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NCS INTERNATIONAL
CERTIFIED QUALITY MANAGEMENT SYSTEM
ISO9001

STRUCTURAL ASSESSMENT REPORT

HOFFMAN BRICKWORKS
FORMER BRICK PRESS BUILDING
CORNER DAWSON STREET AND BRICKWORKS DRIVE
BRUNSWICK, VICTORIA

PREPARED BY

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APPENDIX I

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1.0 INTRODUCTION

The O'Neill Group Pty Ltd was engaged by 94 Feet to prepare an initial structural conditions assessment for the structure of Former Brick Press Building at Hoffman Brickworks, Dawson Street, Brunswick.

The investigations consisted of a walk-through inspection of the building. No computations or in-situ materials testing were undertaken. Inspections were completed on Thursday 6th March 2014 by Christopher Potter of the O'Neill Group.

The opinions expressed by The O'Neill Group in this report are based upon the scope of our commission.

The O'Neill Group Pty Ltd has agreed to prepare this report on the following conditions:

- The report may only be used by the named addressee for the purposes for which it was commissioned and in accordance with the corresponding Conditions of Engagement.
- The report may only be reproduced in full.
- The report may not be considered as relieving any other parties of their responsibilities, liabilities or contractual obligations.

2.0 SCOPE OF THE REPORT

The purpose of this report is to:

- Appraise and report on the existing building fabric and condition of the existing brick press buildings at the south-west corner of the site (previously known as Buildings 5 and 6) at Hoffman Brickworks, Brunswick. Observed defects have been identified and the condition of the buildings is discussed in detail.
- Provide written comment on the aspects of safely being able to maintain the existing building fabric whilst future site remediation takes place.

Prior to attending site, a review of all available information, previous reports and the like relating to previous building and geotechnical assessments at Hoffman Brickworks was undertaken.

This report reviews the following general and specific areas (where access was available):

- Internal and external load-bearing walls.
- Timber floor framing and supports.
- Roof and ceiling framing and supports.
- Lateral stability of the structure.
- Review of external guttering and downpipes.

3.0 PROPERTY DESCRIPTION

Hoffman Brickworks are located in Dawson Street, Brunswick. The brickworks are historically significant as the site pioneered the use of the continuously fired Hoffman brick kilns in Australia and was one of the first uses of mechanical brick presses[1].

The original Brick Press building was constructed in 1884 and was located at the south-west of the brickworks site (Figure A1-1). The current building comprises elements from a number of alterations and additions to the original structure and itself comprises three primary elements, as follows[1] (Figure A1-2):

- The central sections (dating from 1884 to pre 1910);
- The south-west section (dating from 1904 – 1909); and,
- The eastern extension (dating from the late 1950s).

The central sections of the building comprise a double storey timber framed structure. At ground floor are a series of north-south aligned post and beam supports which support a timber framed first floor level with timber floor boards.

The roof of the central section comprises corrugated iron roof sheeting supported on timber rafters and a series of east-west aligned timber trusses on timber posts.

At the south-west corner of the building is a single storey addition to the original central section. The walls of this area comprise double brick masonry which support a corrugated iron roof with timber rafters and north-south aligned timber trusses.

The most recent addition is located along the eastern side of the building. It comprises a braced steel post and beam structure along the eastern external wall which supports a corrugated iron roof.

4.0 EXISTING CONDITIONS

The building is generally in extremely poor condition, with many elements displaying signs of decay or local structural failure.

In this section representative examples of the observed conditions of the framing elements are presented for the three identified areas of the building; the central section, the south-west addition and the eastern addition.

4.1 Central Section

The central section encompasses elements from the original brick press building at the site. Over time many alterations have occurred to this section of the building, including building extensions to the east and north, local demolition to the north, and numerous alterations to the layout of post supports to allow for the installation and operation of machinery.

The building extensions to the east have placed additional load on the original fabric however do not appear to have significantly detrimentally affected the structure.

