APPENDIX N
JOINT REPORT – GROUND FLOOR BRICK WORKS

COVEY
ASSOCIATES PTY LTD
Consulting Engineers

JOINT REPORT
GROUND FLOOR BRICK WALLS AND COLUMNS

AT

PAVILION 1, 50 MARINE PARADE, REDCLIFFE

BY

COVEY ASSOCIATES & ACOR CONSULTANTS

FOR

MORETON BAY REGIONAL COUNCIL

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1.0 INTRODUCTION

Component Description

There were originally a number of brick columns and brick walls supporting the suspended slab. There have been numerous renovations in which some of these walls were cut, shortened, or demolished.

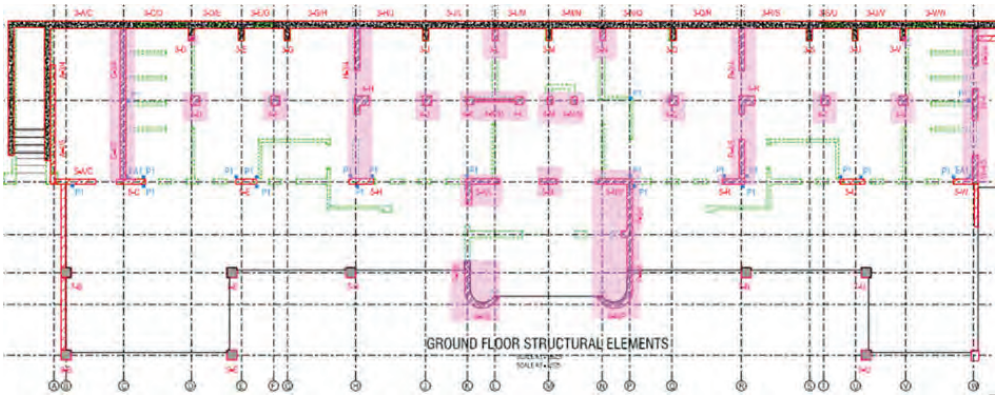


Figure 1: Highlighted remaining/current brick columns and walls in pink

Component Reference

Numerous references - See plan SK01 in Appendix. Wall or beam component reference, material and likely origin.

Construction

- Concrete footings, followed by short sub floor brick walls and columns then slab on ground then Brick walls and brick columns built above original slab on ground. Then the suspended concrete slab.
- Hence the Brick walls are generally directly supported below the slab on ground by another shorter brick wall on a concrete footing. See other report on Footings and Foundations of the report.
- Similarly for the brick columns above original slab on ground.
- Most ground floor walls were double skin brick with reinforced concrete lintels.
- There were also single skin brick walls. Most single skin brick walls have been removed. Including the original single skin brick walls along grids D and V between 3 and 4.
- Many double skin brick walls and lintels have also been removed or had openings widened with new steel angle lintels or beams installed.
- Another topping slab of was installed later (possibly post 1975 or post 2000). This topping slab also had a protective coating/lino in most areas.
- Many of the original brick walls were fully or partially rendered – some were left as exposed brick and rendered later on or even re-rendered over the top of the original render. Some walls had cladding screwed, bolted or glued to cover them.
- Many internal brick columns and walls had tiles grouted or glued directly to the brick or original render.

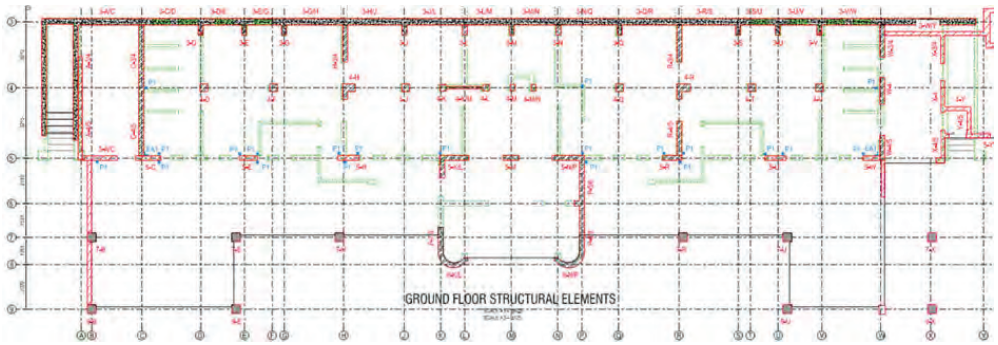


Figure 2: Plan Showing Original Brick walls remaining with black brick hatch and original brick walls removed in green. For clarity see SK01 in Appendix.

Structural Components and Details

- The height of the sub floor walls between footing and original slab on ground at the locations exposed varied approximately 300 to 800mm.
- Original slab on ground is approximately 150 to 180mm thick.
- Topping slab thickness varies in thickness approximately 70-100mm.
- Some original brick walls and concrete lintels were removed, leaving a brick buttress similar to the concrete buttresses of approximately 225mm by 400/450 .
  - See Figure 2 above showing brick walls removed.
- The original suspended slab design thickness varies between 135 and 150mm. with a topping slab the total thickness varies from 160 to 260mm.
- Area of topping on suspended slab is shown hatched on the plan below.
- The original height of the brick columns and walls must have been just under 3000mm but now with the ground floor topping slab the effective height of the walls and columns is just under 2900mm or less. This is because there is a step in the suspended slab soffit along grids H:3-4, 5:H-R and R:3-4. See figure 4 below showing building section.
- The entire brick wall along grid 6 was removed. A steel beam was installed next to where this wall was under the slab. Labelled B1-1. See drawing below. Note that one end of this beam is bolted directly to the face of the cur brick wall on grid P, the other end is supported by another steel beam.
- Most of the brick wall along grid K between grids 5 and 6 was also removed and replaced with a steel beam B1-2 which picks up B1-1. Note that one end of this beam bears directly on the remaining brick wall by around 150mm, but the other end is bolted to the face of the cut brick wall.

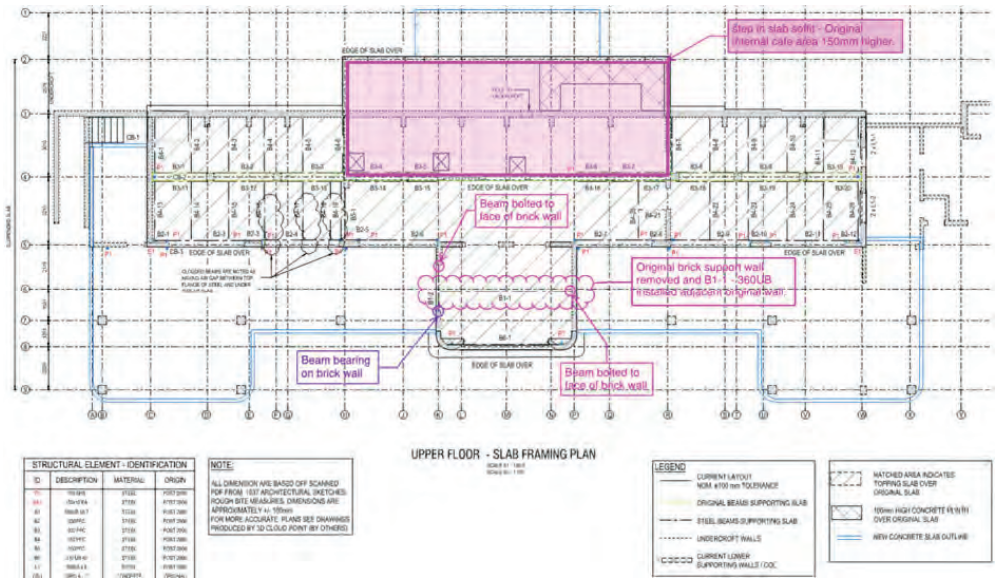


Figure 3: Plan showing area of upper floor that was raised, steel beams supporting slab and steel beam connections to brick walls of most concern

Reinforcement

- Scans by others revealed no reinforcement in the brick columns or brick walls.

Geotechnical Parameters

- Footings exposed revealed that the brick walls and columns extended to a concrete footing grid beneath the ground. The two locations the footings were exposed agreed somewhat with the original blueprints so it has been assumed that the footings and subfloor walls were built as per the plans for the purpose of any calculations. See original blueprints – footing layout and section in Fig 5 below.
- A geotechnical engineer carried out tests and was present for footing excavations. See results in appendix G of main report.
- There is no ground water to consider unless in a weather event.

