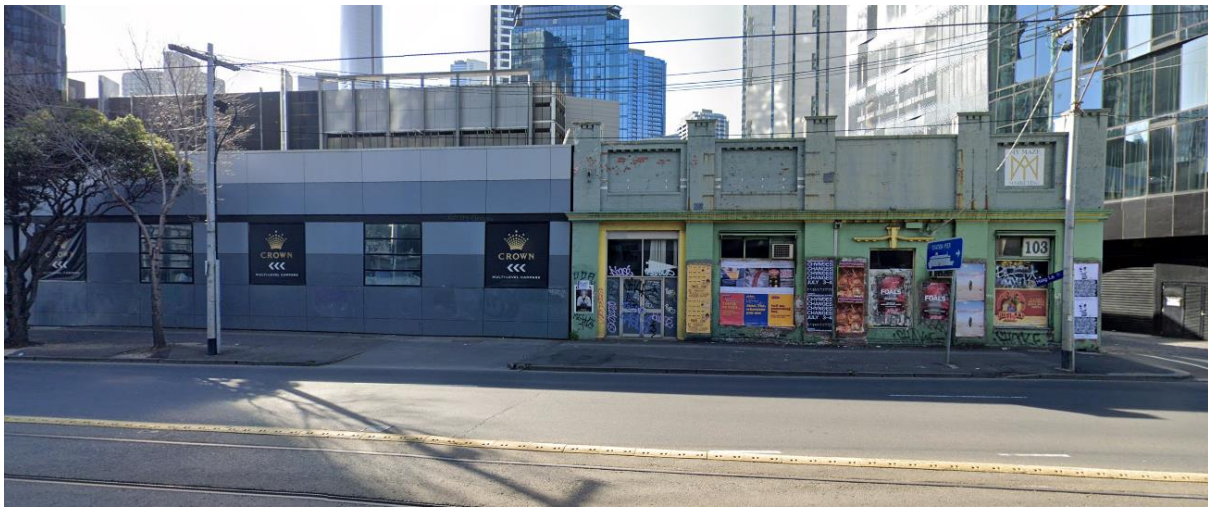
ASHURST AUSTRALIA

93 - 103 CLARENDON ST SOUTHBANK

PHIL GARDINER

STRUCTURAL ENGINEERING EXPERT EVIDENCE REPORT

2 JULY 2020



wsp

93 - 103 Clarendon St Southbank
Phil Gardiner
Structural Engineering Expert Evidence Report

Ashurst Australia

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EXPERT QUALIFICATIONS

Name: Phil Gardiner

Address: Level 15, 28 Freshwater Place Southbank, VIC, 3006

Qualifications:

BEng (Hons) FIE Aust CPEng

Member Structural & Civil Colleges Engineers Australia

Registered Building Practitioner VIC EC 1126

Experience:

Phil has over 40 years' experience in the provision of engineering consultancy for all types of buildings and engineering structures and 17 years' experience as Managing Director of Irwinconsult; now Principal Director of WSP. His broad experience includes low, medium and high-rise commercial and residential buildings, large clear span and high bay industrial developments, educational, sporting and healthcare facilities, as well as maritime and other civil engineering structures.

Significant Contributors:

Name: John Keating

Address: Level 15, 28 Freshwater Place Southbank, VIC, 3006

Qualifications:

BEng (Hons), BCom, MIE Aust

Experience:

John is a Senior Structural Engineer in WSP's Melbourne Office. John has been practicing engineering for 9 years, and has experience in commercial, education, and heath market sectors.

INSTRUCTIONS DEFINING SCOPE OF REPORT

Engagement on behalf of Crown, to prepare an expert witness statement, and appear as an expert witness, at the panel hearing for Planning Scheme Amendment C305.

Preparation of an expert evidence report, for circulation to the Panel and other parties.

PROVISIONAL OPINIONS

- I have not sighted any geotechnical investigations for the site nor witnessed exposed foundations, but based on experience with other sites in the area expect that the building is founded on shallow strip footings.
- I have not completed any intrusive investigations into the structure, or material testing. My assessment is based on visible observations at the time of site inspection.

EXECUTIVE SUMMARY

93-103 Clarendon Street corners Clarendon Street, Haig Street and Haig lane. The building is typically single story, constructed of masonry load bearing facades, with timber sawtooth roof trusses. A two-story section is located on the south-eastern corner of the building, which is constructed of a concrete first floor, and a steel and timber trussed saw tooth roof. Significant visible rectification works have been completed in the last five to ten years, including strengthening existing roof trusses, installing additional wind bracing, and bracing existing masonry facades. The rectification works are required to stay in place, unless alternative equal support can be provided.

The existing structure is in varying levels of condition, and requires commensurate levels of rectification to maintain long term integrity.

Category 1: The original structure is in adequate condition. The structure is likely to remain adequate for the medium to long term provided general levels of maintenance and inspections are completed.

- Main warehouse sawtooth timber roof trusses
- Haig Lane two story masonry façade

Category 2: The original structure is in poor condition, and works are required in the medium to long term to address the integrity of the structure. The proposed works may be achieved without significant intrusion to the building.

- Western store sawtooth timber roof trusses
- Southern store sawtooth timber roof trusses
- Clarendon Street masonry façade
- Majority of Haig Lane masonry façade
- Eastern level 2, external storage yard masonry façade

Category 3: The original structure is in poor condition, and significant works are required in the short to medium term to address the integrity of the structure. The works are likely to have aesthetic implications, and in some cases retention of the structure is impractical.

- Haig Street masonry façade. Large portions of the wall are required to be demolished and rebuilt, partially with new bricks, to maintain its long-term integrity.
- Haig Lane masonry façade at the corner of Clarendon St. This façade is significantly damaged, and beyond repair without partial demolition and rebuilding.
- Internal timber column in the southern store. The timber column is significantly damaged and requires repair or replacement in the short term.

