

**STRUCTURAL ASSESSMENT  
REPORT OF  
BUILDINGS 5 & 6  
BRICK PRESS BUILDING ,  
FORMER HOFFMANS  
BRICKWORKS  
72-106 DAWSON STREET,  
BRUNSWICK**



**PREPARED FOR  
94 Feet Property Development & Construction  
c/- Neoscape Pty Ltd  
Attention: Darren Woolf**

## EXUCTIVE SUMMARY

- I. The buildings at this sites have been identified to have considerable heritage value and have stood the test of time.
- II. The walkthrough inspection and observations has revealed the buildings to have numerous areas of naturally occurring material degradation from exposure, poorly constructed alterations, general neglect and poor to non existence cyclic maintenance which has resulted in ad-hoc structural interventions .
- III. My opinion is that, fundamentally the buildings have been constructed to an excellent standard and subject to detailed structural fabric inspections, remedial works could address the building fabric faults identified and prolong the life of the building .
- IV. To the untrained eye this poor condition may be alarming , but in my opinion and subject to the remedial works described in this report, the fundamental structural fabric of the building is good and sound, and I would not condemn them
- V. Active intervention for immediate remedial works and safe works practices is required.
- VI. This office has adopted structural engineering philosophies and assessment practises based on AS ISO 13822-2005 Basis for design of structures- Assessment of existing structures ( ISO 13822:2001, OOD ) to make recommendations on this building
- VII. In my opinion, this building should be assessed on the basis of satisfactory past performance, with careful inspection being undertaken to ensure that any evidence of significant damage, distress and deterioration is corrected.
- VIII. This building has demonstrated a satisfactory performance over a sufficiently long period of time for extreme actions and environmental effects to have occurred and the building remains , while degraded, structurally sound provided the actions contained in this report are adopted and acted upon.
- IX. I further believe that subject to detailed assessment and interventions that the buildings could be made suitable for continued adapted use .
- X. The challenges that soil contamination presents at the site are significant . The removal to significant depths over an extensive area under and around the buildings to address this contamination may not allow retention of the buildings
- XI. Should alternative methods of soil remediation be discovered that do not require removal of the contaminated soil, then in my opinion the retention of the building on a structural basis is possible

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## STRUCTURAL ASSESSMENT REPORT OF

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### 1.0 INTRODUCTION

This office has been engaged to undertake an independent structural fabric assessment report of the Former Brick Press Building at the site of the former Hoffman's Brickworks to offer a structural engineering opinion to determine the suitability of the remaining Brick Press Building for a change of occupancy and use in the proposed mixed use (retail/commercial/residential) development at the site.

The Scope of Works was limited by agreement to :

- An inspection and report on the building's structural fabric assessment to be limited in nature based on a walk through visual inspection with no invasive or destructive investigations and no geotechnical investigations of existing footings – ( reliance on the GeoAust geotechnical report is to be made for commentary on existing footings and their impact on the past / current performance of the building and its suitability for continued use.)
- This office was also requested to consider and make comment of the impact of a soil contamination report prepared by CompassEnvironmental which has identified contamination that may require deep level soil removal . This office was requested to make comment of the ramifications identified in the Compass Environmental Report as it may impact on the structural engineering considerations in the assessment of the building for continued use.
- Consideration in the structural assessment to be given to the building's expected code compliance if it were to be retained and incorporated into the development.
- An assessment of the building has been undertaken by the O'Neill Group. A review of that O'Neill Group report is to be included in this independent structural assessment.

## 2.0 DESCRIPTION AND HISTORY OF STRUCTURE

### *History Summary<sup>1</sup>*

*A large number of brickworks and potteries were established in the Brunswick area from the 1870s due to the presence of quality clay deposits. Formed in 1870, the Hoffman Patent Brick and Tile Company introduced large scale brick making to Victoria when they established brickworks on 4.9 hectares (12 acres) in Albert Street, Brunswick (not extant). Central to their brickmaking process was the revolutionary Hoffman kiln for which the company had patent rights. This kiln, developed in Prussia in 1859, allowed a continual process of loading 'green' bricks and allowed an economical use of fuel. Hoffman kilns were constructed at the original site in 1870, 1871 and 1875. In 1884 the restructured 'Hoffman Patent Steam Brick Company' purchased an additional 14.6 hectares (36 acres) of adjacent land to the south and opened their No 2 works fronting Dawson Street. This enabled an increase in production which reflected the dramatic growth of Melbourne at the time. Hoffman kilns were constructed at the No 2 works in 1884, 1888 and 1908; the latter replacing a Foster tunnel kiln erected in 1885. In 1887 a technologically advanced mechanised steam powered brick press was added to the site, based on the English Bradley-Craven principle and manufactured in Victoria. This resulted in a fully industrialised brick making process. Established as one of the largest brick manufacturer in Victoria by the late 1880s, the company began to diversify its range of products, and the eastern section of the site was developed as a pottery producing ceramic pipes and sanitary ware, and later tessellated tiles, terracotta items, Marseilles roofing tiles and decorative pottery ware. This included the production of drainage pipes for the Melbourne & Metropolitan Board of Works for the sewerage of Melbourne from the 1890s.*

*By the early twentieth century the site contained three kilns, a large brick grinding and pressing building, an engine house, a special brick department to the west, a pottery works to the east and three tramways which connected with the main Coburg train line and transported bricks from the site. The depressions of both the 1890s and 1930s temporarily halted production at the Hoffman Brickworks and the No 1 works were permanently closed in 1941. Production continued at the No 2 works, however as kiln technology advanced after World War II, the Hoffman Company did not keep up with advances in the industry and fell behind in the market. Clifton Holdings bought the business in 1960 and the closure of the drain pipe division followed in 1962 and the other pottery works in 1969. Much of the pottery land to the east of the site was subdivided and sold. Nubrik purchased the brick making operations in 1986, but production ceased in 1993 and the site was sold to a development company in 1996. It has subsequently been redeveloped as parkland and for residential purposes.*