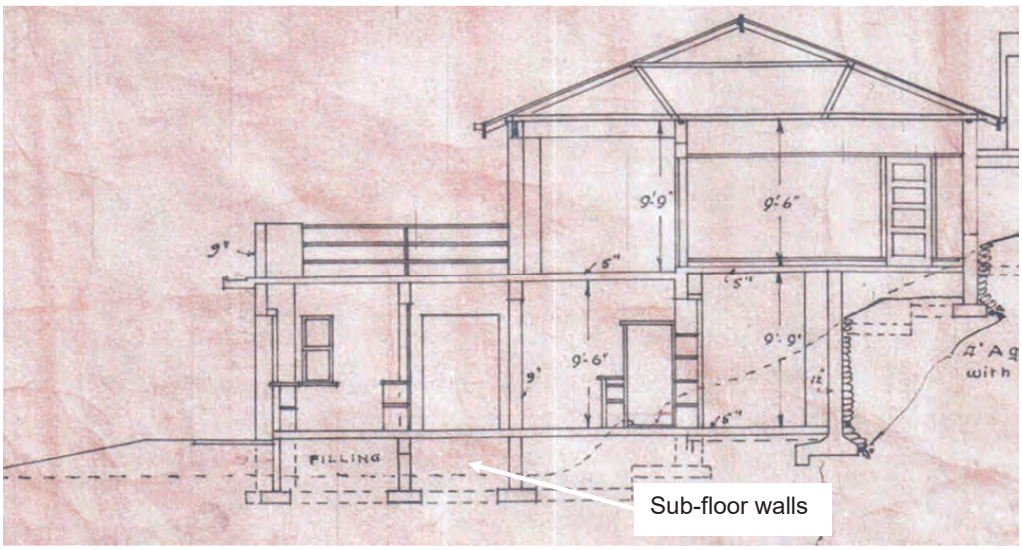


Figure 4: Excerpt from Original blue prints showing section through building – Note sub floor walls and step in suspended slab.

History

The history in terms of exposure and demolition is important when assessing the integrity of the structure from strength, serviceability and durability perspectives.

Photo 1: from 1937 shows some of the brick walls were originally rendered and some were not.

Photo 2: Building fully rendered and enclosed in 1975 – photo here from 1991.

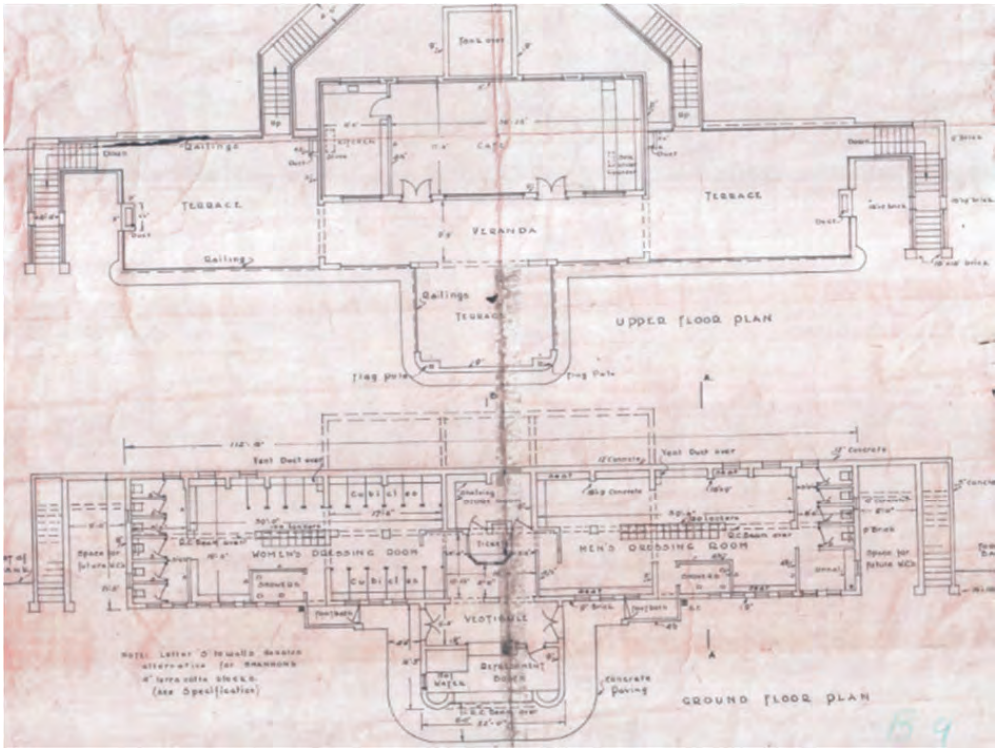


Figure 5: Scan of original blueprints showing ground and upper floor use.

In 2007 an extension of the suspended slab was built, there were no structural engineering plans available but it has been assumed that this is also when the topping slab was laid on the suspended slab and the steel support beams and columns were installed. See drawing …. In appendix…. And excerpt below showing the new suspended slab section and another drawing showing the topping slab area and suspended slab steel beam supports.

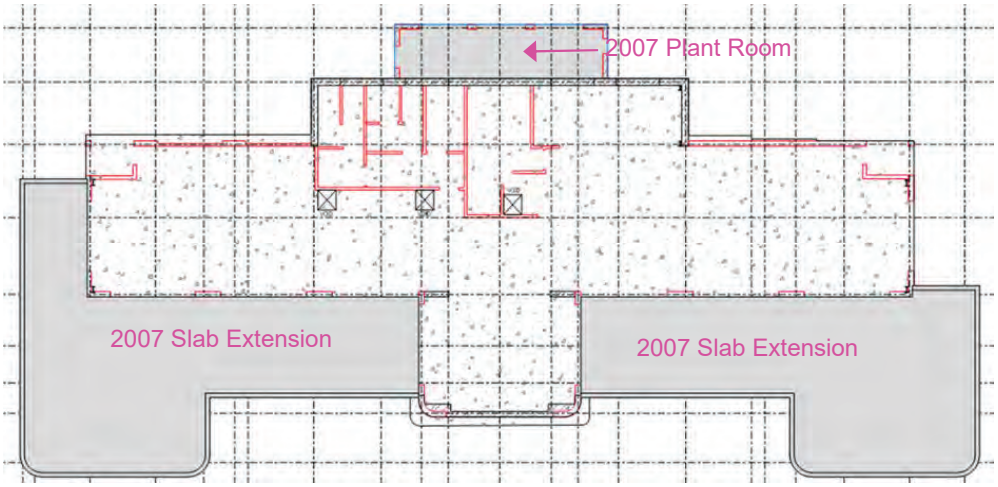


Figure 6: Plan showing suspended slab extensions.

2.0 OBSERVATIONS

Detailed observations, comments with supporting photos.

Brick walls along Grids C, H, R and W were all concealed behind cladding (at least since 2007 renovations). Upon removal of the cladding a white powdery build up was seen on some of these walls as per photo below. Some brick surfaces appeared worn and pitted.

There was some cracking in the mortar between the bricks and in other places there were cracks running right through the bricks.

Remains of brick walls were visible underside of the slab where the wall was removed.

Some of the rear brick walls running perpendicular to the rear retaining wall had discolouration and higher moisture readings at the bottom section of wall. Similarly, some of the brick columns along grid 4 had discoloration and higher moisture readings at the base after rain events.

Steel support beams were installed and connected directly to the brick walls. Steel side plates on these beams were also bearing on some of the brick columns.

Remaining bricks generally appeared to be in good condition.

2.1 General Condition of Bricks

Photo 3

Photo 4

Images show close up of white powdery substance on bricks, pitted / worn / oxidised brick surface and mortar with localised failures in a few locations. Taken after cladding removed.

Photo 5: Efflorescence at 5-K/L

Photo 6: Example of spalling of brick and grout surface.

Photo 7: Cut lintel beam with exposed reinforcement at 4-K/M. Typical. Original render is cracked and has fallen off in many places.

Photo 8: Another cut Concrete lintel

Photo 9: Cut brick wall

2.2 Wall Section C-3/4

Photo 10: C/4 Brick wall cracks stepping down from rear retaining wall on northern side of wall. Note discoloration and decay of some brick surfaces as well as some efflorescence. Also note the water damaged timber ceiling batten at the top.