It is likely that the building's foundations will continue to settle indefinitely, and therefore further movement of the building façade is also likely.

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

1 PROJECT BACKGROUND

1.1 SCOPE

Ashurst Australia, on behalf of Crown, has engaged WSP to prepare an expert witness statement, and appear as an expert witness, at the panel hearing for Planning Scheme Amendment C305.

I last inspected the building in 2018, as part of ongoing monitoring and rectification works. John Keating inspected the property on Tuesday the 21st of April 2020.

A structural condition assessment is noted in section 2 of this report.

Section 3 of this report comments on the feasibility of retaining original aspects of the building.

The original aspects have been categorized into three categories:

1. The aspect is in good condition and may be retained in in the medium to long term with general levels of maintenance and inspections.
2. The aspect is in poor condition, and works are required in the medium to long term to address the integrity of the structure.
3. The aspect is in poor condition, and significant intrusive works are required in the short to medium term to address the integrity of the structure.

1.2 BUILDING DESCIPTION

The existing building is located at the corners of Clarendon Street, Haig Street and Haig lane. The building is typically single story, constructed of load bearing masonry around its perimeter, with a timber trussed saw tooth roof. Timber columns support the roof trusses internally. A two-story section is located on the south-eastern corner of the building, which is constructed of a concrete first floor, and a steel and timber trussed saw tooth roof.

The façade is likely founded on shallow footings supported on Coode Island silt, which is typical of the area.

Works to the building have been completed in the last five to ten years to rectify sections of the original structure. Irwinconsult, now part of WSP, was responsible for the structural design of the associated works. The works involved:

- Partial demolition of the Clarendon St masonry facade and reconstruction with steel framing and Exotec compressed fibre cement sheet cladding
- Demolition of the eastern façade and reconstruction with steel and corrugated steel cladding
- Bracing of existing masonry facades, at the corner of Haig and Clarendon Street, and at the corner of Clarendon St and Haig Lane
- Rectification of damaged timber columns by adding steel columns to each side of the timber column
- Rectification of damaged timber roof trusses by adding steel channel sections to each side of the timber truss
- Constructing additional vertical rod bracing within the main warehouse

The building structure and strengthening works are noted on the plan attached in appendix A.

The recently completed works are clearly visible within the building and are required to remain in place to maintain structural support. Any modifications to the building that would remove or alter the noted works are required to provide equivalent support to the remaining existing elements.

The following images are examples of visible recent works:

Image 1.1: Corner of Clarendon and Haig St, showing Exotec cladding on Clarendon St.

Image 1.2: Steel column strengthening of timber columns, with vertical rod bracing between columns

Image 1.3: Timber trusses strengthened with steel channels each side. The Clarendon St steel framed wall in the background.

Image 1.4: Bracing of Façade at Corner of Clarendon St and Haig Lane

1.3 CODE COMPLIANCE

Due to the age of the building, whilst it may have complied with the relevant codes of practice and Australian Standards at the time of construction, it is commonly found older buildings are non-compliant when compared with the latest structural standards, specifically earthquake resistance requirements.

If the site were to change use or be developed in the future, the Relevant Building Surveyor may deem it necessary for the structure to be assessed against current Australian Standards, including AS1170: Design actions and AS3826 – Strengthening of Existing Buildings for Earthquake.

Based on the existing building condition, strengthening of the overall building stability will be required, in addition to previous strengthening works, which may have significant cost implications to any proposed developments. The applicable Australian Standard will be determined by the Relevant Building Surveyor, and is dependent on the quantum of works proposed.

Generally, parapets pose the highest risk of local collapse in the event of an earthquake. My preliminary assessment has determined that the existing parapets do generally comply with the requirements AS3826, given the recent strengthening and rectification works, and where the parapet is in sound condition, there is a low level of risk of local failure if a tremor were to occur.

2 CONDITION ASSESSMENT

The following items were observed on site by John Keating on Tuesday the 21st of April 2020. The location of each of the items is marked on the appendix A plan.

ITEM 1 -VERTICAL CRACKING

Image 2.1: Vertical cracking observed at door lintel, intersection of roof truss and downpipe.

ITEM 2 - VERTICAL AND HORIZONTAL CRACKING

Image 2.2: Vertical cracking in masonry wall at connection to roller door rails. Horizontal cracking above roof truss connection.

ITEM 3 – VERTICAL CRACKING

Image 2.3: Vertical cracking in masonry wall above and below connection of roller door header. Vertical cracking at connection of roller door rail.

ITEM 4 - MASONRY DETERIORATION

Image 2.4 Significant deterioration of existing masonry above lintels. Horizontal cracking above connection to timber truss.

ITEM 5 – VERTICAL CRACKING

Image 2.5: Vertical cracking in masonry above lintels.