### *Description Summary*

*The original Dawson Street brickworks site of 14.6 hectares (36 acres) has been greatly reduced. It contains two kilns (1888 & 1908) and a chimney from a third kiln (1884); a brick press building (part of which may date from 1884) which contains nine brick presses dating from the 1920s, 1960s and 1970s and an adjacent edge runner mill, and a small remnant section of the original pottery works to the east. The brick press building, situated to the west of the site, has a large iron clad gabled building at its core. Surrounding sections include a gabled brick building to the south west which was probably the former engine house. Two former Hoffman kilns, with tall brick chimneys,*

are located to the east of the brick press building and both have been adapted for residential use. The basic forms of these elliptical brick kilns, with battered lower walls, arched wicket openings and hipped iron roofs, have been retained. A third chimney is the only remnant of the first kiln erected in 1884 and this is located to the north west of the other kilns. The area surrounding the kilns is asphalted and an access road has been formed to the east. Further to the east is a small brick paved area; the site of two earlier pottery kilns which were once part of the extensive pottery works. Circular brick paving indicates the position of these kilns and there may be sub-surface remains.

*This site is part of the traditional land of the Wurundjeri people.*

***How is it significant?***

*The Former Hoffman Brickworks, Brunswick is of archaeological, architectural, historical and scientific significance to the State of Victoria. It satisfies the following criterion for inclusion in the Victorian Heritage Register:*

*Criterion A Importance to the course, or pattern, of Victoria's cultural history*

*Criterion B Possession of uncommon, rare or endangered aspects of Victoria's cultural history*

*Criterion C Potential to yield information that will contribute to an understanding of Victoria's cultural history*

*Criterion D Importance in demonstrating the principal characteristics of a class of cultural places and objects*

*Criterion F Importance in demonstrating a high degree of creative or technical achievement at a particular period.*

***Why is it significant?***

*The Former Hoffman Brickworks, Brunswick is significant at the State level for the following reasons:*

*The Former Hoffman Brickworks, Brunswick is historically significant for its association with the development of Melbourne's brickmaking industry in the nineteenth century and the development of the city and suburbs in the twentieth century. This is clearly demonstrated in the establishment of the No 2 Works in 1884 in order to increase production during the Melbourne building boom of the 1880s and in the production of large quantities of pipes, building and household products at the site over a long period from the 1880s. [Criterion A]*

*The Former Hoffman Brickworks, Brunswick is historically significant as a rare surviving industrial site which is illustrative of Melbourne's brickmaking industry. The site retains a brick press building, with associated machinery, an engine house and two Hoffman kilns and three chimneys. The kilns were the last of their type to operate in metropolitan Melbourne. [Criterion B]*

*The Former Hoffman Brickworks, Brunswick is archaeologically significant for its potential to contain archaeological features, deposits and relics that relate to the development and use of the site from the mid-late nineteenth century onwards. [Criterion C]*

*The two remaining Hoffman kilns and the three chimneys at the Former Hoffman Brickworks, Brunswick are architecturally significant as rare remaining examples of these innovative kilns, designed with elliptical plans, battered brick bases and associated chimneys of circular tapering form. They demonstrate the large scale of the industrial process in the late nineteenth and early twentieth century. [Criterion D]*

*The Former Hoffman Brickworks, Brunswick is scientifically significant for its adoption of the latest technology and the full industrialisation of the brickmaking industry in Victoria in the nineteenth century. This demonstration of a high degree of technical achievement included the first use of the Hoffman kiln in Victoria and the use of mechanised steam powered brick presses based on the Bradley-Craven method. [Criterion F]*

1. Victorian Heritage Database, Former Hoffmans Brickworks, Victorian Heritage Register ( VHR ) Number H0703

### 3.0 BUILDING CONDITION REPORT FINDINGS

The building comprises several distinct and discrete but interlinked structural elements

1. First floor and Above of two storey Building 5 – Former brick press and machinery building
2. Ground Floor and Above of two storey Building 5- Former brick press and machinery building ( Observations
3. Two storey Western Annex
4. Single storey ( Double story height volume ) Building 6 – Former Engine House
5. Single story Eastern Annex
6. External Claddings

#### 1) First floor and Above Building 5

##### Refer to App A - 01

Observations and finding from walk through inspection on first floor .above first floor and the surface of first floor

- a) The roof framing in this section of the building comprises Corrugate Iron ( CI ) roofing on timber hardwood ( HW ) rafters at approximately 900 mm centres ( crs). Rafters are securely tied to trusses with either retro-fitted metal tie down straps or classic traditional timber blocks. Most rafters remain plumb and square with few visible signs of sag or distress. Rafter timbers seem to be in good sound condition.
- b) Classic timber Queen post trusses span the first floor @ approximately 4.0m centres with timber knee braces to timber columns on the perimeter of the floor area. Trusses appear to be true to square with little obvious warping in-plane.
- c) Timber knee braces run from the trusses to robust timber columns providing lateral stability to the first floor roof framing in the East West direction
- d) A timber gantry frame runs down the centre of the first floor slung from the underside of the timber roof trusses over supporting industrial mechanical equipment and providing walkways to hoppers supported on the first floor.
- e) Gantry framing construction is of low quality, rudimentary but effective in an industrial sense.
- f) A skillion roof runs the entire eastern elevation of the first floor . This framing consists of roof beams at 3.5 – 4.0m crs with rafters @ 900 mm crs supporting CI roof sheeting .
- g) Timber posts support the roof beams and CI cladding is supported by timber girts.
- h) Timber framing mostly appears to be unidentified Hardwood. Timber appears to be sound, very few pieces seemed to be experiencing rot, infestation by insects.
- i) No termite mounds or mud were observed .
- j) The flooring in this section has been locally badly affected by falling damp and ingress of rainwater over a prolonged period of time. The extend of the degradation was hard to gauge because a particle board over lay had been placed . This overlay had also degraded in the presence of damp.
- k) The overlay was generally resistant to forceful probing with a blunt metal tube in significant parts of the floor area, allowing access to the majority of the floor in a cautious manner.
- l) In some sections of the floor, the original flooring had degraded and disintegrated. This was generally under the drip line of the upper steeply sloping roof where the CI roof sheeting had failed . These sections of degraded flooring were represent 10 – 15 % of the floor area.
- m) In the area that the floor had disintegrated, the top edge of the timber floor joist had been adversely affected to depths of 25 – 45 mm . The degradation was of limited length and given the robust nature of the floor joists, the joist could be

expected to sustain normally accepted construction or residential level floor loads in the order of 1.5 – 2.0 Kpa

