd was asked to carry out a structural inspection the north-west elevation of a warehouse at Harling Road following concerns that debris has fallen to the ground and further debris being at risk of falling.
- 6.2 A visual internal and external inspection was carried out and identified the internal lintels to generally be in a sound structural condition with limited localised defects, however the external lintels had inherent defects that had led to separation of the profile window surround and risk of sections of stone falling from the building.
- 6.3 For the internal lintels it is recommended that any loose material is removed, the exposed reinforcing bars cleaned and painted with a suitable protection system and then a concrete repair carried out using a concrete repair mortar such as Fosroc Renderoc. Works are required to the internal lintel above window 8 and is also recommended where minor cracking is present above windows 5 and 3.
- 6.4 For the external lintels it is recommended that the window head profile is vertically cut off at the face of the concrete lintel to allow a similar concrete repair to be carried out as noted in 6.3 above. The window head profile could then be reinstated by pinning new cast sections to the outside face of the lintel. It would be recommended that these works be carried out to all 8 No external lintels, however further discussion is required with the relevant conservation professionals to agree the methodology and materials to be used in the repair of the building, prior to submitting a listed building consent application for these works.
- 6.5 Localised areas of the window jambs was also spalled and requires replacement, however further careful intrusive investigation is required to understand the connection between adjacent panels and between these and the adjacent masonry piers. Listed building consent may be required before carrying out these intrusive works and the repair methodology will again require prior agreement prior to an application being made. The likely repair for these elements will likely be new like-for-like elements being cast and installed, to the same profile as the existing damaged sections.
- 6.6 The render to the full north-west elevation is in poor condition and there are large sections at risk of falling from the building. The replacement of the render is not considered to be a structural item and requires architectural input as well as agreement to replace the render, material selection and methodology followed by a listed building consent application.
- 6.7 The parapet wall was generally in a reasonable structural condition however it is recommended that a measured verticality survey be carried out by a surveyor to understand the magnitude of the outward incline, as well as replacement of the decayed bitumen at the bottom of the parapet masonry.
- 6.8 The works noted above all require taking forward to detailed design and specification by a conservation architect and it is intended that this report is used to inform these works and facilitate discussions with the local authority. A drawing is included in Appendix A for reference purposes and to demonstrate the general arrangement of the elevation, windows and lintel details.

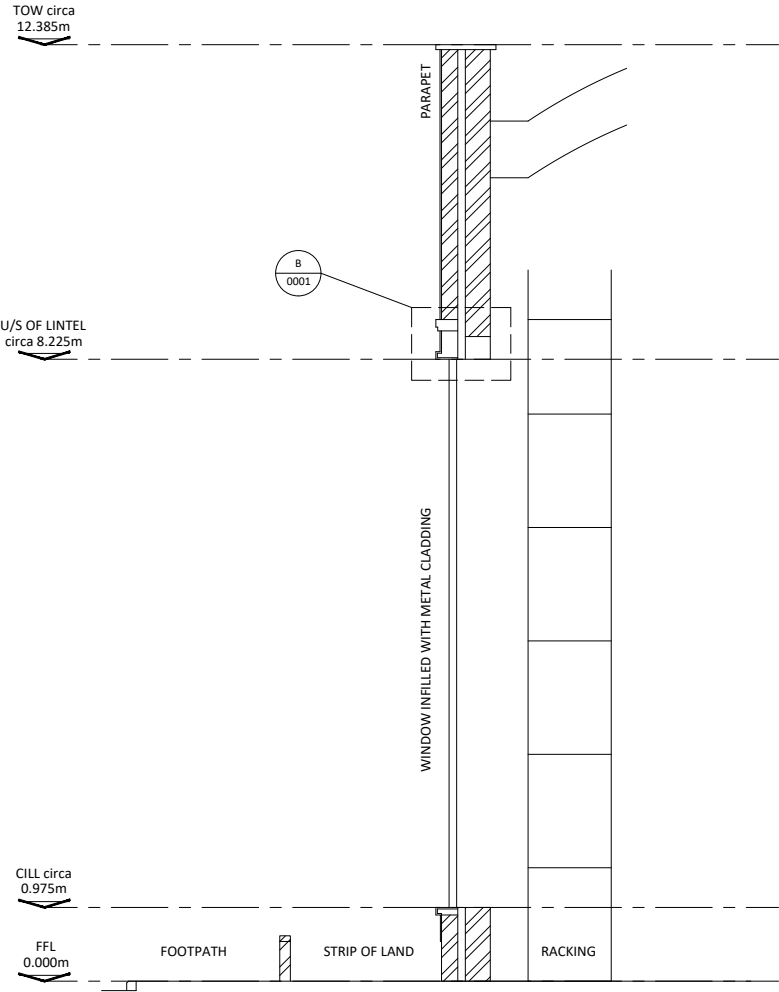
Project Title Cardinal Partnership, Harling Road, Wythenshawe, M22 4UZ
Project No 2951-BCL-00-XX-RP-S-0001
Date 31st March 2024



Appendix A – Brennan Consult Drawing



ENLARGED SECTION B - B
SCALE 1:10



SECTION A - A
SCALE 1:50

© THIS DRAWING AND ITS CONTENTS ARE STRICTLY THE COPYRIGHT OF BRENNANCONSULT LTD

GENERAL NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ASSOCIATED DRAWINGS. ANY DISCREPANCY TO BE RAISED PRIOR TO CONSTRUCTION. ANY CONSTRUCTION WORKS WHICH COMMENCE BEFORE THESE DRAWINGS ARE APPROVED ARE AT THE RISK OF THE BUILDING CONTRACTOR.
- ALL DIMENSIONS ARE IN MILLIMETERS (mm). DO NOT SCALE FROM THIS DRAWING, WORK TO STATED DIMENSIONS ONLY.
- BUILDING CONTRACTOR TO ENSURE ALL WORKS COMPLY WITH THE CURRENT EDITION OF THE BUILDING REGULATIONS. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH APPROVED DOCUMENT REGULATION 7.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN, FABRICATION, ERECTION AND REMOVAL OF ALL TEMPORARY WORKS AND SHALL PROVIDE ALL TEMPORARY BRACING AS NECESSARY TO MAINTAIN STRUCTURAL STABILITY DURING CONSTRUCTION.
- IF THE CONTRACTOR CONSIDERS THAT THEY DO NOT HAVE SUFFICIENT INFORMATION TO SAFELY COMPLETE THE WORKS DETAILED ON THIS DRAWING, THEY SHOULD CONTACT THE ENGINEER.

P01	PRELIMINARY ISSUE	DF	02.04.24	LM
REV	REVISION DESCRIPTION	BY	DATE	CHECKED

BrennanConsult
Civil & Structural Consulting Engineers
www.brennanconsult.com
info@brennanconsult.com
0161 428 2880

BrennanConsult Ltd | Oak House | 2 Gatley Road
Cheadle | Stockport | SK8 1PY

CARDINAL MARITIME, HARLING
ROAD, SHARSTON,M22 4 UZ

STRUCTURAL REPORT
APPENDIX A
NORTH-WEST ELEVATION GA

Status
PRELIMINARY

Project No.	Originator	Zone	Level	Type	Role	Drawing No.	Revision
2951	BCL	00	00	SK	S	0001	P01

Scale	Size	Drawn	Date	Checked	Passed
AS STATED	A1	DF	FEB 24	LM	CB