ITEM 6 – DETERIORATION OF CONCRETE LINTEL

Image 2.6: Concrete lintel deterioration

ITEM 7 MASONRY WALL SIGNIFICANTLY LEANING

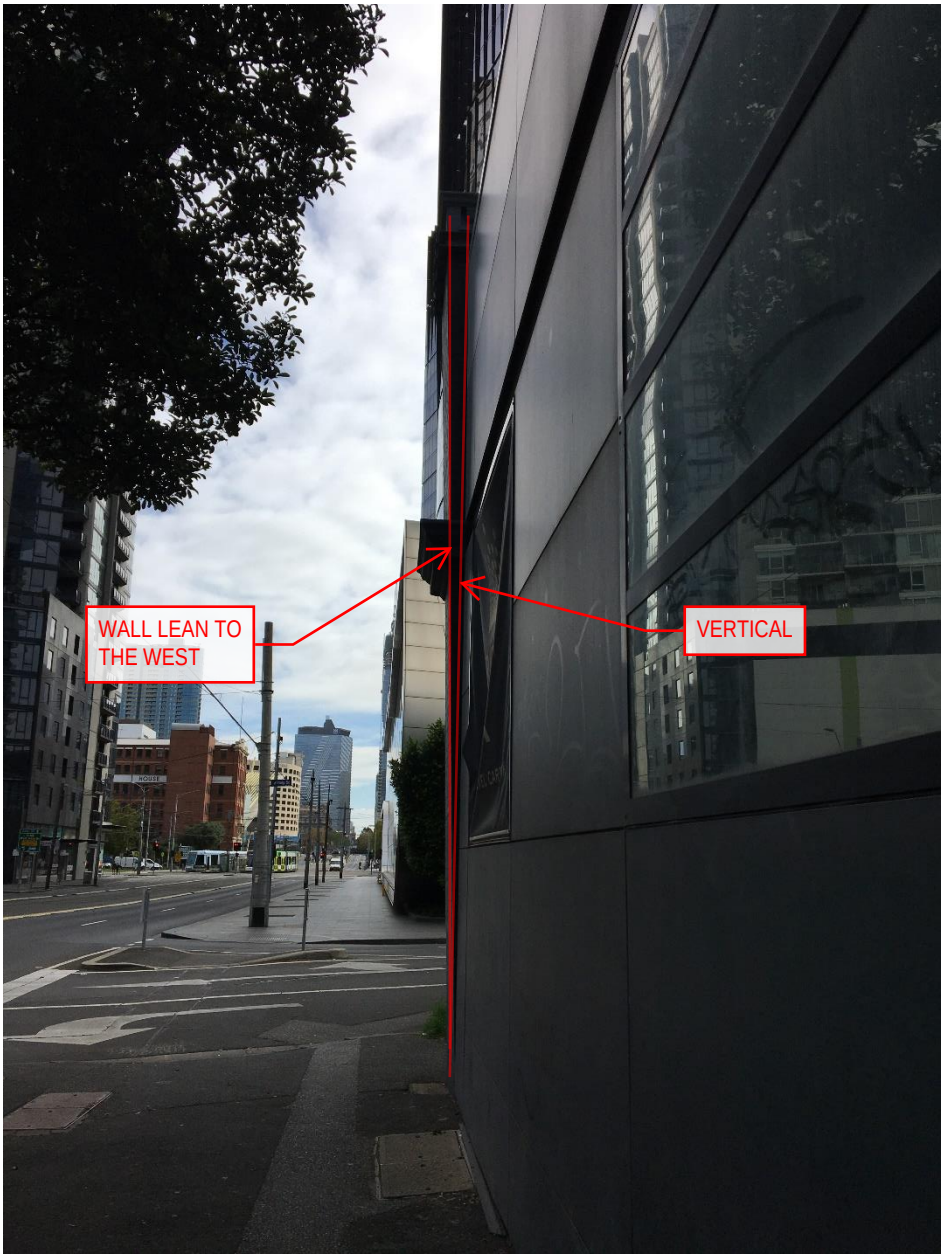


Image 2.7: The masonry façade wall at the corner of Clarendon and Haig Street leans approximately 2 degrees to the west.