1. '*The Hoffmann Brick and Tile Company, Melbourne, Australia'*. B.J. O'Neill & R B Sandie, Trans. of Multidisciplinary Engineering, Vol. GE26, 2002, pp 1-9.

Local demolition works to the north have however caused significant distress to the structure. A series of steel posts along the northern side of the building have been removed, replaced with a series of timber posts locally wedged into position and supporting only by plinths of timber sleepers at ground level (Figure A1-3). The posts are not sufficiently secured to the first floor framing and there is evidence that the posts have moved due to local settlement of their makeshift supports at ground level (Figure A1-4). Further, the easternmost post does not adequately align to support the two timber beams at first floor level that were originally supported by the steel post in this area. As such the posts are not providing an adequate support to the northern side of the structure and the area is not structurally sound.

Alterations to the central part of the structure have also caused significant distress to the existing fabric. The most common alteration found throughout the building is the removal of original timber support posts to allow for the installation and operation of machinery at ground floor level. Supplementary posts and support beams have been installed in a few locations, although in the vast majority of areas no strengthening works was observed (Figure A1-5 and Figure A1-6).

As a result of the removal of posts, many of the first floor beams are currently spanning far in excess of the original spans and are exhibiting clear signs of distress such as excessive deformations and splitting of the timber beams (Figure A1-7). In some areas, the additional load from the increased beam spans has also affected the timber posts with significant splitting and bowing of timber posts in a number of locations (Figure A1-8).

Where supplementary posts have been installed at ground floor level, the location of a number of these posts does not suit the arrangement of the first floor beams so that timber splices over original timber posts are currently unsupported (Figure A1-5 to Figure A1-7).

In some areas, natural deterioration of the timber either by fungal decay or pests has also appeared to promote failure of the elements. Such deterioration was particularly evident at a column capital at the northern end of the central section (Figure A1-9).

In summary the numerous alterations to the central section of the building, combined with the natural decay of the timber, has resulted in a central section of the building that is structurally unsound at each series of beam and post supports.

The footings of the timber posts at ground floor level was not able to be observed during the investigations on site, however the geotechnical assessment report No. 2057-6-R from GeoAust Geotechnical Engineers provides a clear record of footing explorations of two footings along the eastern side of the central section of the building. The results of these investigations indicate that the exposed post footings comprise a mixture of building materials including brick fragments and poor quality concrete. The results also indicate that the footings not only comprise a variety of materials, but are of inconsistent size and depth. As such, at this time it is not possible to accurately quantify the capacity of the post supports without a detailed exploration of each footing. The implications of these results are discussed further in Section 5.

At first floor level, the timber floor framing and flooring has been significantly affected by moisture ingress. A number of sections of the original roofing are no longer in place and this has permitted water penetration over a significant number of years. As a result, sections of the timber flooring has decayed and long since collapsed (Figure A1-10). Many other areas of the timber flooring are

structurally unsound and therefore are unsuitable to traverse. Large areas of the floor have been covered by a supplementary composite lining, however this lining also has been impacted by moisture ingress and is displaying evidence of decay (Figure A1-11).

It was not possible to closely inspect the timber floor joists at first floor level, however they generally appeared to be in satisfactory condition with little evidence of excessive deformations or splitting. Unfortunately the moisture ingress to the timber flooring will have penetrated these elements and as such local minor-destructive testing would be required throughout the floor to accurately confirm the integrity of the timber.

The timber posts, timber roof trusses and the supplementary roof and wall framing were not able to be closely inspected due to limitations of safe access on site (Figure A1-12). The elements have been subjected to many years of moisture ingress with the ongoing deterioration of the roof sheeting. As such, it is likely that the timber truss connections and the connections between other timber members will be affected by rust which may have led to local splitting of the timber elements at these connections.