- n) Two metre spirit level placed on the floor did not indicate significant deflection sag of the joists or out of level in either direction

## 2) Ground Floor and Above Building 5

### Refer to App A-02

Observations and finding from walk through inspection at ground floor level , above and at ground floor level

- a) Construction first floor is timber flooring on large section softwood floor joists @ 450 crs spanning 3.0- 4.0m to large section HW floor beams on HW timber columns 300 x 300 at varying spacing's. Columns have timber capitals
- b) Timber flooring has deteriorated from prolonged exposure to falling damp and adverse affects of weather, as described in the previous section. The full extent and level of degradation is difficult to determine when viewed from below as the flooring appears to be sound
- c) Only a limited up close examination of timber floor joist framing was possible. Those sections examined up close were in remarkably good condition , stable and true to line showing few signs of distress.
- d) First floor joist examined from ground level in the most adversely affected section of the timber flooring, while discoloured, still seemed to be robust.
- e) Timber column supports had been removed and altered in a number of locations. Additional retro fitted steel columns had been placed in others. The area affected was mostly the Eastern edge of building, two bays wide only and represented approximately 10 – 20 % of the floor area.
- f) Steel framing and columns had been place in a number of locations to support hopper and industrial machinery over.
- g) The North East corner of the building had been altered and construction practices in this location were particularly bad. While ugly, rudimentary and very agricultural, I do not believe this portion of the building is in danger of collapse.
- h) Existing framing and timber columns at the interior of the building were examined and showed to be sound and in good condition.
- i) Large section timber columns support first floor beams, often with large section timber capitals. Columns are highly durable, very dense unidentified HW
- j) Timber column bases appeared to run through the floor slab indicating posts that are cantilevered to provide lateral stability to the building. The base of timber posts were sound and in good condition in all cases.
- k) One column location examined in detail exhibited damaged to a height of approximately 1.2m. In my opinion this was consistent with mechanical damage associated with forklift traffic. Remaining timber post heart timber was extremely hard and sound, not exhibiting any decay or rot.
- l) Timber capitals in a number of locations have been crushed or split indicating over loading. This was observed in approximately 30% of locations . That a capital has crushed or split does not represent an immediate danger of collapse unless significant loads were re-applied prior to rectification
- m) Building 5 ground floor is reinforced concrete (RC) slab with numerous trenches, sumps and plinths supporting the former pressing machinery. The area contains numerous historically important pieces of equipment. Those parts of the slab visible seemed to be sound and in reasonable condition.



### 3) Two storey Western Annex Refer to App A-03

- a) Timber flooring has deteriorated from prolonged exposure to falling damp and adverse affects of weather. This section of the building is condemned as not trafficable for any type of activity in its present condition
- b) Large sections of the timber flooring had rotted, decayed and deteriorated to a point to being unsafe.
- c) Top edges of timber joist floor structure have been adversely affected to a level that could not be determined from the type of inspection conducted .
- d) Steel braces had been fixed to existing timber columns above and below the floor lines on the western elevation of this part of the building.
- e) When examined from below, the condition of the timbers appears to be sound for the majority of the section depth. Despite the appearance of the timber flooring from above, the examination from below indicates that I do not believe this section is in immediate danger of collapse, but extreme care needs to be exercised in establishing safe work practises in this location.

### 4) Building 6 – Former Engine House Refer to App A – 04

- a) Roofing is CI with timber linings on timber framing rafters @ 900 centres spanning between large timber trusses of a modified Queen type configuration spanning between the North and South elevations walls .
- b) Rafters appeared true and straight as did the trusses
- c) Walls are solid 350 mm thick bonded brick walls , laid with high strength pressed reds bricks in cement mortar.
- d) North and South load bearing walls are stiffened by engaged 230 x 470 brick piers
- e) Western gable wall had been stiffened and stabilised by steel braces at third points of the wall length.
- f) South wall is buttressed by a brick construction, former switch room, to a height of approximated two third the height of the wall
- g) Timber condition in the trusses appears good for the majority of the truss with no obvious signs of rot, in the majority of the truss.
- h) One critical element of the trusses displays a disturbing structural fault. At the heel location of both trusses on the north side, the heel timber has crushed and rotated . In one location the timber has split ,revealing the colour of the original timber. This reveals that the truss has moved , and given the lack of discoloration, the movement is historically recent
- i) Given the water marks and discoloration at the concrete pier cap, I suspect the crushing is the result of prolonged exposures of the timber to ingress of water. If the timbers are soft wood Oregon, this species is known to be non durable and susceptible to rot in an exposed condition
- j) The condition of the heel of the major load bearing element of this building is of great concern for working under this element for repairs. Repairs of stabilisation would need to be actioned from outside the buildings and above the trusses
- k) When viewed from outside the building, a considerable and obvious sag is evident in the roof framing. This may be an original condition, or it may be associated with the crushing and splitting of the heel of the timber trusses.
- l) The condition of the brick walls is variable but I believe fundamentally sound. The west wall is in the worst conditions with mechanical damage and loose brickwork associated with the previous demolition works at the top of that wall.