ITEM 8 - MINOR DETERIORATION OF TIMBER TRUSS

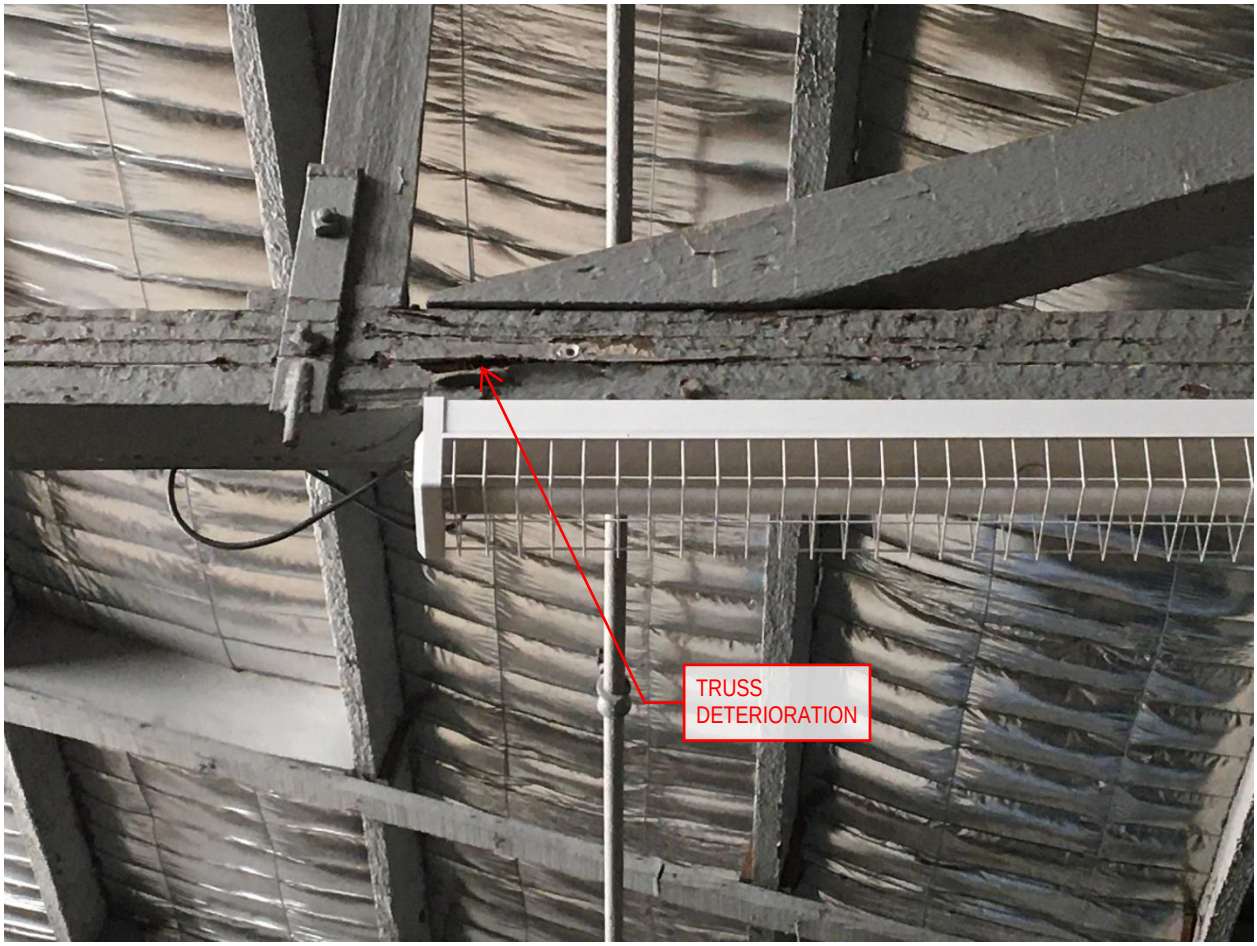


Image 2.8: Minor deterioration of timber truss within the western store room

ITEM 9 - DETERIORATION OF TIMBER COLUMN.

Image 2.9: The existing timber column at the base of the stairs to the first floor has significantly deteriorated. The damage requires repair in the short term.

ITEM 10: VERTICAL CRACKING

Image 2.10: Minor vertical cracking adjacent to steel brace. Internal view of item 12.

ITEM 11: SOUTHERN STORE TIMBER DETERIORATION

Image 2.11: Southern Store timber truss deterioration.

ITEM 12 – SIGNIFICANT VERTICAL CRACK

Image 2.12: Significant vertical cracking to the masonry façade. Outward lean of the wall, which is braced behind.

ITEM 13 – VERTICAL CRACKING

Image 2.13: Minor vertical cracking at the transition in parapet heights

ITEM 14 – MINOR CRACKING

Image 2.14: Minor cracking in masonry mortar joints.

ITEM 15 - CRACKING AT LINTEL

Image 2.15: Cracking in masonry and mortar joints below a lintel.

ITEM 16 – EXPOSED CAVITIES

Image 2.16: Exposed cavities in masonry due to demolition of adjacent structure

ITEM 17 – VERTICAL CRACKING

Image 2.17: Vertical cracking/step out of masonry façade.

3 RETENTION OF ORIGINAL ASPECTS

The existing structure is in various levels of condition. I have categorized elements into three categories.

Category 1: The original structure is in adequate condition. The structure is likely to remain adequate for the medium to long term provided general levels of maintenance and inspections are completed.

Category 2: The original structure is in poor condition, and works are required in the medium to long term to address the integrity of the structure. The proposed works may be achieved without significant intrusion to the building.

Category 3: The original structure is in poor conditions and significant works are required in the short to medium term to address the integrity of the structure. The works are likely to have aesthetic implications, and in some cases retention of the structure is impractical.

Appendix B presents a marking plan of where these categories are applicable to the existing building.

I anticipate short term to be 0-5 years, medium term to be 5-10 years, and long term 10-20 years. Note that timelines are provided indicatively, and do not absolve the owner's responsibility for regularly inspecting the building and maintaining a safe structure within the noted timeframe.

ITEM A – MAIN WAREHOUSE SAWTOOTH TIMBER ROOF – CATERGORY 1

The existing saw tooth timber roof trusses in the main warehouse, excluding those already strengthened, are generally in adequate condition. The paint appears to be deteriorating but does not affect the structure.

Figure 3.1: Main warehouse timber trusses

ITEM B HAIG LANE TWO STORY MASONRY FAÇADE – CATEGORY 1

The existing load bearing masonry wall is generally in adequate condition. The wall will likely experience ongoing settlement typical to shallow foundations found in Coode Island silt. This is not feasible to prevent and will likely result in increased distress over time.

Figure 3.2: Haig Lane two story facade

ITEM C – WESTERN STORE TIMBER TRUSS – CATEGORY 2

Minor levels of deterioration of a timber truss were observed in the western store room. The deterioration is minor however, requires rectification. Refer to item 8 of section 2. The truss may be repaired by steel channels, similar steel rectification details, or the damaged section of timber may be locally replaced.

ITEM D – SOUTHERN STORE TIMBER TRUSS – CATEGORY 2

The existing timber trusses in the southern store room are in moderate condition. Some timber members appear to have been modified during previous building works. Refer to item 11 of section 2. To retain the trusses in the long term, minor investigative works would be required to expose all the timber and ensure the members have not been damaged by water or pests.

ITEM E – CLARENDON ST MASONRY FAÇADE – CATEGORY 2

Localised sections of deterioration and cracking were observed in the Clarendon St Façade. Refer to item 15 of section 2 item. The identified cracking requires rectification in the medium term. Rectification works would be relatively minor such as repointing. The wall may experience ongoing settlement typical to shallow foundations found in Coode Island silt.

The outward lean of the wall is currently stabilized by the retrofitted bracing but will likely become unsafe again with ongoing movement.

The retrofit bracing is required to stay in place following any rectification works. Any modifications to the main building would be required to maintain an equivalent or better level of bracing to this façade.

ITEM F – HAIG LN SINGLE STORY MASONRY FAÇADE – CATEGORY 2

Localised sections of deterioration and cracking were observed in the Haig Lane Façade. Refer to item 13 and 14 of section 2. The identified cracking requires rectification in the medium term. Rectification works would be relatively minor such as repointing, and locally replacing any damaged bricks. The wall may experience ongoing settlement typical to shallow foundations found in Coode Island silt.

The retrofit bracing is required to stay in place following any rectification works. Any modifications to the main building would be required to maintain an equivalent or better level of bracing to this façade.

ITEM G – EASTERN LEVEL 2 MASONRY FAÇADE – CATEGORY 2

Cavities in the existing masonry façade are present. Refer to item 16 of section 2. The cavities require filling in the medium term to prevent water ingress which may lead to deterioration. The cavities could be filled with mortar, flashed over, or by keying new bricks into the existing wall.