Photo 11: Image shows the wall C-3/4 during strip out. Note termite and water damage to non-load bearing stud framing attached directly to brick wall and rear concrete retaining wall.

Photo 12: C-3/4 during strip out. Timber frame wall linings were damp with termite and water damage.

Photo 13: C-3/4 Image shows white powdery mould on brick surface after cladding removed.

Photo 14: C-3/4 Brick wall. Note stepped cracks at top. And cracks at joint to suspended slab.

Photo 15 : Other side of Wall C-3/4 shows cracks stepping down from the rear retaining wall is reflected to this face of the wall too. Also note water ingress.

2.3 Wall Section C-4/5

This section of wall was originally the end wall and exposed on the southern side for over half it's life. It has water ingress at the top closest to grid 5 and 4.

Photo 16: Wall section C:4/3 Inside view. Call out close up pics below.

Photo 17: Modern render ground off to expose crack at top of wall through bricks.
Also shows previous grout repairs beneath modern render.

Photo 18: Crack at base of wall much finer. Also shows gout patching beneath modern render.

Photo 19: Opposite side of the wall – shows original render with cracks through bricks and mortar that do line up on the inside face – see above pictures where the newer grout was ground back.

Photo 20: Close up of above

2.4 Section D-3/4

This single skin brick wall was removed.

Photo 21: At top of Butress column/wall at grids 3:D. Northern Face. The column is mostly concrete with a brick corner that used to be a continuous brick wall along D:3-4 but was removed.

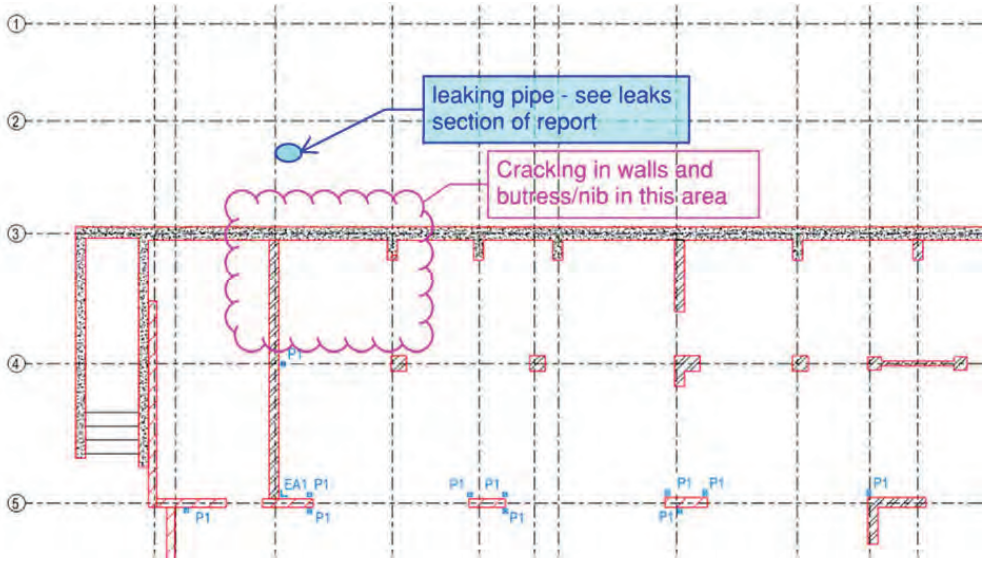


Figure 7: Plan excerpt showing cracking in corner and proximity of leaking pipe.

Note the cracking in wall C-3/4, 3-C/D and buttress/nib at 3-D suggest settlement of the rear retaining wall footing in this area. In addition to unknown/inadequate drainage behind the rear retaining wall, the cracked stormwater pipe could be providing a water source to flush fines away and consolidate foundation soils allowing this corner to settle. Causing the cracks and gaps visible today. See other sections of the report for more details including *Foundations* and/or *Leaks and Water Ingress*.

2.5 Wall H-3/4

Double skin brick, with a small opening made in the top corner. The original lintel has been cut at grid 4 and the reinforcement is exposed.

Photo 22: Section H-3/4 at join to rear retaining wall

Photo 23: Close up of cracked bricks at wall section H-3/4

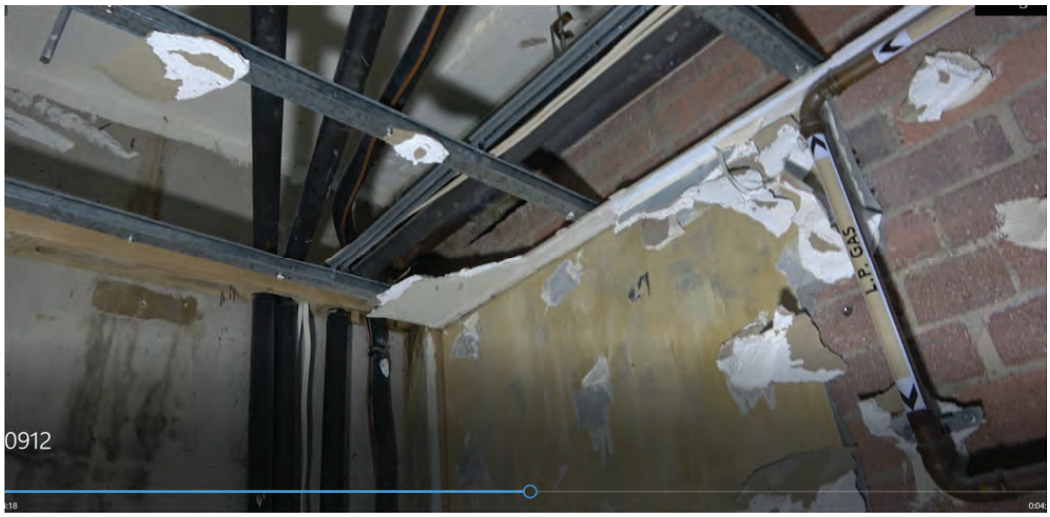


Photo 24: Other side of wall above. Note some wall linings glued on in patches other render and tiles glued to wall.

2.6 Wall Section R-3/4

Photo 25:

Photo 26: Wall with timber cladding removed – has no glue/render on this side – original bricks appear worn with some decay. There was some white efflorescence on the wall when cladding removed, but after being left open for weeks this has reduced somewhat with better ventilation. Note the opening with original lintel still in place. Also note discolouration of wall at the base.

Photo 27: Moisture Content near base of wall above.

Photo 28: Cracking in render over original concrete lintel above. Also note cracking and gaps in mortar

Photo 29: Note surface of bricks appears pitted and warn with some cracks in mortar extending through the bricks.

2.7 Wall Section W-3/4

This section of wall was originally the end wall and the northern stairs were on the other side.

Photo 30: Wall W-3/4 on far right mostly clad with a with brick corner – this is all that remains of a single skin brick wall along grid V that was removed.

Photo 31: Of the opposite side of W-3/4 at the top where the stairs were cut off. Note stair beam on the left and landing/stair reo exposed at the top right.

2.8 Wall Section W-4

This section of wall was originally the external wall at the northern end of the building.

Photo 32: Section of wall at W-4/5
Also lintel between W-4/5 and W-4.

Photo 33: Section of wall at W-4.
Render and Brickwork cracked.

Photo 34: Steel Lintel between wall segments W-4/5 and W-4. Missing bricks over and newer bricks over also installed. Brick work cracked through at W-4.

Photo 35: Close up of missing bricks above lintel.

Photo 36: View from other side of lintel in above photo. Note missing bricks, new bricks. Surface rust on steel angle

Photo 37: Lintel between W-3/4 and W-4. Note infill with modern bricks and grouted patch repairs

Photo 38: View of other side of wall along Grid W. Note the tile glue, patches and other render

Photo 39: Top of brick wall at W:3/4 where northern stair has been removed

2.9 Brick Columns – Along Grid 4

Photo 40: Brick columns on grids 4:H and 4:J

Photo 41: Efflorescence at 5-K/L

Photo 42: Brick column at D-4

Photo 43: Brick column at V-4

Note discolouration of bricks at base of column and the moisture reading taken at V-4 below:

Photo 44: Moisture reading near bottom of brick column at V-4

Photo 45: Concrete beam CB-2 metal side plate bearing on brick column at D:4, Note that these metal side plates are above every brick column along Grid 4 and some of the side plates are in contact with (bearing) on the top of the brick column and others have a small gap.

2.10 Steel beam connections to brick walls

Brick walls removed at front of building have steel beams installed to support above slab and are connected directly to the brick walls see call outs below.