From the first floor level, it was observed that a number of diagonal members had been removed from the timber trusses and additional timber framing elements have been introduced between the trusses to support machinery and other elements. The remaining framing elements appeared to be relatively unaltered from their original form and the timber appeared in reasonable condition with no observed splitting or excessive deformations. Closer inspection of the timber joints and elements would be required to determine the precise condition of the timber elements at this level, however developing safe access to these elements would be complex given the extremely poor condition of the first floor framing and supports. A preliminary assessment of the structural capacity of the trusses has found that they would not satisfy actions from current Australian Standards and would require strengthening as part of any future redevelopment.

As stated above, the roof cladding above the central section of the building is significantly deteriorated with many sections completely displaced and many sections deteriorated allowing moisture penetration to the timber framing. The deterioration has occurred over many years and it is likely that all roof fixings would also have deteriorated, potentially causing splitting of the timber battens due to rusting of the embedded elements.

The roof guttering and downpipes have collapsed or are significantly deteriorated and are not serviceable.

4.2 Eastern Section

As stated in Section 3, the eastern section comprises a late single storey addition along the eastern side of the building. The structure comprises steel posts and beams aligned east-west with north-south aligned timber rafters (Figure A1-13). The posts are connected by steel ties and cross braces aligned north-south at regular intervals along the eastern external wall.

The steel elements are generally in good condition, with no excessive deformations or rusting observed. It was not possible to observe the composition of the post footings and there are no records of geotechnical investigations of these elements.

The timber rafters also appeared in good condition with no observed deterioration. The roof sheets are displaying signs of deterioration along lapping of the sheets, however such limited deterioration would not permit moisture ingress to the timber rafters.

4.3 South-West Section

Similarly to the remainder of the building, the south-west section has been left to deteriorate over many years. As a result, the guttering and flashings along the southern and western external walls have long since deteriorated and have mostly collapsed. This damage has subsequently permitted moisture ingress into the top of the external walls which has eroded to the mortar and softened the bricks. A number of bricks along the top of the western wall have been lost, either attached to collapsing flashings or due to other actions. Along this wall there remain a large number of loose and displaced bricks that are at risk of collapse (Figure A1-14 and Figure A1-15).

The connections of the roof framing to the walls have also been subjected to regular moisture penetration, weakening both the timber and masonry components This connection not only provides vertical support to the roof framing, but provides lateral support to the external walls. Given the observed deterioration of the masonry and likely deteriorated condition of these connections, it is not possible to confirm the structural adequacy of these walls.

In addition, there is significant cracking within the western brick masonry wall extending from ground level approximately four metres north of Dawson Street to the top of the wall at the Dawson Street façade. The cracking regularly exhibits a lateral displacement of approximately 15mm which indicates that the wall is no longer acting as an integral structure, but two separate elements moving independently both laterally and vertically (Figure A1-16).

It is clear that the poor condition of the western wall has previously been observed and the significant risk to users of the roadway considered, as a series of braced frames has been installed along the wall to provide some measure of stability to the western façade. No such bracing is installed along the southern façade, however there is a return brickwork wall midway along this wall. The stability of these elements is discussed further in Section 5.

Apart from the connections to the external walls, the internal framing of the south-west section appeared generally in satisfactory condition. Similar to the central sections of the building, the roof sheeting has deteriorated permitting moisture penetration to the timber elements. Closer inspections of the framing elements and internal connections would be required to confirm their adequacy.

No information was available regarding the composition of the brick masonry footings, however given the age and form of the structure the footings are likely to comprise either a shallow bluestone footing or a shallow strip footing composed of poorly compacted concrete or a mortar and rubble mix.

5.0 DISCUSSION AND RECOMMENDATIONS

As discussed in Section 4, the building is in extremely poor condition and is not structurally sound. The numerous extensions, alterations, local demolition works and the many years of neglect have caused the current conditions.