ITEM H – HAIG ST MASONRY FAÇADE – CATEGORY 3

The existing masonry façade has significant deterioration and cracking, likely due to differential settlement of the shallow foundations. The damage requires intrusive repair to ensure the long-term integrity. We recommend further investigation works to review the current condition of the wall. The following indicative repair methods could be adopted:

- At locations where masonry has cracked through (items 1,2,3 and 5 of section 2), the brick wall is required to be partially demolished and rebuilt, with new bricks. The damage appears to have occurred locally at the fixing location of the roller door. As the bricks, have cracked, rather than between mortar joints, repointing is not an option. At the time of rectification works the condition of the existing foundation should also be assessed to verify its suitability.
- At locations where the masonry has deteriorated (item 4 of section 2), the bricks will continue to deteriorate. The bricks require cleaning to assess their current condition. If they are found to be in adequate condition, repointing is required. If the bricks are found to be in poor condition the wall would be required to be partially demolished to approximately the top of the existing window. Satisfactory bricks may be cleaned and used in reconstructing the wall, or replaced with new bricks if the bricks are found to be beyond repair.
- At locations where the concrete lintel has deteriorated (item 6 of section 2), the concrete will continue to deteriorate. The lintel may be repaired if destructive investigation shows the existing steel reinforcement is in sound condition. If the reinforcement has corroded such that it is compromised the lintel is to be replaced. Destructive investigation would involve the use of a small jack hammer, or heavy duty hammer drill to break out the concrete and expose the reinforcement. The long term integrity of the lintel is uncertain.
- The eastern end of the wall is leaning significantly to the west (item 7 of section 2) and has stepped out, so that the wall is not vertical (item 17 of section 2). It is likely this is due to settlement of the existing shallow foundation, and/or inadequate ties to the permanent structure. It is currently braced internally to resist further movement.

  It may be possible to retain this section of wall with intrusive underpinning, jacking and repair works to the existing foundation. These works would likely cause significant cracking of the masonry which would then require repointing. Alternatively, the bricks at this corner appear in sound condition and may be reused if the wall was to be demolished and rebuilt.

  Any modifications would also require the wall to be adequately braced or tied to the internal structure to maintain stability.

Though the structure is adequate in the short term, it should be regularly monitored, and further investigation should be completed. It is likely that as the wall continues to deteriorate in the medium term, the wall will become inadequate structurally. Large portions of the wall are required to be demolished and rebuilt, partially with new bricks, to maintain its long-term integrity.

The wall may experience ongoing settlement and further differential settlement typical to shallow foundations found in Coode Island silt.

ITEM I – HAIG LN MASONRY FAÇADE AT CLARENDON ST CORNER – CATEGORY 3

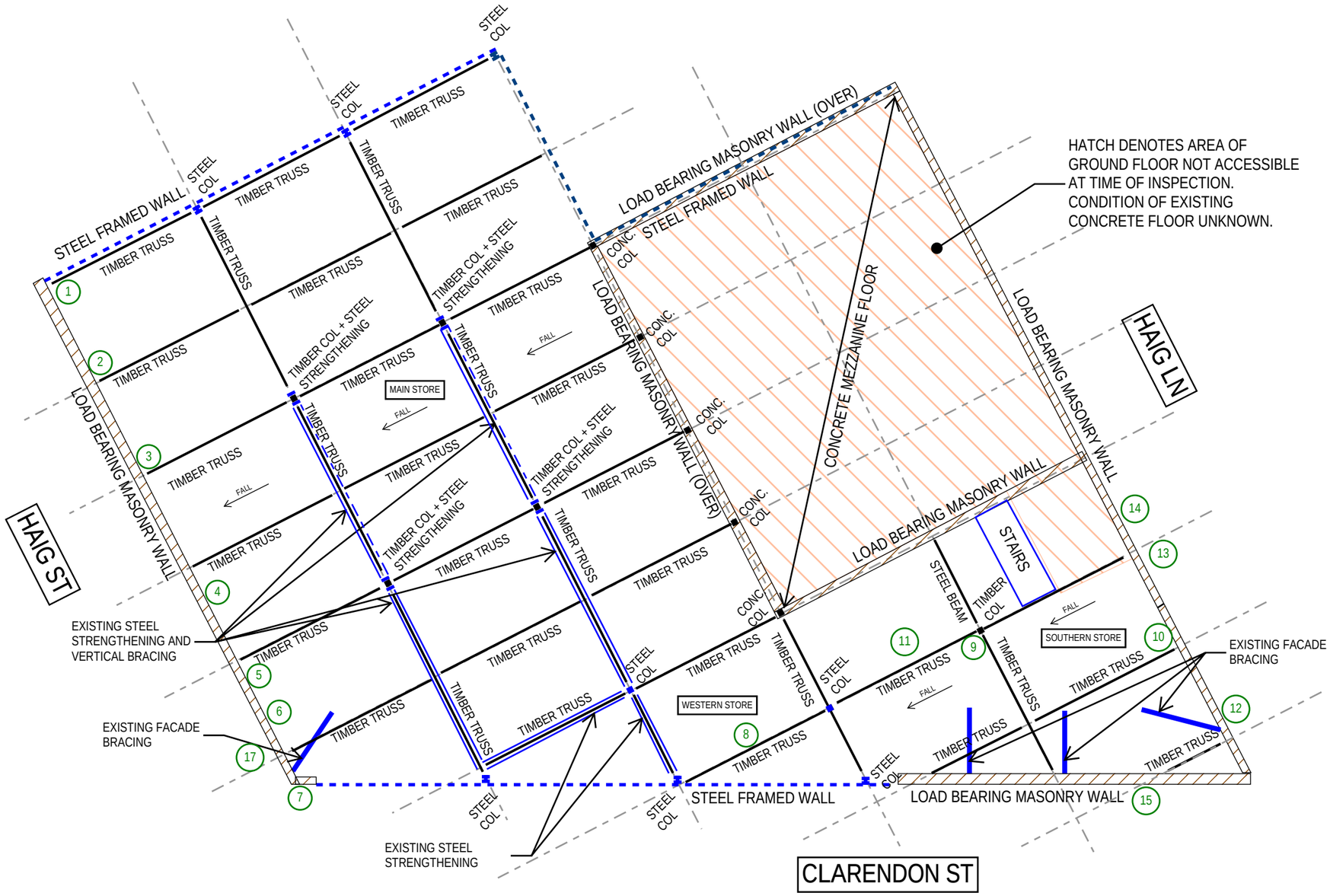
The Haig Ln masonry façade has suffered significant cracking, likely due to differential settlement of existing shallow foundations. Refer to item 12 of section 2. The integrity of the wall has been compromised, and repair is required in the short to medium term. The cracking is currently being monitored, as evident from the crackmeters and survey points fixed to the façade, and should continue indefinitely, until a permanent repair is completed.