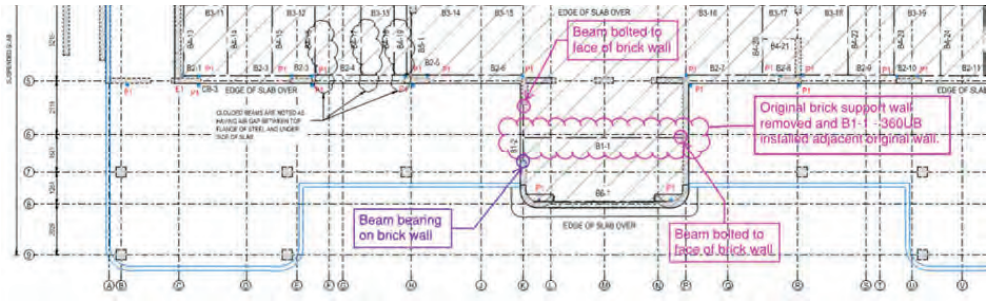


Figure 8: plan excerpt highlighting connections to the face of brickwork.

Photo 46: View of B1-1 at top of photo

Photo 47: Beam to wall connection at 6:P

Photo 48: Close up of above at Grid P:6
Bolts to remaining brick wall on grid P

Photo 49: Other side of UB at P:6

Photo 50: Remaining brick wall at 7:K Supporting steel beam B1-2

Photo 51: Beam B1-2 near Grids K:7. Note gap between steel beam and top of original brick wall.

3.0 SUMMARY OF ISSUES

- **Wall cracks:**
  Cracks through bricks and mortar in walls.
- **Sections of brick walls cut and removed:**
  All or part of the perpendicular along grids D, L, N, V and W were removed. See plan for clarification.
- **Exposed reinforcement in cut lintels:**
  Exposed reinforcement is at risk of corrosion, which in turn will expand and cause spalling of concrete lintel.
- **No reinforcement in brick piers:**
  It thus is reasonable to assume no ties to the suspended slab or ground slab.
- **Water ingress:**
  At various locations.
  Leaking pipe at 3C can be fixed.
- **Entrapped moisture:**
  Trapped moisture has led to degradation of some brick surfaces and affected the mortar in some areas.
- **Undercroft walls:**
  Enclosed space. Cannot excavate behind wall or could undermine the higher level footings along grid 2. Sub floor brick walls – the one on grid line N has undergone settlement and has cracks stepping diagonally from the rear retaining wall in the grout and through the bricks.
- **Steel side plates on PFC side beams on CB2 bearing on top of brick columns:**
  This occurs on most columns that have the side plates along grid 4 between D and K, Q and V.
- **Steel Beams connected to face and end of brick wall:**

This occurs in the side of the wall at P:6 and in the end of the wall near K:7. The load path is eccentric to the brick wall. The brick wall is inadequate. It does not have enough capacity in bending. Also there is potential issue with the effectiveness of the anchors in the brickwork.

- **Other issues are mentioned in the BG & E Condition Assessment report**

4.0 STRUCTURAL ASSESSMENT AND REMEDIAL OPTIONS

The structure, condition and amenity of the Pavilion is addressed by others (within this report).
This (ACOR) report addresses structural issues with the existing brickwork on both lower and upper levels and provides comment on fixings and bracing capacity.
The building is a two (2) storey structure. There are masonry walls on both levels.

At the ground level, the masonry walls:

- Support the concrete, masonry, and timber framed structure above, and
- Contribute to the lateral stability of the building

4.1 Assessment assumptions

Bricks
The original bricks are “dry pressed” (ie; solid), with the following dimensions 230mm long x 110mm wide x 76mm high.

These were standard dimensions for bricks at the time of construction and (with some exceptions) remain standard currently.

Such bricks typically have a compressive strength capacity of (approximately) 15 – 17 MPa.

The wall heights are:
- Lower level – 9’9’ ~ 3.0 metres
- Upper level – 9’6’ ~ 2.9 metres

Regarding the masonry compressive strength, we note from BG& E engineering, Condition assessment report results, Aug 2022, section 8, that;

Table 18 – Brickwork estimated in-situ strength

Brickwork	Estimated in-situ Strength (MPa)
Columns	12 ± 7
Walls	14 ± 7

In qualifying these results reports also says,

A relatively high degree of variation in the estimated mortar strength has been identified and is consistent with the expectations of hand mixed mortar.

We acknowledge the wide range of these values. Our assessment has adopted these (table 18) values and applied the modification factors required of the Code (AS 3700) to assess the in-situ capacity of the brickwork, at the locations as noted. In the areas where the design loads have proved critical, we have taken a conservative approach and adopted the lower in-situ strength values.

Wind Loads

On consultation with Covey Consulting Engineers, and after discussion of the merits of the available sources for wind assessment, the two primary sources for estimating wind loads are contained within AS4055, “Wind Loads for Houses” and AS 1170.2 “Wind Loads”.

We note that the Covey Consultants assessment for lateral wind loads has used AS4055, specifically, N5 category.

The following report addresses the specific areas identified in our site inspections of 28 July 2022 and 25 August 2022 as requiring review. Specific items are as referenced on the following figures 1 and 2

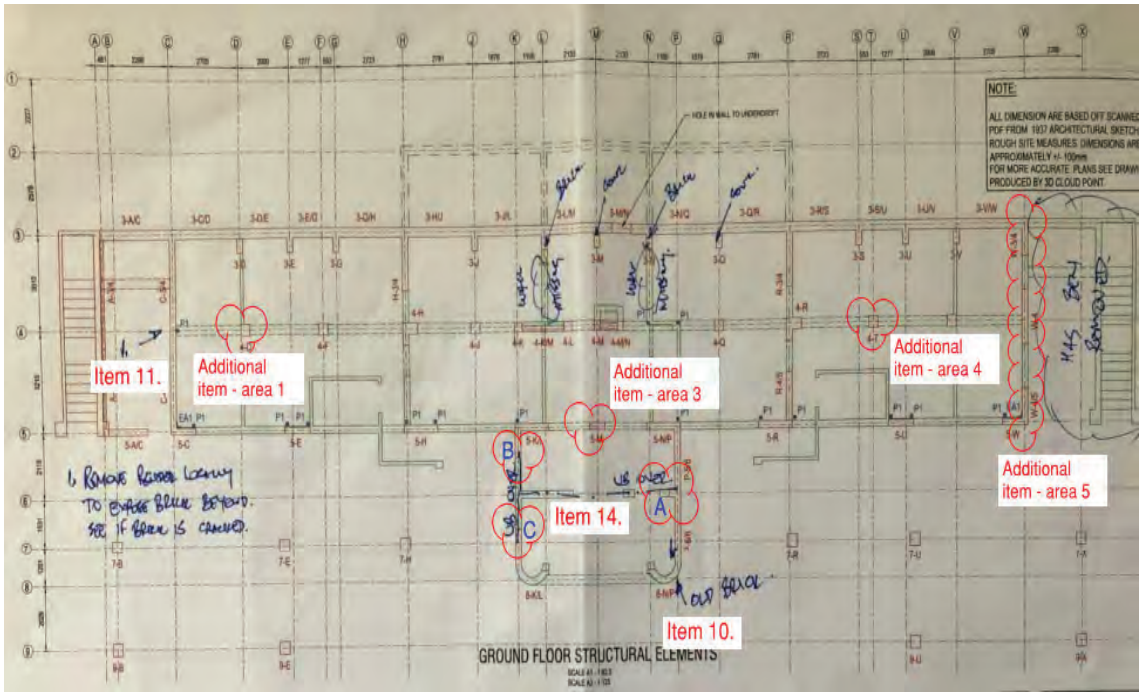


Figure 2 – site notes and references – ground floor brickwork

4.2 Item 10

Comment on condition of original heritage masonry wall components, and suitability to support concrete masonry structure over

We note that immediately inside the front sliding door, the brickwork panel has been power saw cut and partially removed.

With reference to the original plan (see below) we suspect that the transition from the curved brickwork to the nib abutting the door extended further (west) in to the building.

We further suspect that at some stage (and for whatever reason) this was amended to its current shape.