In its current condition, it is our opinion that the building is unsafe to enter to undertake remedial works, or to remove the existing movable items of heritage significance such as the bricks and press equipment. In order to remove the significant movable items, we would recommend the installation of a temporary gantry frame installed by temporary works specialists to permit access to local areas of the building footprint.

A large proportion of the ground floor framing elements in the central section of the building are currently structurally unsound. As such, it is currently not safe to undertake the further detailed investigative works, inclusive of minor destructive testing, that would be required to confirm the integrity of the existing fabric. Even without undertaking such inspection works by gaining safe access to each element in turn, the results of our initial investigations alone suggest to make safe, that temporary supports and braces would be required to the vast majority of the load-bearing frames in the central section of the building, that the majority of connections would require strengthening and that flooring and roofing elements would require supplementing throughout the structure.

We have also undertaken an initial review of the lateral stability of the structure for wind and earthquake actions. In general, there are insufficient wall braces at both first and ground floor levels to satisfy the requirements for lateral stability, regardless of the condition of the existing framing. If the existing framing was able to be remediated, additional bracing elements within wall and post and beam alignments would be required to be installed at regular centres throughout the building. To minimise bracing elements in wall planes, lateral bracing elements would also be incorporated at the underside of the first floor framing and at roof level. The connections of all elements would also require local strengthening to satisfy minimum requirements for tie-down and transfer of the imposed actions.

It is our understanding that the ground at the site may be somewhat contaminated, requiring a substantial depth of soil removal across the breath of the building. This being the case, it would significantly complicate any temporary or long-term works on the subject site, as no footings would be permitted to be installed in the contaminated soils.

The presence of contaminated soils also raises a number of concerns regarding the viability of retaining parts of the superstructure in place. As stated above, it is our understanding that a substantial depth of contaminated soil may require removal across the subject site. As discussed in Section 4, the exposed existing footings of the central section were found to be relatively shallow and of inconsistent and segmented construction. The footings of the remaining brick masonry walls and the frames of the eastern section are also likely to be relatively shallow. We do not believe that it would be possible to safely remove a significant depth of soil adjacent to and locally under these footings. It is our opinion that the restricted safe access to the structure, coupled with the regular spacing of the supports and the fragility and current poor condition of the superstructure would render this activity of too high a risk to undertake.

As stated in Section 4, further investigations would be required of the timber framing at roof level of the central section of the building to determine the precise morphology and existing conditions. Unfortunately, such investigations cannot safely be completed from within the structure due to the significant deterioration of the flooring both at first floor level and within the post and beam framing below. External access by cherry picker or similar may be permissible to some limited elements, however a temporary works specialist would be required to ensure that the trusses remain in a stable

condition upon local removal of roof sheeting to gain access. Given the extent of observed deterioration throughout the building and the complications in retaining the structure with the local soil contamination, such investigative works may be found to not be required.

The top of the masonry walls along the western and southern external walls are significantly deteriorated due to moisture penetration and decay, and the flashing and guttering elements have partially or completely collapsed. Along the western external wall, there are loose bricks along the top of the wall that are at risk of collapse. The area beneath this section of the wall should be hoarded to prevent access and the risk of harm due to local brick collapse (Figure A1-18).

Along the southern wall, the small remnant sections of guttering and downpipes should be immediately removed as they are also at risk of collapse, and the condition of the timber fascia board and masonry should be inspected as part of this process (Figure A1-17). It is expected that both the timber and masonry will be found to be deteriorated due to moisture ingress. For these reasons and given the observed conditions of the internal framing, it is our recommendation to install a temporary gantry over the footpath at the north side of Dawson Street for the full width of the subject building (Figure A1-18). The car parks immediately adjacent to the building also should not be available for use. The street is a major thoroughfare and we believe that the risk of damage to pedestrians or private property is too great.