This façade is significantly damaged, and beyond repair without partial demolition and rebuilding. The existing bricks generally appear to be in sound condition, and may be used in rebuilding the wall, subject to on site confirmation.

ITEM J – EXISTING TIMBER POST IN SOUTHERN STORE – CATEGORY 3

The timber post is significantly damaged and requires repair in the short term. Refer to item 9 of section 2. Rectification could be completed by splicing in new steel columns, similar methods used in the main store, or completely replaced.

APPENDIX A – CONDITION ASSESSMENT NOTES



LEGEND

- ORIGINAL STRUCTURE
- MODIFIED STRUCTURE
- (17) NOTED DEFECT, REFER SECTION 2 OF INSPECTION REPORT

NOTE:
TIMBER PURLINS SPANNING EAST-WEST
NOT SHOWN FOR CLARITY

LOWER ROOF PLAN

NORTH

REV	DESCRIPTION	BY	DATE

PRELIMINARY ISSUE
NOT TO BE USED FOR CONSTRUCTION

SCALE INDICATED FOR REFERENCE ONLY. DO NOT SCALE DRAWING.

CLIENT:
ASHURST

PROJECT NAME:
93-103 CLARENDON ST
SOUTHBANK

TITLE:
LOWER ROOF PLAN
CONDITION ASSESSMENT

DATE:	SCALE AT A3:
02/07/20	NTS
DESIGNER:	DRAWN:
CHECKED:	APPROVED: PHG

PROJECT NUMBER:	DRAWING No:	REVISION
PS119550	SK01	2

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SHEET SIZE: A3

REV	DESCRIPTION	BY	DATE

PRELIMINARY ISSUE
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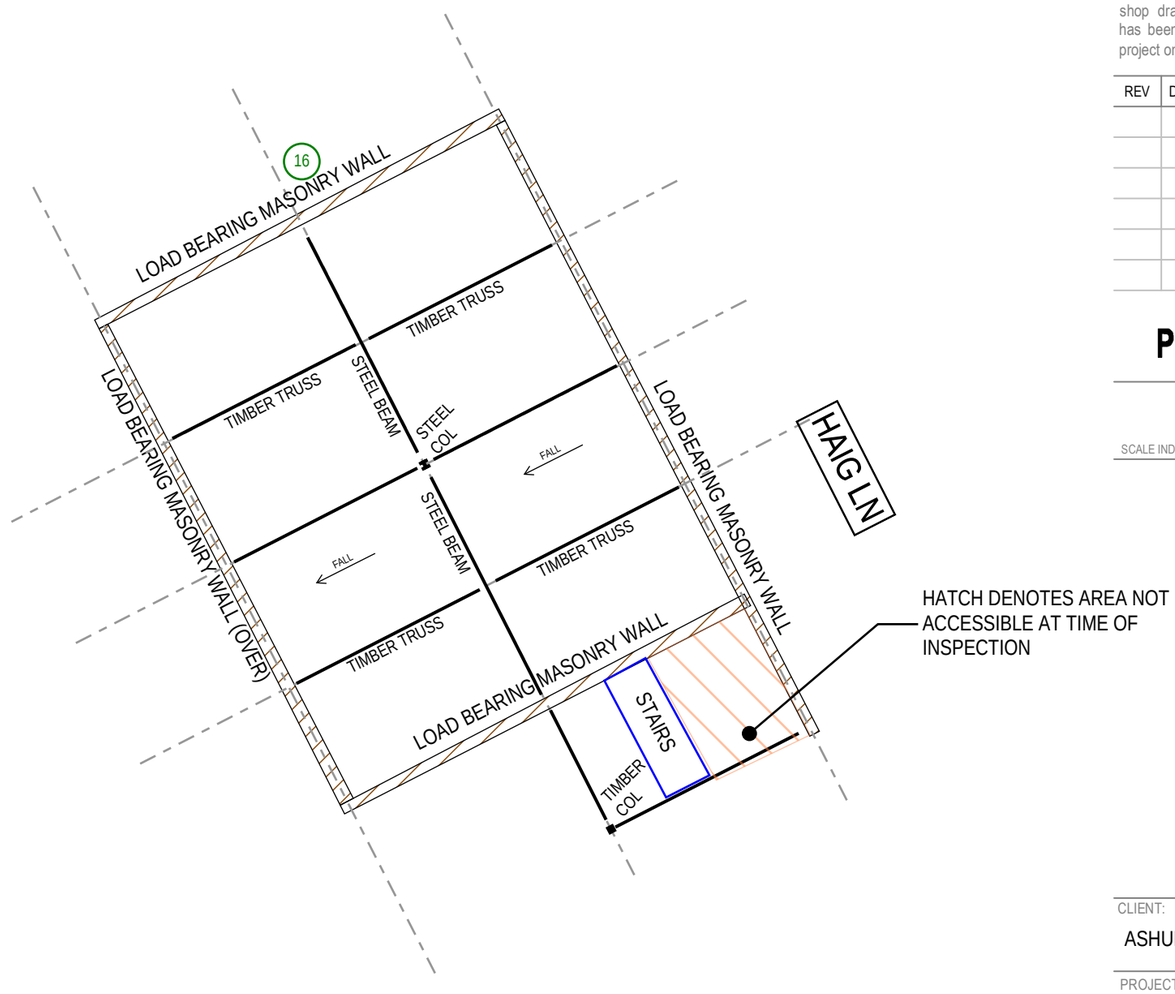