Photo 10 – Masonry wall panel

Photo 11 – Close up, batts & demolished ends

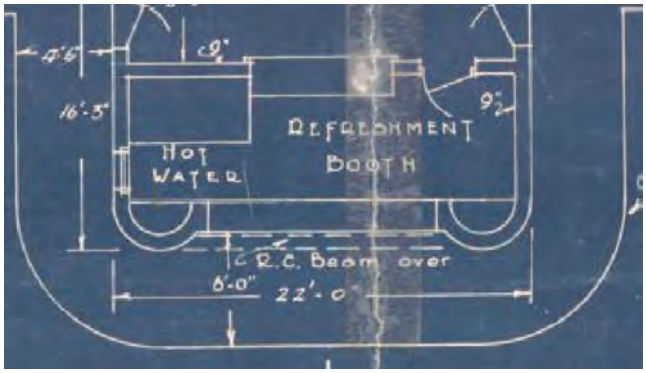


Figure 3 – original ground level plan

Without recourse to structural calculations, we can see that area of brickwork forming the wall, especially as evident in photo 11, is substantially less than was originally constructed.

Further the batts (that is, the ends of the bricks) and demolished ends (again, visible in photo 11) suggest a tenuous (at best) connection between the curved section and the abutting nib.

We suggest that the offending portion of brickwork should be made good, sufficient to:

- Maintain the continuity of the brickwork (ie; through the curved to straight transition), and
- Reinstate the sectional dimension of that part of the wall

Such work would ideally be done either with similar materials (bricks) won from site. Or, alternately, with suitably approved replacements.

All work should, of course, only be undertaken by suitably qualified practitioners.

4.3 Item 11

Noted, cracking observed to render coating over original heritage brickwork.

We note that the render coat, as inspected, was cracked in a square pattern.

This area did suffer historic water ingress.

As noted by Covey Consultants, in areas that were often wet, when the render coat was removed from the brickwork, it had the affect of allowing the bricks to dry.
We suspect this is such a case.

We also understand that further removal of the render in this area did not reveal cracking to the brickwork, in the same manner that was observed in the render coat.

Photo 12 – Masonry wall panel

Photo 13 – Close up, batts & demolished ends

Referring to photo 12, we note that there is some evidence of cracking in the brickwork substrate here. It is not heavily reflected in the second skin of brick, as discovered when the render was removed from the other side of the wall. Only hair line cracks in brick and grout. We suggest that crack repair (as discussed earlier) and, if necessary, brick replacement, will suffice.

Regarding the integrity of the wall, our structural review suggests that this wall is compliant for the imposed loads.

4.4 Item 14

Comment on capacity of masonry walls (nibs) to support level 1 loads.

Comment on condition of brickwork.

This item contains three (3) load points. As per figure 4 (below) they are referred to as A, B & C

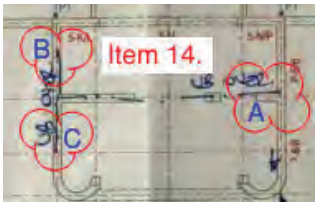


Figure 4 – Load points within item 14.

Load Point A

Photo 14 – Load point A

Masonry assumptions

- Dimensions of wall elements 3.0m high x 4.3m long
- Nature of construction – double brick
- Mortar strength – 14 MPa +/- 7

Loaded area – approx. 8m^2

Approximate ultimate dead and live (gravity) load combination force ~ 111 kN

This load is partially distributed over the length of the wall, and partly imposed as a point load by the structural steel beam.

As evidenced by the photo (14), there is a 1400mm wide opening immediately adjacent to the support location.

Further, the steel beam is fixed to the face of the wall by four (4) masonry anchors.

Additionally, review of figure 3 (above) suggests that there used to be a brick nib at this location. Photo 14 shows that this has since been removed

If we consider the eccentric load imposed on the wall by the face mounted beam, at best the slab over will contribute to stabilising the wall.

At its most conservative, the unreinforced wall has no ability to support this load.

A comment about the connection. Given the dimensions of the structure (in this area), we consider it reasonable to assume that the beam is carrying approximately half of the load indicated above. Therefore, it is imposing a concentrated load of 111 kN on to the face of the brick wall, via 4 x masonry anchors.

Referring to the Ramset literature for masonry anchoring, the maximum shear capacity of their anchors is around 5.2 kN for chemical injection anchors and 4.8 kN for expansion type anchors.

Proportionally, this is less than one quarter of the restraint required to support the steel beam.

Recommendation

Given the above discussion, we suggest that a vertical structural element be placed under the end of the beam at load point A that supports the beam and is founded on an approved bearing pad (which may be the existing slab) below. This element could either be:

- structural steel – 75 x 5 SHS (or similar. Noted – pending the result of further site investigation, this may require a footing under the post).)
- brickwork – 350 sq grouted engaged pier
- reinforced concrete – 350 square with reinforcement, or
- reinforced masonry – 290 x 290 blockwork, fully grouted with reinforcement.

Load Point B

Photo 15 – Point Load B

Although not clearly shown in the photo (15), at this location, the steel beam is face fixed in to the nib of the wall.

The loaded area at this location is approximately half that of point load A, ie, 0.5 x 111kN ~ 55 kN.

We know from the original drawing that the thickness of the nib is 9” (~ 230mm).

With a similar analogy as used at load point A, a connection using masonry anchors is non-compliant. Also, a 4 x bolt patten on a 230mm wide nib does not provide sufficient area to achieve the edge distances (for the anchors) required of the manufacturer.

As with load point A, we suggest that a vertical structural element (see commentary load point A) be placed under the end of the beam at load point A that supports the beam and is founded on an approved bearing pad (which may be the existing slab) below. This element could either be structural steel, brickwork, reinforced concrete, or reinforced masonry.

Load Point C

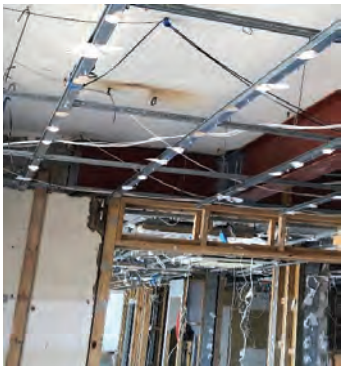


Photo 16 – Load Point C

At load point C, the steel beam is seated on the nib of the wall.

As with load point B, a concentrated ultimate load of approximately 55 kN is imposed at this point. Additionally, we know from the original drawing that the thickness of the nib is 9" (~ 230mm). We estimate that the beam bears on the wall for a distance of approximately 250mm.

Our review suggests that under these conditions the brick wall has the capacity to accommodate this load.

However, we note (refer to photo 16) that there is a large portion of the brick nib is missing (broken off).

Also, we are unaware of any connection between the wall and the structural beam. This observation is supported by the Covey Consultants inspection report.

Recommendation

1. Reinstate the damaged portion of the brick wall to provide an appropriate bearing pad for the steel beam
2. Provide tie down for the beam to the brick wall. There are a number of ways this can be achieved
   - Temporarily remove an area of brick work and build in threaded rods, or
   - Provide an RHS column at the face of the nib that is attached to the steel beam (over) and extends to an appropriate fixing at the base (slab). Fixing should also be provided from the RHS to the face of the brick nib.

Additional Item – Area 1

Check capacity of 350 square brick column to accommodate dead and live loads.

Photo 17 – Additional item, Area A

Masonry assumptions

- Dimensions of wall elements 350mm square wide x 3.0m high
- Mortar strength – 14 MPa +/- 7

Area of upper floor supported – 9.3 square metres. Approximate ultimate dead and live (gravity) load combination force ~ 128 kN

Result – the isolated pier is compliant for strength

Additional Item – Area 3

Check capacity of masonry wall to accommodate dead and live loads.

Photo 18 – Additional item, Area 3

Masonry assumptions

- Dimensions of wall elements 230mm thick x 750mm long x 3.0m high
- Mortar strength – 14 MPa +/- 7

Area of upper floor supported – 5.7 square metres. Approximate ultimate dead and live (gravity) load combination force ~ 82 kN

Result – the isolated pier is compliant for strength

Additional Item – Area 4

Check capacity of 350 square brick column to accommodate dead and live loads.

Photo 19 – Additional item, Area 4

Masonry assumptions

- Dimensions of wall elements 350mm square x 3.0m high
- Mortar strength – 14 MPa +/- 7

Area of upper floor supported – 10.2 square metres. Approximate ultimate dead and live (gravity) load combination force ~ 141 kN

Result – the isolated pier is compliant for strength

Additional Item – Area 5

Wall along grid W.