Similarly at the northern side of the building, we recommend a hoarding be installed to prevent access to the area between the adjacent new construction and the existing structure. Temporary props should also be installed to supplement the support of all first floor elements currently supported by the round timber posts at the northern side of the structure. Raked props should also be installed to the round easternmost post that appears to have settled and shifted out of position. These works are to be installed by a temporary works specialist.

6.0 CONCLUSION

The building is in extremely poor condition due to the significant number of alterations, extensions, local demolition works and the many years of neglect. The existing structure is structurally unsound and we do not recommend access to the structure without the prior installation of local temporary access gantries installed by temporary works specialists to access movable items of significance.

Temporary hoardings and gantries, as well as restrictions in car parking are recommended adjacent to the western external wall of the south-west section and along Dawson Street to protect public safety.

We believe that it is not practicably possible or safe to undertake the required works to retain the existing structure whilst undertaking removal of a significant depth of contaminated soil across the subject site.

APPENDIX I

FIGURES AND PHOTOS

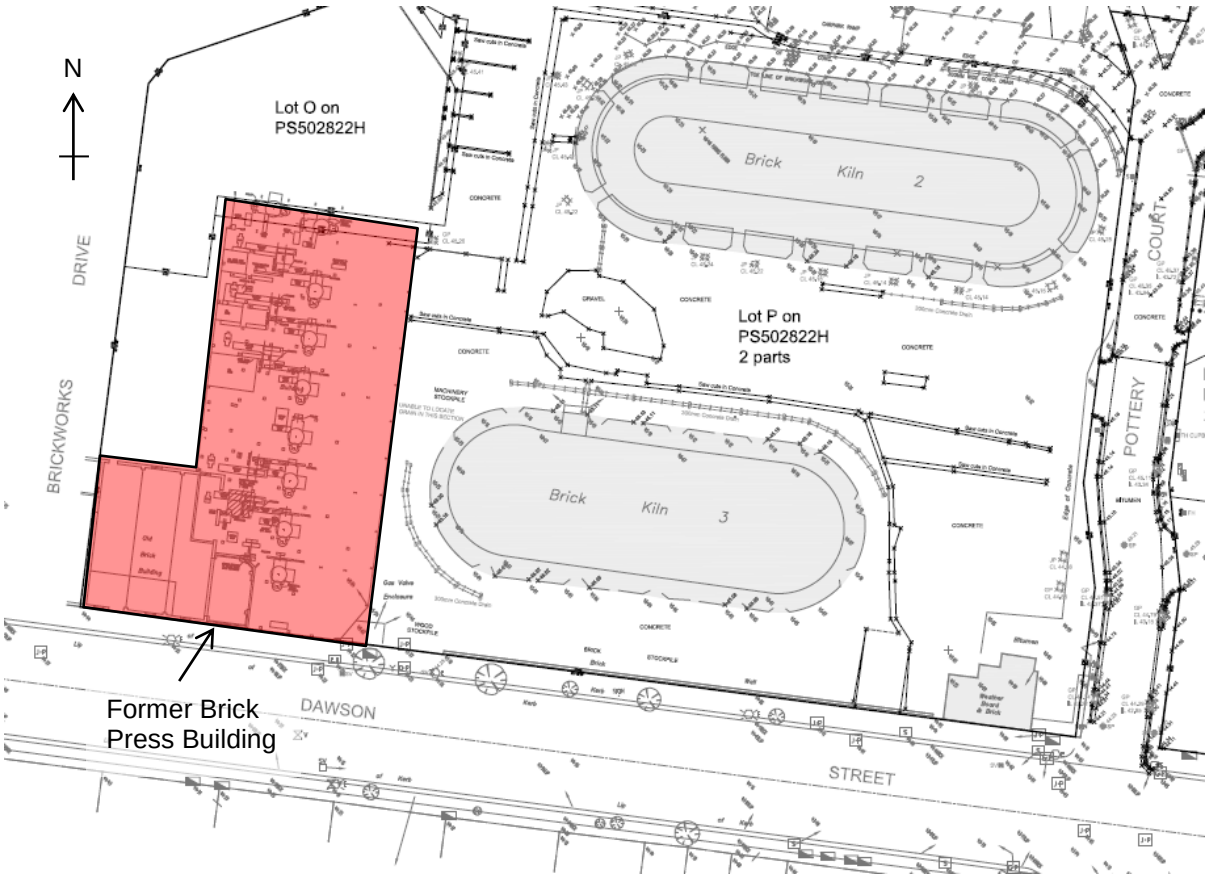

Figure A1-1 – Hoffman Brickworks - Site Key Plan

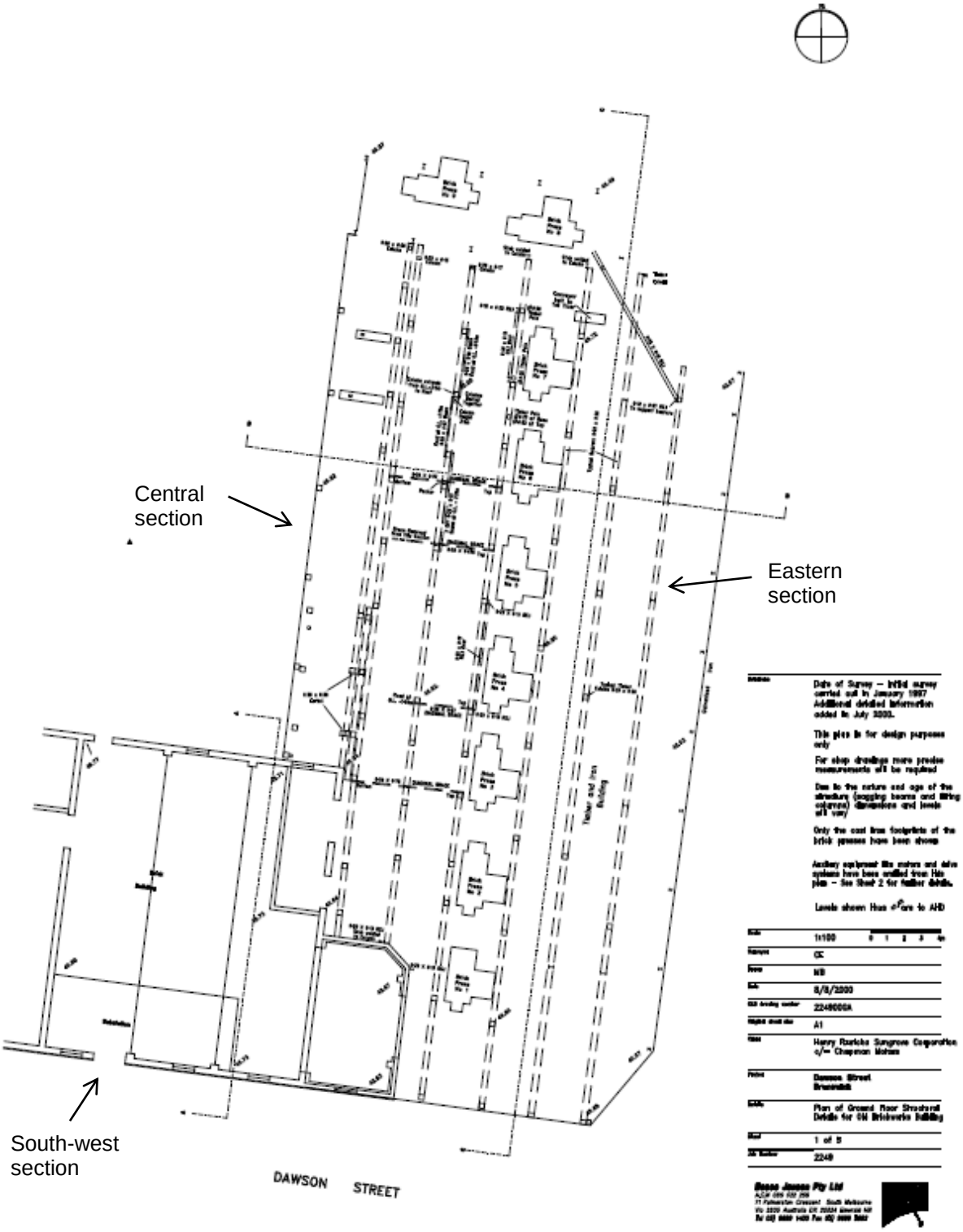

Figure A1-2 – Former Brick Press Building – Ground Floor Plan

Figure A1-3 – Remnant section of steel post and timber sleeper support of supplementary post

Figure A1-4 – Displaced supplementary timber post beneath timber floor beam