LEGEND

- ORIGINAL STRUCTURE
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- (17) NOTED DEFECT, REFER SECTION 2 OF INSPECTION REPORT

NOTE:
TIMBER PURLINS SPANNING EAST-WEST
NOT SHOWN FOR CLARITY

UPPER ROOF PLAN

NORTH

CLIENT:
ASHURST

PROJECT NAME:
93-103 CLARENDON ST
SOUTHBANK

TITLE:
UPPER ROOF PLAN
CONDITION ASSESSMENT

DATE:	SCALE AT A3:
02/07/20	NTS
DESIGNER:	DRAWN:
CHECKED:	APPROVED: PHG

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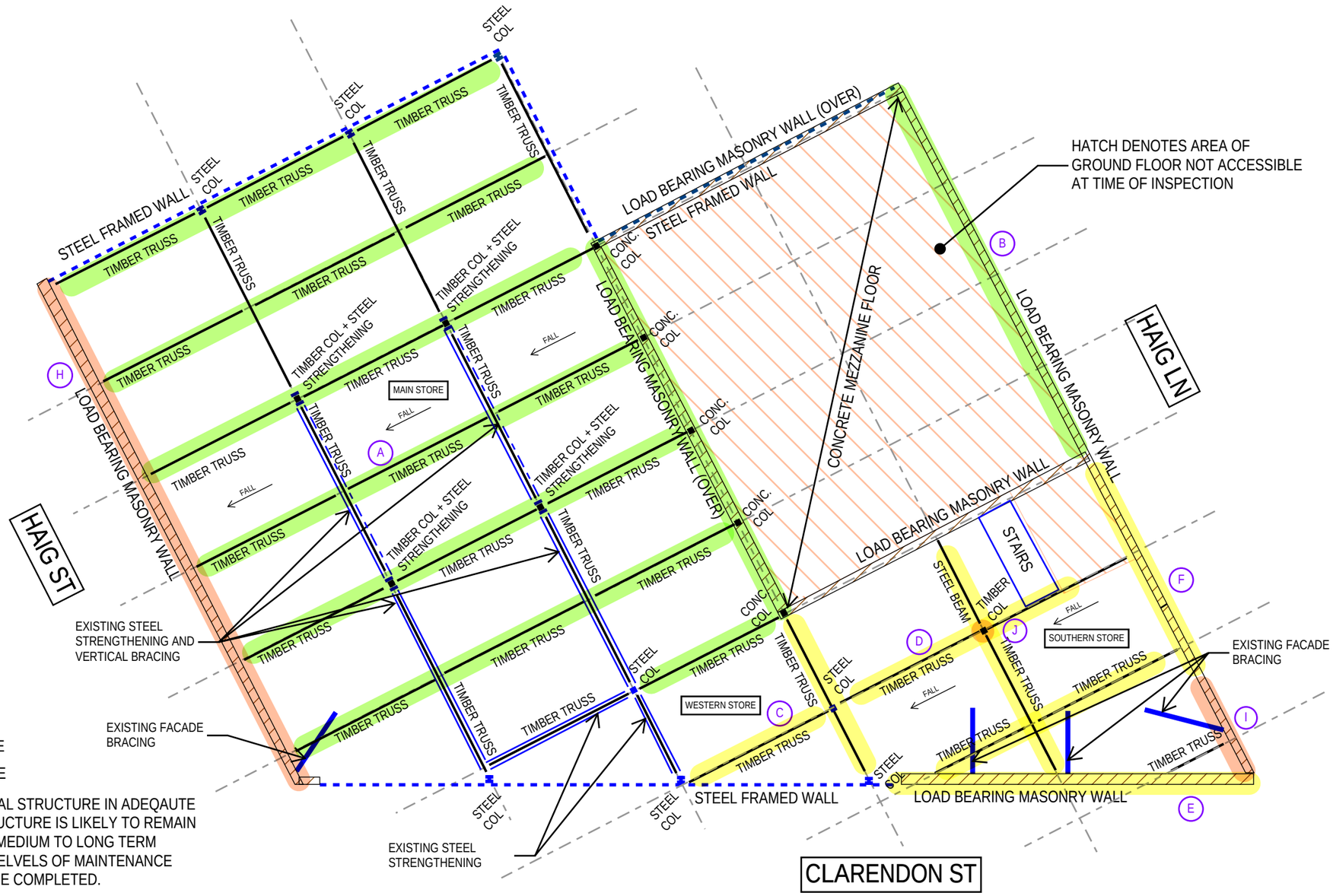
APPENDIX B – RETENTION OF PROPERTY NOTES



LEGEND

- ORIGINAL STRUCTURE
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CATEGORY 1: ORIGINAL STRUCTURE IN ADEQAUTE CONDITION. THE STRUCTURE IS LIKELY TO REMAIN ADEQUATE FOR THE MEDIUM TO LONG TERM PROVIDED GENERAL ELVELS OF MAINTENANCE AND INSPECTIONS ARE COMPLETED.

CATEGORY 2: ORIGINAL STRUCTURE IN POOR CONDITION. WORKS ARE REQUIRED IN THE MEDIUM TO LONG TERM TO ADDRESS THE INTEGRITY OF THE STRUCTURE.