- m) A stepped crack in the south – west corner seems to indicate some form of footing movement on the south boundary. Given the changes in soil moisture gradients caused by the development works, it is unsurprising that foundation movement could occur by drying shrinkage or opposite, from falling damp caused by leaking and non effective rain water collection systems.
- n) The south wall appears to be stable, buttressed by the switch room construction, even if foundation movement has occurred.. The west wall appears to be stable, buttressed by the steel framing of the temporary columns despite the cracks and the loose brickwork at the top of the wall. The north wall could be susceptible to collapses depending on the continued movement associated with the crushing of the truss heel.
- o) Extreme care should be exercised in entering this part of the building until a more thorough examination of the condition of the truss heel can take place and additional movement observations on the stability of this wall are made .
- p) There was no obvious floor observed in Building 6 . The majority of the area was covered in piles of bricks, brick bats and demolition rubble

## **5) Single story Eastern Annex**

- a) The single story Eastern annex of the ground floor of Building 5 holds no historic merit and was not examined in detail and should be demolished.
- b) In its present condition the framing is stable and in good condition with no danger of collapse.

## **6) External Claddings**

- a) Roofing – The majority of CI roofing in the building is in a general state of decay, with numerous holes and missing sections. This degradation has led to a significant number of the faults in the timber framing and damage observed in the building
- b) Gutters had corroded and down pipes are all but non existent resulting in little or no collection of rainwater and in a number of locations funnelling rainwater to the interior of the building.
- c) There does not seem to be a rational system of underground drainage for the collection of rainwater at the site.

## **Findings Summary**

The walkthrough inspection and observations has revealed the buildings to have numerous areas of naturally occurring material degradation from exposure, poorly constructed alterations, general neglect and poor to non existence cyclic maintenance which has resulted in ad-hoc structural interventions .

My opinion is that, fundamentally the buildings have been constructed to an excellent standard and subject to detailed structural fabric inspections, remedial works could address the building fabric faults identified and prolong the life of the building .

## 4.0 IMMEDIATE REMEDIAL WORKS

### 4.1. BUILDING STABILITY

#### a) First floor and Above of two storey Building 5

It is my opinion that this section of the building is stable and in reasonable condition. Clearly identifiable stability elements in good condition exist in the East West direction and the building is buttressed by the Building 6 eastern brick wall in the north - south direction .. Timber braces could be installed on the eastern side to ensure a direct and clearly identifiable load path for lateral stability

At floor level, the timber flooring is an important element of the building structural stability to establish a stiff diaphragm in the absence of any diagonal bracing in the East – West direction with cantilever action from the ground floor timber posts. Incrementally the stiff diaphragm of the flooring and floor framing engages with each column bay.

The flooring of the first floor is in a variable condition with some parts to be in extremely bad condition and should be trafficked with extreme care and should be replaced or supplemented with an over lay before it is trafficable for any function

I do not believe any of the roof framing is in danger of collapse.

Despite the degradation in the top edge of the first floor joists , I believe they could safely support temporary flooring to undertake additional inspections

#### b) Ground Floor and Above of two storey Building 5

Despite numerous missing columns in the ground floor framing, the remaining timber joists and beams in those locations do not seem to be suffering such gross distortion or distress that they would appear to be in danger of collapse.

The existing floor joists are robust and in my opinion not in danger of collapse.

Ground floor timber columns and beams are braced with a knee brace indicating a definitive lateral load path, providing stability in the North – South direction.

I suspect that past East West lateral stability has been provided by cantilever action of the ground floor timber columns. The columns bases remain in good condition to ensure this action. In the absence of invasive investigation of the columns bases, and an alternative to this structural philosophy, diagonal timber struts or braces could be introduced in the area below the Western annex and on the East side to ensure the East -West stability.

#### c) Two storey Western Annex

The stability of the Western annex is extremely questionable in the absence of the steel braces observed.

I am not convinced that the western annex framing is in danger of collapse. Additional detailed inspection is recommended from external to the building to gauge the end condition of the timber floor joist. The existing joists are robust and of 250 – 300 x 75 mm, I suspect Oregon. If the end condition is sound despite the top 25 – 35 mm of rotted degraded material, these joist would be suitable to receive temporary flooring

d) Single storey ( Double story height volume ) Building 6 – Former Engine House

This area should have temporary barriers and DO NOT ENTER signs displayed. Because of the condition of the timber truss heels, the inability to examine them closely, and the sags evident from outside the buildings, these may present the most danger to collapse.

I believe that the trusses could be stabilised in the short term from outside the building and above the trusses and I am not advocating demolition.

e) Single story Eastern Annex

The single story annex should be demolished

f) External Claddings

After a program of works has been established. The first action should be to remove all wall cladding materials.

Wall cladding should be removed, by access externally only

Roof sheeting should then be removed

Upon removal of the wall sheeting especially, the perceived threat associated with building instability due to wind loadings will be greatly reduced. and temporary structural bracing of the building can be designed accordingly

In my opinion, while I have concerns for the Building 6 North wall because of the truss heel condition, I do not believe this section of the building is in danger of impending collapse.

#### 4.2. CONSTRUCTION STRATEGY & SAFE WORKS PRACTICES

##### Building 5

- a. Engage a builder with experience in restorations works for Heritage Buildings and undertake a detailed structural assessment of the buildings to formulate a Works Method statements for temporary works
- b. Remove the ground floor steel roof framed Eastern Annex
- c. Remove bricks and brick rubble in location of missing columns adjunct to the Eastern elevation
- d. Place temporary props progressively from intact columns below main timber beams to limit the span of the existing floor beams to not more than 6.0m.
- e. Remove all rubble , bricks and loose easily transportable steel equipment from the ground floor
- f. Clear the ground floor to accept a mobile scaffold to allow a detailed condition report ,sample of the timber floor joist, timber beams, timber capitals and timber post to be conducted.
- g. Undertake the preparation of measured drawings of structural framing and detailed condition report, including the sampling and identifying of all timber species.
- h. Any rotted floor joist beyond repair to be replaced
- i. Install a goods lift and access scaffold on the eastern edge of Building 5 to allow an over lay to be installed over the existing floor joist to provide a safe work

- platform , duck walks and working areas with barriers.
- j. Determine a strategy for removal of Steel hoppers and industrial equipment from the first floor. Which might include additional ground floor temporary props to beams and joist to allow skating of the hopper to a crane accessible location and may include removal of sections of upper level roof framing . Remove industrial type fixtures and fitting that have no heritage value.
  - k. Remove whole of timber flooring progressively and replace with 25 mm Structural flooring panels, glue and screw fix to existing floor joist.