We note that this was originally the end wall of the building. Successive renovations to the building have seen openings cut in to the wall.

The brickwork (above the openings) is supported by structural steel lintels. The depth of the supported brickwork is not sufficient for the brickwork to “arch” the span. Therefore, the steel lintel is fully utilised.

Also, there are (what appears to be) a duct penetration over the steel lintel (see photo 20).

Review of the lintel depicted in photo 20 (approximately at the intersection of grids W & 4) suggests that there has already been significant shear failure of the brickwork immediately supporting the right-hand side of the lintel. This is visible under the removed render.

This crack (shear failure) suggests the brick wall, as it currently exists, is not sufficient to support the load impose by the opening/lintel.


Photo 19 – Grid W wall, from south


Photo 20 – Grid W wall, from north


Photo 21 – Grid W wall, existing steel lintel

We suggest that:

- The capacity of the brick wall should be checked by an appropriately qualified practitioner.
- If (as we suspect) the brick panel is proven non-compliant; it should be replaced with either:
  - A new brick panel, of appropriate proportions, or
  - An alternate form of vertical support (for example, a steel column) of sufficient capacity to support the imposed load. Noted – pending further site review, a new footing may be required.
- That all affected brickwork be rebuilt with approved replacement materials, as appropriate for the task.

5.0 CONCLUSION

General – Notwithstanding the above content, our investigation suggests that regarding brickwork:

a) Where loads are supported concentrically over masonry elements, and where the masonry element is of sufficient length, the brick work (as reported) is generally compliant (for strength) with the requirements of AS3700, “Masonry Code”.
b) Where structural elements transfer concentrated loads to the face of masonry walls, the brickwork is non-compliant
c) Those areas identified as being non-compliant require remediation.
d) Where masonry anchors have been used to support concentrated loads (on the face of masonry walls) those connections are non-compliant.
e) In areas where successive renovations have contributed to the removal of parts of walls (and decreased the section capacity of that wall), those areas should be re-built as per the original intent
f) In areas where brickwork has cracked, but the structural integrity remains intact, those areas should be remediated by filling the cracks with an approved product/method.

g) In areas where brickwork has suffered shear (or similar) failure, and the integrity of the structure is in doubt (locally), those areas should be
   - Reinstated by either approve masonry re-construction methods, or
   - Augmented with addition structure (for example, structural steel) sufficient to reinstate the integrity of the area.

6.0 ADDITIONAL CONSIDERATIONS

It is noted that there appeared to be no connection between the suspended slab and the rear retaining wall and brick columns and brick walls. Hence the buildings resistance to lateral earthquake and wind loads is limited to the front of the building. Australian standard AS1170.4 requires that *All parts of the structure shall be tied together in Horizontal and vertical planes*. There are steel columns connecting the slab on ground to the suspended slab along grid 4 and 5. These do provide some racking resistance however it is not enough (they are only 100SHS). Additional connections are required along the rear of the building on grids 3 and 4.

Where brick walls are of cavity construction, we suggest that remedial (Helifix) type ties be included to all areas.

Where new supporting elements are to be introduced to augment deficient brick locations, new footings may be required.

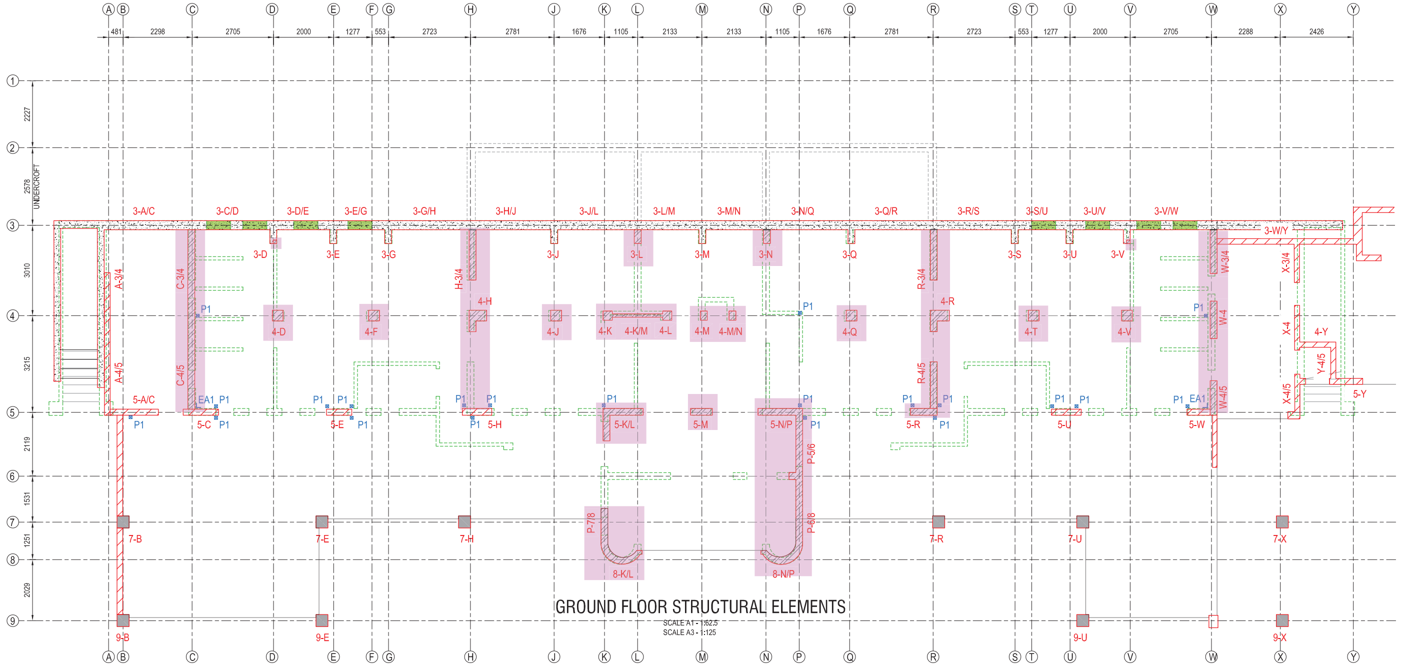
7.0 LIMITATIONS

The opinions, conclusions and any recommendations in this report are based on information from, and testing undertaken at or in connection with, specific sample points. Site conditions in other parts of the site may be different to those found at the specific sample points.

The opinions, conclusions and recommendations in this report are based on the assumptions made by Covey Associates and ACOR described in this report. Covey Associates and ACOR disclaim any liability arising from any of these assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on the conditions encountered and information reviewed at the date of preparation of the report. Covey Associates and ACOR have no responsibility or obligation to update this report to account for events or changes subsequent to the date the report was prepared.

APPENDIX A
COLUMNS AND WALLS



GROUND FLOOR STRUCTURAL ELEMENTS

SCALE A1 - 1:62.5
SCALE A3 - 1:125

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
3-AC	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-CD	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-DE	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-EG	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-GH	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-HJ	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-JL	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-LM	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-MN	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-NQ	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-QR	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-RS	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-SU	REAR WALL	IN-SITU CONCRETE	ORIGINAL
S-UV	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-VW	REAR WALL	IN-SITU CONCRETE	ORIGINAL
A-3/4	WALL	HALF CONCRETE/HALF BRICK	ORIGINAL /NEW
C-3/4	WALL	DOUBLE BRICK	ORIGINAL

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
3-D	BUTTRESS	CONCRETE WITH BRICK CORNER	ORIGINAL
3-E	BUTTRESS	CONCRETE	ORIGINAL
3-G	BUTTRESS	CONCRETE	ORIGINAL
H-3/4	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-J	BUTTRESS	CONCRETE	ORIGINAL
3-L	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-M	BUTTRESS	CONCRETE	ORIGINAL
3-N	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-Q	BUTTRESS	CONCRETE	ORIGINAL
R-3/4	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-S	BUTTRESS	CONCRETE	ORIGINAL
3-U	BUTTRESS	CONCRETE	ORIGINAL
3-V	BUTTRESS	CONCRETE	ORIGINAL
W-3/4	WALL	DOUBLE BRICK	ORIGINAL
4-D	PIER	BRICK	ORIGINAL
4-F	PIER	BRICK	ORIGINAL
4-H	ENGAGED PIER	DOUBLE BRICK	ORIGINAL