**Figure A1-5 – Removal of timber post below remaining timber corbel.
Free end of floor beams are no longer supported. Beyond, failure of timber corbel.**

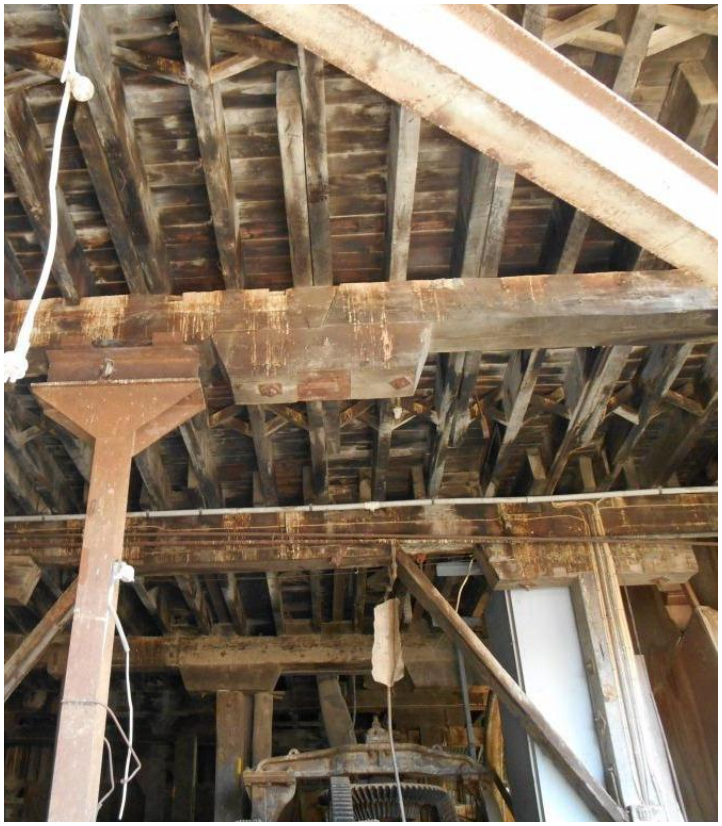

**Figure A1-6 – Removal of timber post below remaining timber corbel.
Spliced end of floor beams are no longer supported. Beyond, failure of timber corbel.**

Figure A1-7 – Horizontal splitting of inadequately supported timber floor beams.

Figure A1-8 – Vertical splitting of timber posts.

Figure A1-9 – Failure of column capital

Figure A1-10 – Local collapse of timber flooring

Figure A1-11 – Decay and collapse of timber floor and lining.

Figure A1-12 – Timber trusses and framing at roof level.

Figure A1-13 – Eastern extension, at left of photo.

Figure A1-14 – South-west section, western external wall.

Figure A1-15 – Detail of damaged and unstable bricks along western wall.

Figure A1-16 – Detail of cracked bricks along western wall.

Figure A1-17 – Southern elevation of the building.