CATEGORY 3: ORIGINAL STRUCTURE IN POOR CONDITION SIGNIFICANT WORKS ARE REQUIRED IN THE SHORT TO MEDIUM TERM TO ADDRESS THE INTEGRITY OF THE STRUCTURE.

(A) REFER SECTION 3 OF REPORT FOR FURTHER DETAILS

NOTE:
TIMBER PURLINS SPANNING EAST-WEST NOT SHOWN FOR CLARITY.

LOWER ROOF PLAN

NORTH

REV	DESCRIPTION	BY	DATE

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CLIENT: ASHURST

PROJECT NAME: 93-103 CLARENDON ST SOUTHBANK

TITLE: LOWER ROOF PLAN CONDITION ASSESSMENT

DATE:	SCALE AT A3:
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PROJECT NUMBER:	DRAWING No:	REVISION
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REV	DESCRIPTION	BY	DATE

PRELIMINARY ISSUE
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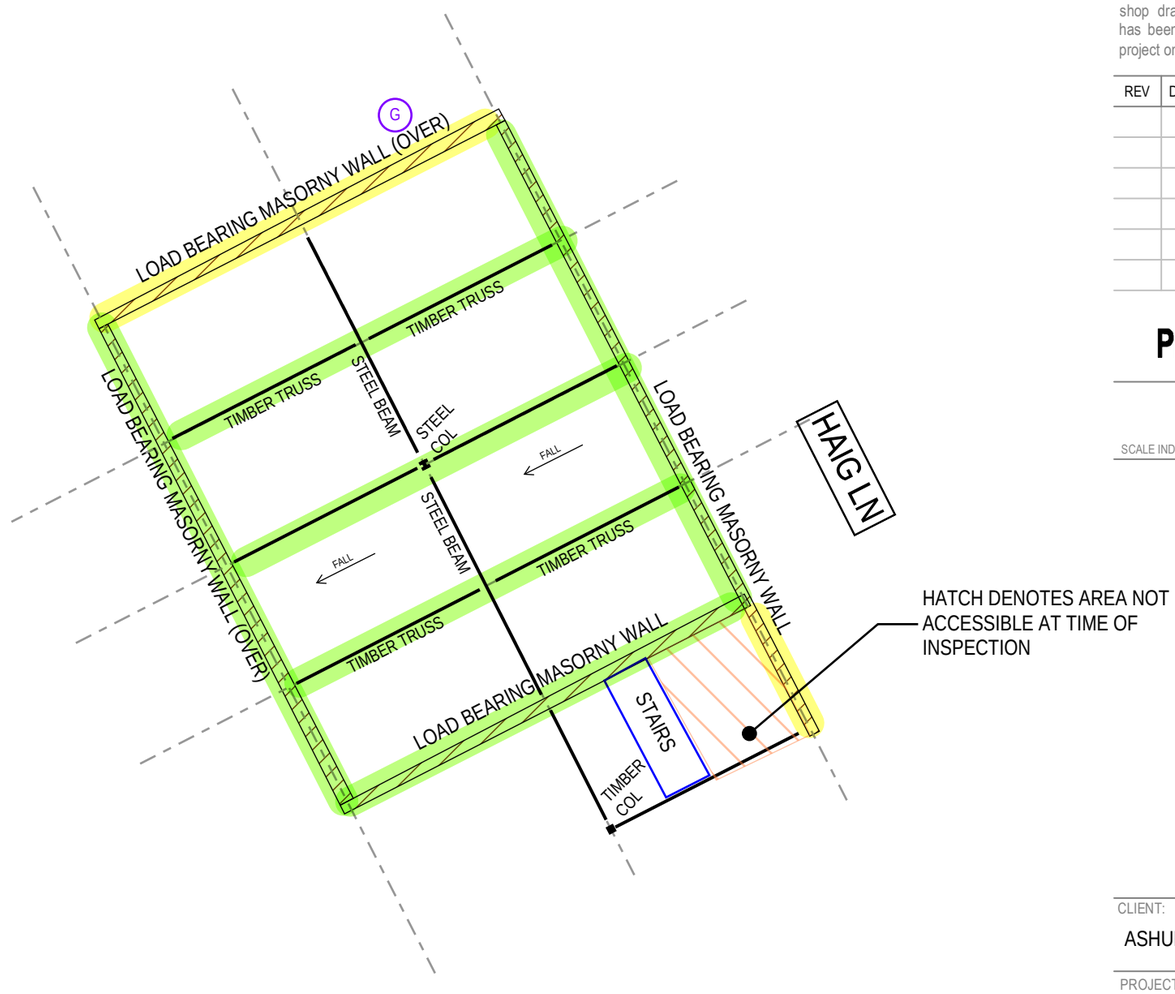

LEGEND

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- MODIFIED STRUCTURE
- CATEGORY 1: ORIGINAL STRUCTURE IN ADEQAUTE CONDITION. THE STRUCTURE IS LIKELY TO REMAIN ADEQUATE FOR THE MEDIUM TO LONG TERM PROVIDED GENERAL ELVELS OF MAINTENANCE AND INSPECTIONS ARE COMPLETED.
- CATEGORY 2: ORIGINAL STRUCTURE IN POOR CONDITION. WORKS ARE REQUIRED IN THE MEDIUM TO LONG TERM TO ADDRESS THE INTEGRITY OF THE STRUCTURE.
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- (A) REFER SECTION 3 OF REPORT FOR FURTHER DETAILS

NOTE:
TIMBER PURLINS SPANNING EAST-WEST NOT SHOWN FOR CLARITY.

UPPER ROOF PLAN

NORTH

CLIENT:
ASHURST

PROJECT NAME:
93-103 CLARENDON ST
SOUTHBANK

TITLE:
UPPER ROOF PLAN
CONDITION CATERGORY

DATE:	SCALE AT A3:
02/07/20	NTS
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CHECKED:	APPROVED: PHG

PROJECT NUMBER:	DRAWING No:	REVISION
PS119550	SK04	2

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