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
4-J	PIER	BRICK	ORIGINAL
4-K	PIER	BRICK	ORIGINAL
4-K/M	INFILL WALL	BRICK	ORIGINAL
4-L	PIER	BRICK	ORIGINAL
4-M	PIER	REMOVED	ORIGINAL
4-M/N	PIER	REMOVED	ORIGINAL
4-Q	PIER	BRICK	ORIGINAL
4-R	PIER	BRICK	ORIGINAL
4-T	PIER	BRICK	ORIGINAL
4-V	PIER	BRICK	ORIGINAL
4-W	WALL	DOUBLE BRICK	ORIGINAL
A-4/5	WALL	BLOCK	ORIGINAL
C-4/5	WALL	DOUBLE BRICK	ORIGINAL
R-4/5	WALL	DOUBLE BRICK	ORIGINAL
W-4/5	WALL	DOUBLE BRICK	ORIGINAL
5-A/C	WALL	BLOCK	2007
5-C	COLUMN	BLOCK	2007
5-E	COLUMN	BLOCK	2007
5-H	COLUMN	BLOCK	2007
5-K/L	WALL	DOUBLE BRICK	ORIGINAL

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
5-M	WALL	DOUBLE BRICK	ORIGINAL
5-N/P	WALL	DOUBLE BRICK	ORIGINAL
5-R	COLUMN	BLOCK	2007
5-U	COLUMN	BLOCK	2007
5-W	COLUMN	BLOCK	2007
P-5/6	WALL	DOUBLE BRICK	ORIGINAL
7-B	COLUMN	CONCRETE	2007
7-E	COLUMN	CONCRETE	2007
7-H	COLUMN	CONCRETE	2007
P-7/8	WALL	DOUBLE BRICK	ORIGINAL
P-6/8	WALL	DOUBLE BRICK	ORIGINAL
7-R	COLUMN	CONCRETE	2007
7-U	COLUMN	CONCRETE	2007
7-X	COLUMN	CONCRETE	2007
8-K/L	WALL / PIER	BRICK	ORIGINAL
8-N/P	WALL / PIER	BRICK	ORIGINAL
9-B	COLUMN	CONCRETE	2007
9-E	COLUMN	CONCRETE	2007

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
9-U	COLUMN	CONCRETE	2007
9-X	COLUMN	CONCRETE	2007
P1	100 SHS	STEEL	POST 2000
EA1	150x10 EA	STEEL	POST 2000
3-W/Y	WALL	BLOCK	2007
4-Y	WALL	BLOCK	2007
5-Y	WALL	BLOCK	2007
X-3/4	WALL	BLOCK	2007
X-4	WALL	BLOCK	2007
X-4/5	WALL	BLOCK	2007
Y-4/5	WALL	BLOCK	2007

LEGEND

ORIGINAL 1937 ARCHITECTURAL LAYOUT

CURRENT LAYOUT NOM. 100 mm +/-TOLERANCE

NOTE:
ALL DIMENSION ARE BASED OFF SCANNED PDF FROM 1937 ARCHITECTURAL SKETCHES, ROUGH SITE MEASURES. DIMENSIONS ARE APPROXIMATELY +/- 100mm
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Checked – RG
Design – CJT Drawn – MS
Scales – AS SHOWN
Document Stage – INFORMATION

Issue	Date	Description	By
E	21.11.22	LAYOUT AMENDED	SAG
D	01.11.22	ISSUED FOR INFORMATION	TW
C	24.08.22	ISSUED FOR INFORMATION	RG
B	20.07.22	ISSUED FOR INFORMATION	CJT
A	15.07.2022	ISSUED FOR INFORMATION	MS

COVEY ASSOCIATES PTY LTD
ABN 59 137 305 992
Consulting Civil & Structural Engineers Project Management & Planning
124 DUPORTH AVENUE Ph (07) 5443 7777
PO BOX 16 Fax (07) 5443 7577
MAROOCHYDORE QLD 4558
E-MAIL: engineers@covey.com.au

Approved

Drawing title – PAVILLION 1 GROUND FLOOR STRUCTURAL ELEMENTS

Project – SUTTONS BEACH PAVILIONS

Client – MORETON BAY REGIONAL COUNCIL

Site – SUTTONS BEACH, REDCLIFFE, QLD, 4020

Project No. 223164 Sheet No. SK101
Digital Ref : 223164_SK101 GROUND FLOOR STRUCTURE Issue : E

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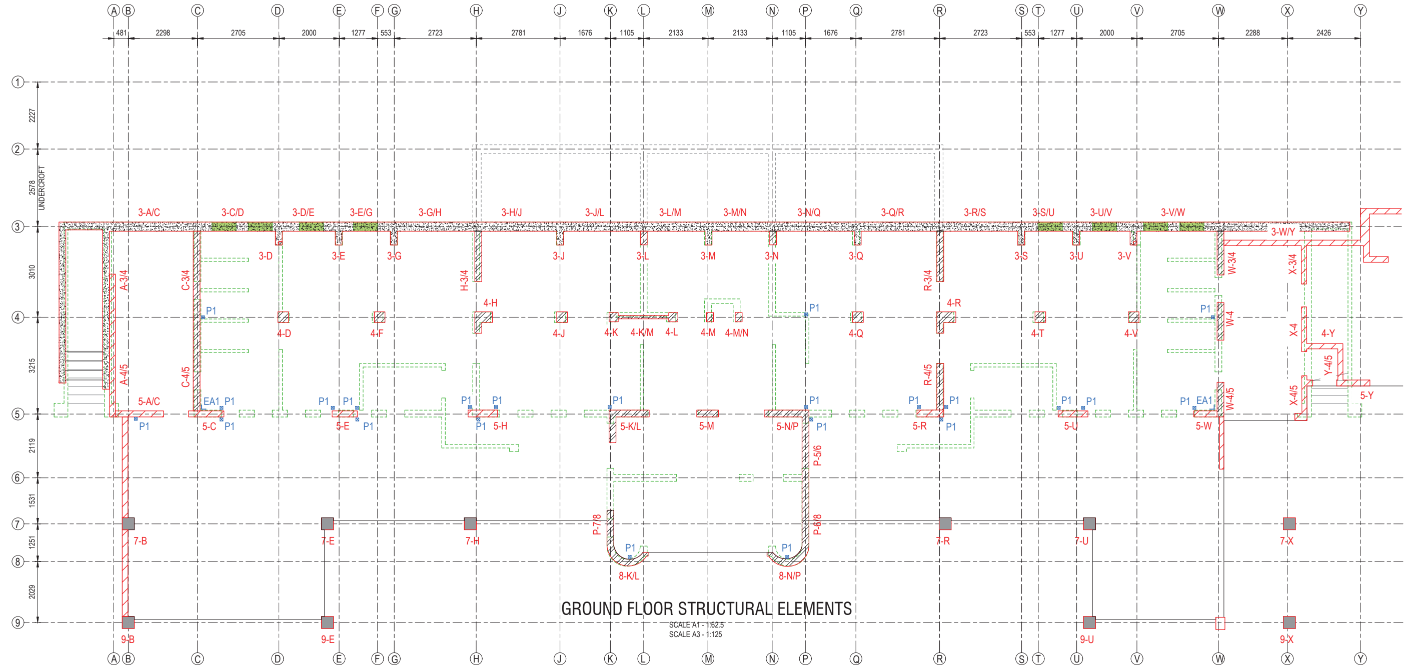
Plot 21 Nov, 2022 - 13:25

APPENDIX B
GROUND FLOOR STRUCTURAL ELEMENTS



GROUND FLOOR STRUCTURAL ELEMENTS

SCALE A1 - 1:62.5
SCALE A3 - 1:125

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
3-AC	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-CD	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-DE	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-EG	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-GH	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-HJ	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-JL	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-LM	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-MN	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-NQ	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-QR	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-RS	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-SU	REAR WALL	IN-SITU CONCRETE	ORIGINAL
S-UV	REAR WALL	IN-SITU CONCRETE	ORIGINAL
3-VW	REAR WALL	IN-SITU CONCRETE	ORIGINAL
A-3/4	WALL	HALF CONCRETE/HALF BRICK	ORIGINAL /NEW
C-3/4	WALL	DOUBLE BRICK	ORIGINAL