#### Building 5 Western Annex

- a. Remove west elevation wall sheeting.
- b. Remove loose construction material and examine support conditions of floor joist timbers on the western edge for conditions from outside the building.
- c. Undertake a condition report on the floor joist timbers . Replace any severely rotted or damaged floor joists
- d. Progressively replace existing rotted condemned flooring with 25 mm structural flooring panels, glued and screw fixed.

#### Building 6

- a. Build an access scaffold external to the building and work platform to access the heel locations of the two timber trusses on the North Wall
- b. Splice onto the damaged heel locations , steel stiffening plates each side to ensure the safety and stability of the trusses.
- c. Examine the timber for condition and devise a strategy for repair .

## 5.0 O'Neill Group REPORT REVIEW

I disagree with the O'Neill report that the structure is unstable , but agree that untrained personnel should not be admitted to the building before Immediate Remedial Work and safe works practices as outlined in this report can be implemented

I agree with the O'Neill group report that the building is in poor conditions because of lack of cyclic and preventative maintenance , but I do not believe these issues render the structural fabric of the building unsound .

I believe that the installed braces on the west side of the Western annex provide perceived and real structural support to allow longer term measures to be implemented. The temporary internal steel braces to the west wall of Building 6 provide essential stability to this wall

I disagree with the finding of the application of contemporary Wind loading codes AS 1170.2 and seismic analysis loading Code AS 117.4 for this building.

The original building on the original site was on approximately 14.6 Ha, surrounded by empty pastures I suspect , indicating a potential wind Terrain Category of 2.5. The present site conditions is now highly urbanised characterising a Terrain Category 3, with significant shielding from surrounding buildings. This represents a reduction in wind pressure from 0.97 kPa to 0.68 kPa , a 30% reduction in the wind loads that this building is expected to receive in the future design life

The normal design life of buildings to present design and building codes is 100 years. This building over the 100 year first design life and has withstood the worst of wind events that can be expected to occur in this location .

The application of seismic design forces and effects is a relatively new issue in Australia over the last 15 – 20 years . This building is over 100 years old . The probability of occurrence of a cataclysmic seismic event at this location in the next 50 – 100 years that has not already occurred in the existing life time of the building is extremely low. The building, I suggest, has been load tested by any seismic events that may have occurred in the previous and existing design life of the building.

This office has adopted structural engineering philosophies and assessment practises based on AS ISO 13822-2005 *Basis for design of structures- Assessment of existing structures* ( ISO 13822:2001, OOD )

In my opinion, this building should be assessed on the basis of satisfactory past performance, with careful inspection being undertaken to ensure that any evidence of significant damage, distress and deterioration is corrected.

This building has demonstrated a satisfactory performance over a sufficiently long period of time for extreme actions and environmental effects to have occurred and the building remains , while degraded, structurally sound provided the actions contained in the BHS report are adopted and acted upon.

A legitimate method of upgrading a structure is the control and management of the occupancy of the building. Limiting the loads applied to the structure to allow the levels of redundancy in the original building construction to be realised. The industrial nature of the previous historical use of this building would consistently and typically have a design

live load of 4.0- 5.0 kPa to contemporary standards ( I think in this case empirical design loads of up to 7.5kPa may even have been adopted ) .

Typically mixed use Residential/ Commercial /Office occupancy would adopt design loads in the range of 1.5 – 3.0 kPa , with areas needing 5.0 kPa being locally strengthened.

## **6.0 REVIEW OF SOIL CONTAMINATION REPORT BY COMPASSENVIRONMENTAL**

The extent, location and depth of the soil contamination identified and recommendations contained in the report by CompassEnvirnmental Ref 13148RPT1-D1 of 28 March 2014 are extremely disturbing with serious consequences for the retention of the building

The location and depth of identified contaminants below the buildings, renders the remedial actions recommended at this site for soil remediation works to be particularly challenging. Excavation to the recommended depth below the existing building to remove contaminated soils may render the structure susceptible to instability without extensive and possible uneconomic structural bracing and support systems.

The recommended depths of excavation below the buildings for site remediation works will have the potential to undercut the structural footings of the existing building identified in the Geotechnical Investigation by GeoAust Geotechnical Engineers Ref # 2057 -6-R of 16 April 2010. Refer to Fig 3.4.1.1 – Fig 3.4.2.5

EPA Victoria has recognised the challenges and economies of scale for treating contaminated sites, especially Class A contaminants and have established publications that document a matrix of current soil remediation technology in Victoria.

This office recommends that all in-situ treatment technologies contained in the publication *Industrial Waste Guidelines "Soil Remediation Technologies in Victoria "* EPA Victoria be explored before decisions on the course of action are taken.

Most insitu treatment processes are stated to be medium to long term in duration, (months to greater than six months)

## **7.0 STRUCTURAL CODE COMPLIANCE**

In analysing these buildings , making recommendations and expressing an opinion for the structural fabric assessment for the expectation of future documentation for building code compliance to incorporate them into a mixed use Retail / Commercial / Residential development , my comments are these.

- The building in its present condition is ugly, abandoned and neglected.
- The building structural fabric is also robust and not so badly degraded that I would condemn it. The structural loads associated with its original use are far in excess of the loads that it will experience in the future with any proposed mixed use commercial/ retail development and occupancy
- My opinion is that provided maintenance issues are attended to, obvious known defects are rectified , the future occupancy is restricted to uses in the 1.5 – 3.0 kPa Live Loads range and recommendations contained in this report are followed , the building could be certified for continued use into the future .

## 8.0 RECOMMENDATIONS FOR ACTION

*Note detailed design and documentation of the immediate and future remedial works has not been undertaken as part of this report.*

The recommendation to proceed with detailed assessment of remedial works is dependant on the outcome of discussion and decisions for the site contamination remedial works.