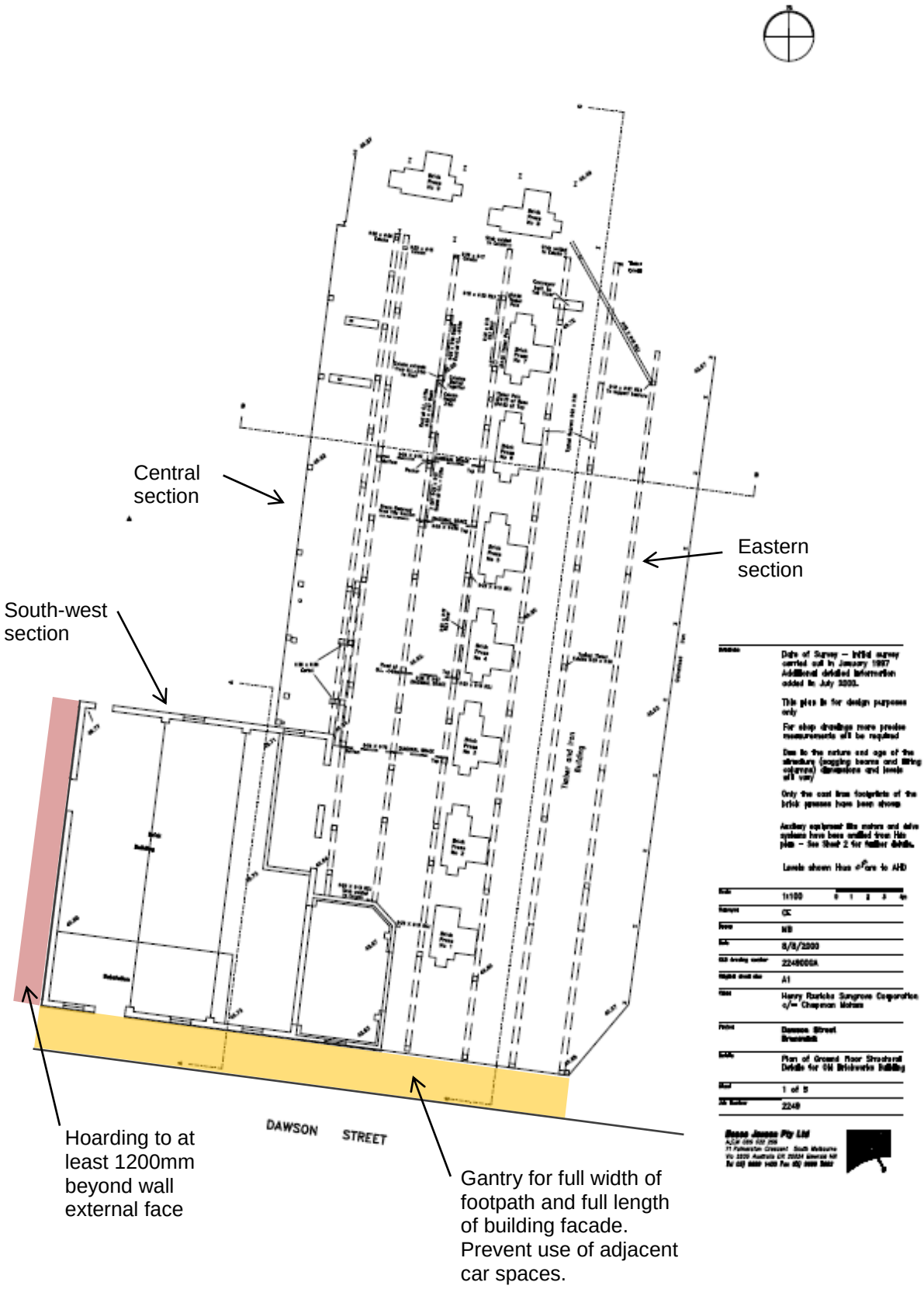

Figure A1-18 – Temporary Hoardings / Gantries to Former Brick Press Building