Recommended actions now are :

- Engage in further discussion about the methods of remediations of soil contamination at the site searching for an insitu treatment solution if possible in-lieu of soil removal .
- Prepare a safeworks plan for immediate interventions at the buildings as discussed in the report to provided safe work environments for all parties.
- Under take a detailed document search and review to try determine the original construction philosophies and practices adopted for the building
- Undertake material testing on columns, beams and floor joist to identify timber types
- Undertake preliminary structural computations to determine the building capacities to absorb different loads and determine the structural capacities of the different parts of the buildings

## 9.0 CONCLUSIONS

The buildings at this sites have been identified to have considerable heritage value and have stood the test of time. The buildings have suffered from lack of period and cyclic maintenance and do present and are in poor condition in part.

To the untrained eye this poor condition may be alarming , but in my opinion the , and subject to the remedial works described in this report, the fundamental structural fabric of the building is good and sound, and I would not condemn the buildings .

I further believe that subject to detailed assessment and interventions that the buildings could be made suitable for continued adapted use .

The challenges that soil contamination presents at the site are significant . The removal to significant depths over an extensive area under and around the buildings to address this contamination may not allow retention of the buildings

Should alternative methods of soil remediation be discovered that do not require removal of the contaminated soil, then in my opinion is that the retention of the building on a structural basis is possible

If you have any queries please do not hesitate to contact the undersigned.

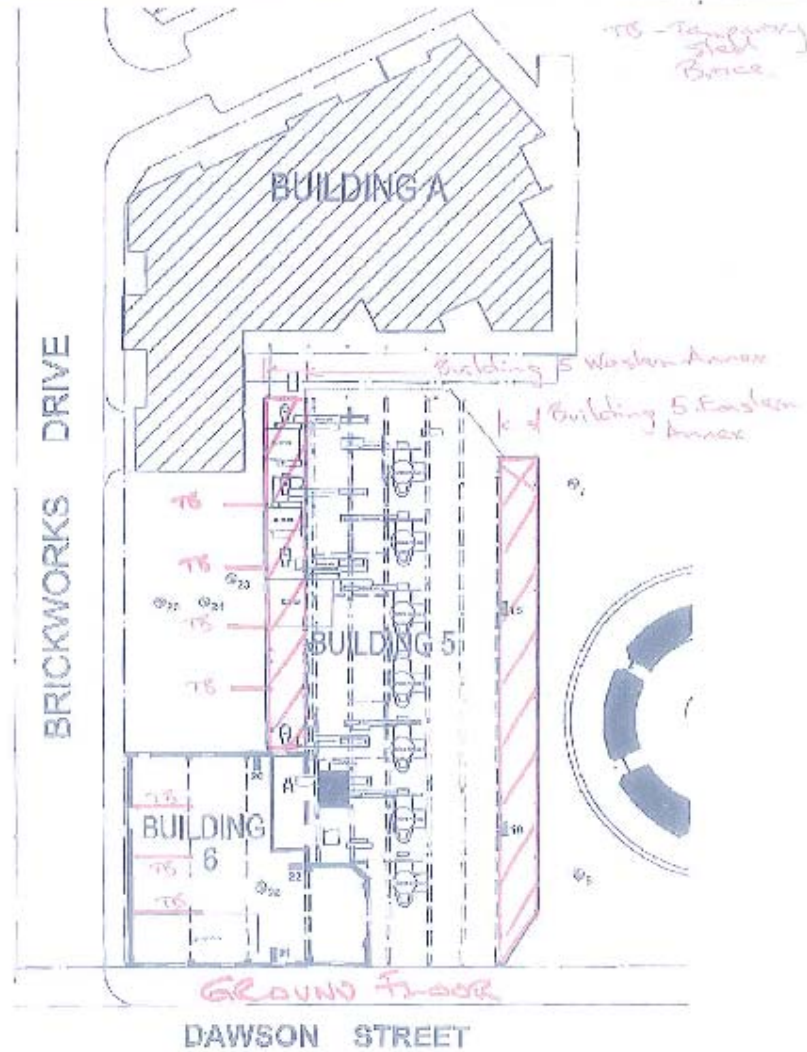
Beauchamp Hogg Spano Consultants  
Terry Lancashire  
CPEng, NPER Structural & Civil .



## **Appendix A**

- **Photographic Record**

Draft 16-05-14



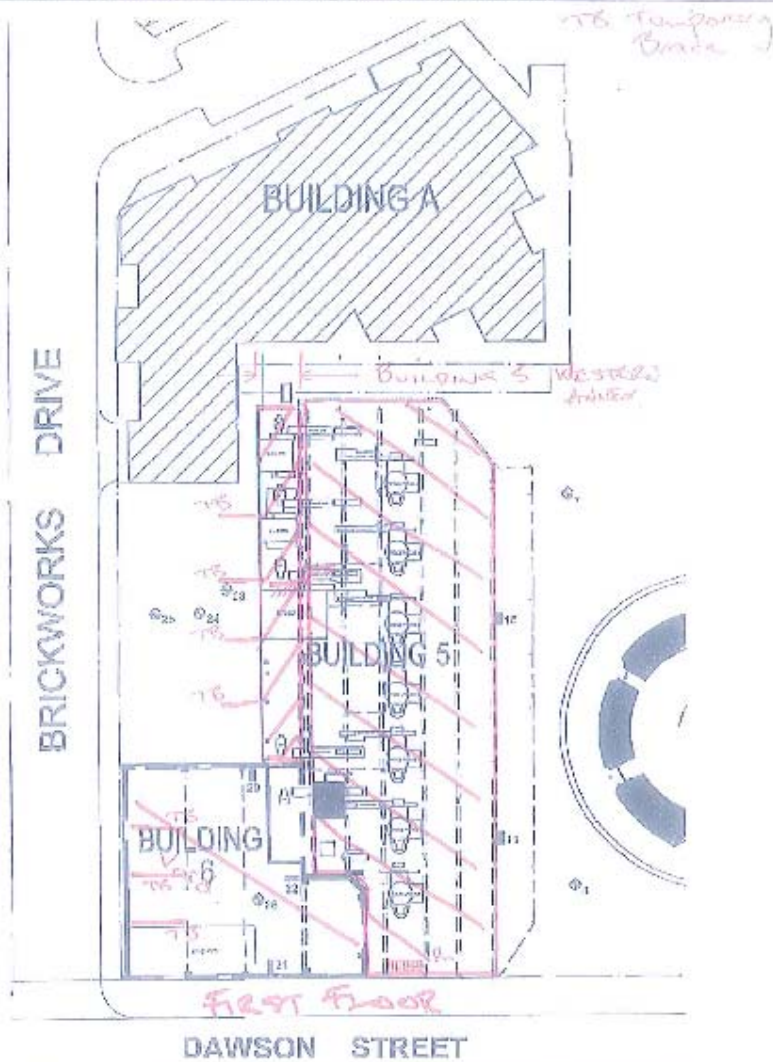
NOT TO SCALE

**LEGEND**

- Ground surface level
- Test location
- Ground surface level and test location



Figure 1



NOT TO SCALE

**LEGEND**

- Ducts approx. into building
- Ducts approx. into building
- Ducts approx. into building

N  
↑

Figure 1

## ROOF & ABOVE FIRST FLOOR – BUILDING 5



Roof Building 5 – Looking South



Roof Building 5 Looking North





Roof Building 5 – East Elevation



Heel repair. Of 8 trusses, only one had any remedial work. Others were in original condition , which was assessed to be good

Roof Building 5 –



Floor Building 5 –



Roof Building 5 Typical Roof framing condition





Roof Building 5 – Typical ad-hoc retrofitted mezzanine type industrial access framing, walkways and machinery supports



Floor Building 5 – Typical ad-hoc retrofitted mezzanine type industrial process access framing and hopper supports



Building 5 – Lower Roof – East Wall Looking South  
 Note the water tanks , approximately 1.2m deep. Representing a potential load on the floor of 12 kPa. This may explain the crushed timber capitals under . Residential floor loads are 1.5 Kpa, Office floor loads are 3.0Kpa



Building 5 – Floor sag condition. With a 2.0m level the floor sag was assessed to be less that 5 – 10mm below the level





Building 5 – Floor level condition



Building 5 – West Wall Looking North

Note : Numerous other photographs are available

FIRST FLOOR AND BELOW – BUILDING 5



Building 5 – Typical first floor framing condition for majority of the floor. Water ingress has in areas had a detrimental affect on the floor joists



Building 5 – First floor framing looking North. 75- 85 % of the floor framing is in this conditions





Building 5 First floor framing. Discoloration of timber from prolonged exposure to ingress of water. Top edge of timber rotted to a depth of 25-30 mm in the places available to be inspected . Ad-hoc structural repairs.



Ad-hoc floor strengthening to support industrial machinery over

Column missing

Floor beam splice strengthening

Building 5 First Floor framing. – Typical examples of poor building and construction practices within the building. These types of practises affect approximately 10 – 15 % of the first floor framing . But it also demonstrates that past practices have intended not to overload the existing/original timber framing



Building 5 – First Floor framing. Past practices associated with altering framing to accommodate the industrial function of the building. The majority of these construction practices, with rudimentary and agricultural are structurally sound



Building 5 First floor framing ad-hoc construction practices. The steel beam is supported by a steel column behind the CI sheeting. The circular post is poor construction practice. This type of poor construction practices affects no more than 10 % of the first floor area.





Building 5 – First floor framing over the pressing machinery in the Western portion of the Bld 5. Columns, capitals, beams and floor joist are all in good condition. I suspect also that the flooring is in reasonable condition given the environment that is subject to. Fundamentally the 'structure' is sound



Building 5 First floor framing posts in the western portion of the building near the pressing machinery. This type of construction is consistent with the posts cantilevering to provide structural lateral stability for the building. Post base is sound and in good condition



Building 5 First floor framing – Post base. I suspect that this damage is mechanical associated with the movement of materials in the industrial processes of the buildings historical context . Exposed timber is sound and in good conditions

Timber post base  
connection from  
above



Building 5 – First floor framing indicating connection of post base over

Note : Numerous additional photographs are available



### 03. WESTERN ANNEX



Steel brackets from  
external braces.  
Note non original steel  
girts

Building 5 – Western Annex- Internal – Note bracing connections. The floor of the western annex is lower than Building 5 by approximately 1500mm



Building 5 – Western Annex external steel bracing frames  
View from Brickworks Drive



Building 5 Western Annex- Flooring badly affected by ingress of water and adverse affects of water over a prolonged period of time and is condemned as structurally unsound



Building 5 – Western Annex- Note construction of step between the floor of Building 5 and the lower floor of the western annex





Building 5 – Western Annex. Eastern Edge . Floor joist and other timber properties seem to be sound

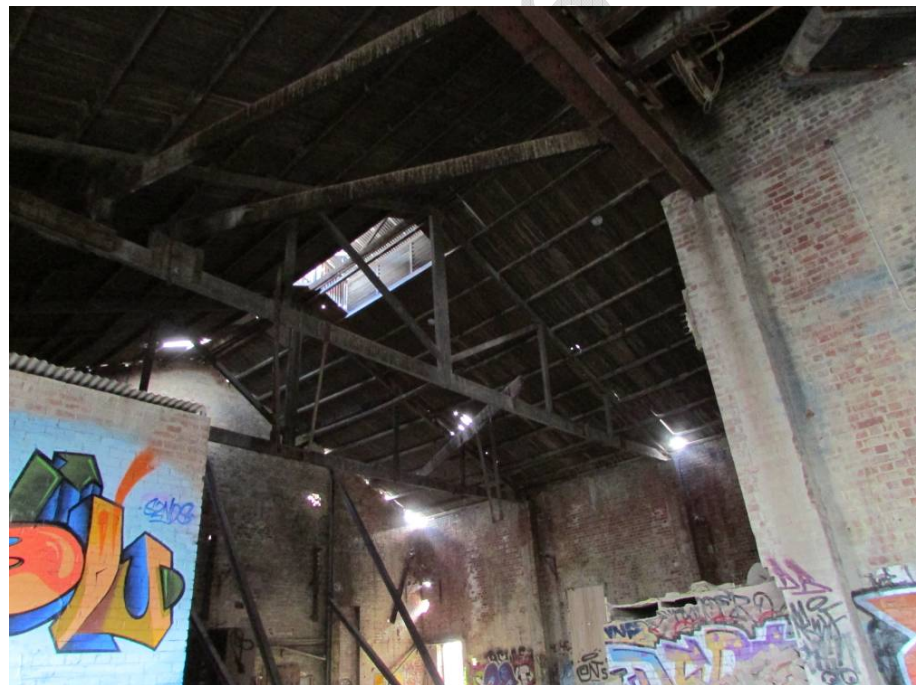


Building 5 – Western Annex – Western Edge . The majority of the section still appears to be sound. This framing is not condemned until additional investigation is undertaken to determine the depths of the top edge surface rot.

## BUILDING 6



Building 6



Building 6 – Timber roof trusses

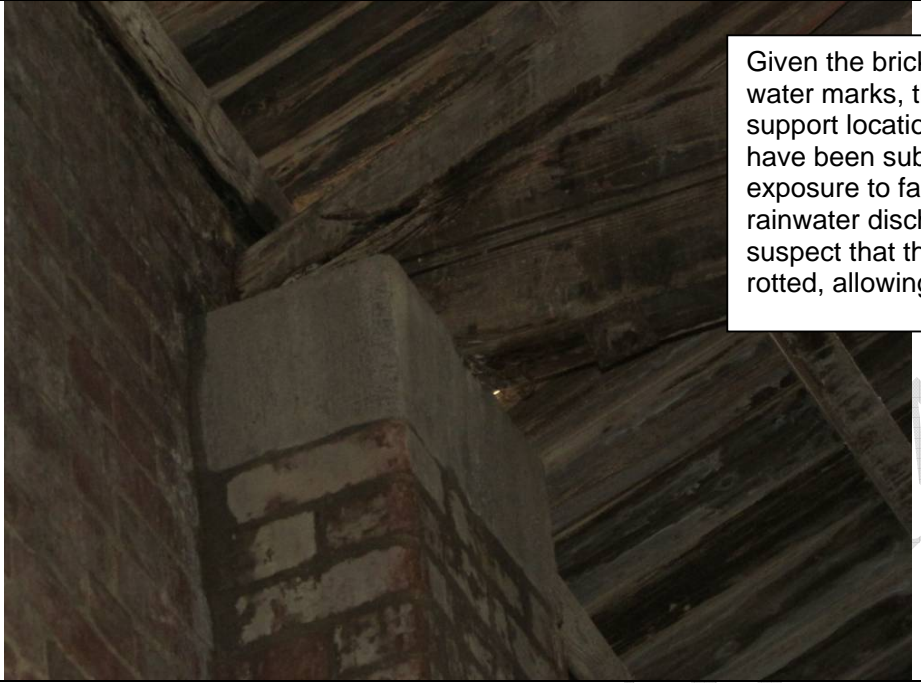




Building 6

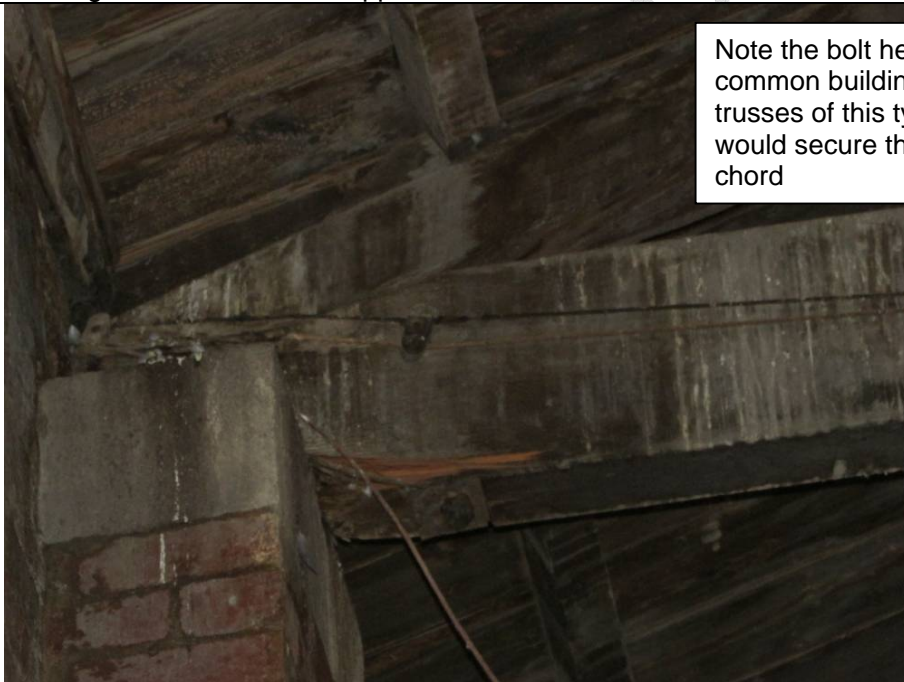


Building 6



Given the brick discoloration and water marks, the truss heel and support location would appear to have been subject to prolonged exposure to falling damp from rainwater discharge on the roof. I suspect that the timbers have rotted, allowing the truss to rotate

Building 6- Truss heel and support.



Note the bolt head. Consisted with common building practices for trusses of this type, the through bolt would secure the top and bottom chord

Building 6 – Truss heel distorted and split. Given the lack of discoloration within the split, the split would seem to be historically recent .



Building 6 External elevation Part N-W elevation



Building 6 – West elevation – External





Note the distortion in the roof line, , a distinctive sag at the location of the lantern . This sag is consistent with the location of the two internal timber roof trusses and is of significant concern

Building 6 – South Elevation



Note the lack of sags and distortions in the ridge and eave line of Building 5

Building 5 – East Elevation