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3-G	BUTTRESS	CONCRETE	ORIGINAL
H-3/4	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-J	BUTTRESS	CONCRETE	ORIGINAL
3-L	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-M	BUTTRESS	CONCRETE	ORIGINAL
3-N	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-Q	BUTTRESS	CONCRETE	ORIGINAL
R-3/4	BUTTRESS WALL	DOUBLE BRICK	ORIGINAL
3-S	BUTTRESS	CONCRETE	ORIGINAL
3-U	BUTTRESS	CONCRETE	ORIGINAL
3-V	BUTTRESS	CONCRETE	ORIGINAL
W-3/4	WALL	DOUBLE BRICK	ORIGINAL
4-D	PIER	BRICK	ORIGINAL
4-F	PIER	BRICK	ORIGINAL
4-H	ENGAGED PIER	DOUBLE BRICK	ORIGINAL

STRUCTURAL ELEMENT - IDENTIFICATION

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4-K	PIER	BRICK	ORIGINAL
4-K/M	INFILL WALL	BRICK	ORIGINAL
4-L	PIER	BRICK	ORIGINAL
4-M	PIER	REMOVED	ORIGINAL
4-M/N	PIER	REMOVED	ORIGINAL
4-Q	PIER	BRICK	ORIGINAL
4-R	PIER	BRICK	ORIGINAL
4-T	PIER	BRICK	ORIGINAL
4-V	PIER	BRICK	ORIGINAL
4-W	WALL	DOUBLE BRICK	ORIGINAL
A-4/5	WALL	BLOCK	ORIGINAL
C-4/5	WALL	DOUBLE BRICK	ORIGINAL
R-4/5	WALL	DOUBLE BRICK	ORIGINAL
W-4/5	WALL	DOUBLE BRICK	ORIGINAL
5-A/C	WALL	BLOCK	2007
5-C	COLUMN	BLOCK	2007
5-E	COLUMN	BLOCK	2007
5-H	COLUMN	BLOCK	2007
5-K/L	WALL	DOUBLE BRICK	ORIGINAL

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
5-M	WALL	DOUBLE BRICK	ORIGINAL
5-N/P	WALL	DOUBLE BRICK	ORIGINAL
5-R	COLUMN	BLOCK	2007
5-U	COLUMN	BLOCK	2007
5-W	COLUMN	BLOCK	2007
P-5/6	WALL	DOUBLE BRICK	ORIGINAL
7-B	COLUMN	CONCRETE	2007
7-E	COLUMN	CONCRETE	2007
7-H	COLUMN	CONCRETE	2007
P-7/8	WALL	DOUBLE BRICK	ORIGINAL
P-6/8	WALL	DOUBLE BRICK	ORIGINAL
7-R	COLUMN	CONCRETE	2007
7-U	COLUMN	CONCRETE	2007
7-X	COLUMN	CONCRETE	2007
8-K/L	WALL / PIER	BRICK	ORIGINAL
8-N/P	WALL / PIER	BRICK	ORIGINAL
9-B	COLUMN	CONCRETE	2007
9-E	COLUMN	CONCRETE	2007

STRUCTURAL ELEMENT - IDENTIFICATION

ID	DESCRIPTION	MATERIAL	ORIGIN
9-U	COLUMN	CONCRETE	2007
9-X	COLUMN	CONCRETE	2007
P1	100 SHS	STEEL	POST 2000
EA1	150x10 EA	STEEL	POST 2000
3-W/Y	WALL	BLOCK	2007
4-Y	WALL	BLOCK	2007
5-Y	WALL	BLOCK	2007
X-3/4	WALL	BLOCK	2007
X-4	WALL	BLOCK	2007
X-4/5	WALL	BLOCK	2007
Y-4/5	WALL	BLOCK	2007

LEGEND

ORIGINAL 1937 ARCHITECTURAL LAYOUT

CURRENT LAYOUT NOM. 100 mm +/-TOLERANCE

NOTE:

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Checked – RG
Design – CJT Drawn – MS
Scales – AS SHOWN
Document Stage – INFORMATION

Issue	Date	Description	By
F	05.12.22	LAYOUT AMENDED	SAG
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COVEY ASSOCIATES PTY LTD
ABN 59 137 305 992
Consulting Civil & Structural Engineers Project Management & Planning
124 DUPORTH AVENUE
PO BOX 16
MAROOCHYDORE QLD 4558
Ph (07) 5443 7777
Fax (07) 5443 7577
E–MAIL: engineers@covey.com.au

Approved

Drawing title – PAVILLION 1 GROUND FLOOR STRUCTURAL ELEMENTS

Project – SUTTONS BEACH PAVILIONS

Client – MORETON BAY REGIONAL COUNCIL

Site – SUTTONS BEACH, REDCLIFFE, QLD, 4020

Project No. 223164 Sheet No. SK101
Digital Ref : 223164_SK101 GROUND FLOOR STRUCTURE Issue : F

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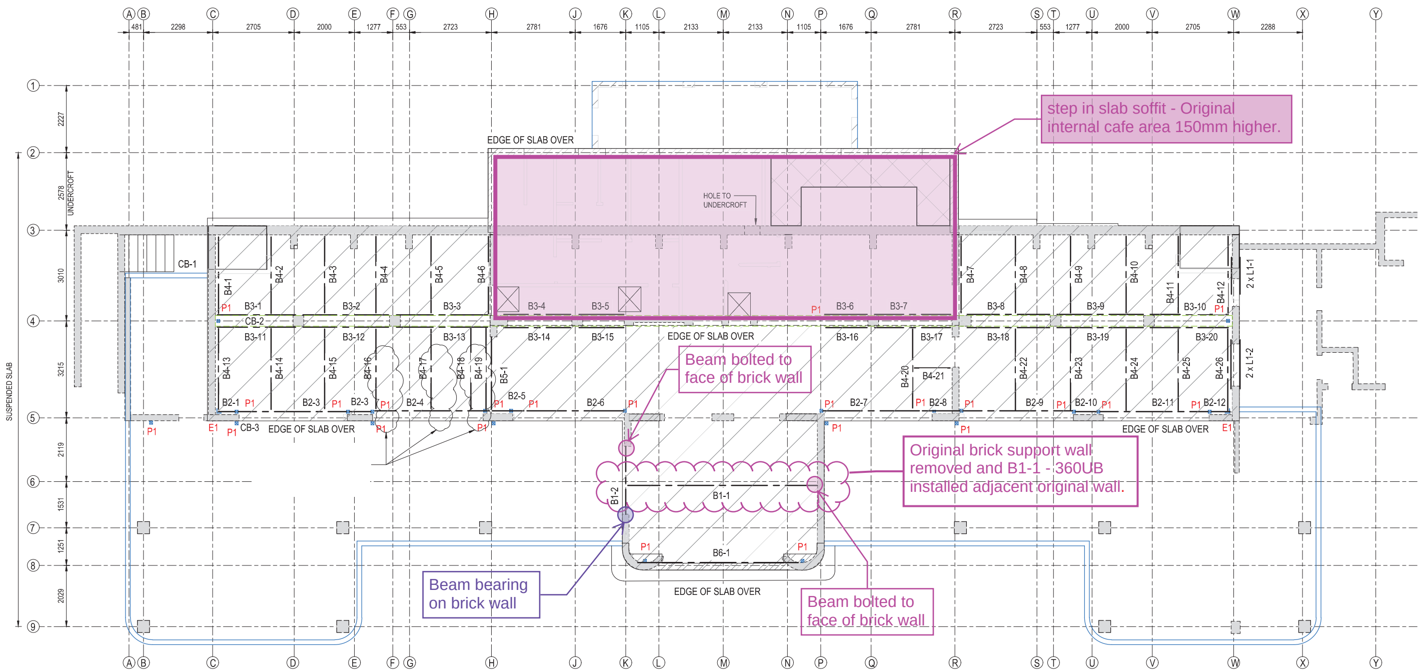
Plot 07 Dec, 2022 - 08:29

APPENDIX C

BEAMS NOTES AND UPSTAIRS INTERNAL SLAB AREA STEPPED



UPPER FLOOR - SLAB FRAMING PLAN

SCALE A1 - 1:62.5
SCALE A3 - 1:125

STRUCTURAL ELEMENT - IDENTIFICATION			
ID	DESCRIPTION	MATERIAL	ORIGIN
P1	100 SHS	STEEL	POST 2000
EA1	150x10 EA	STEEL	POST 2000
B1	360UB 50.7	STEEL	POST 2000
B2	250PFC	STEEL	POST 2000
B3	200 PFC	STEEL	POST 2000
B4	180 PFC	STEEL	POST 2000
B5	150PFC	STEEL	POST 2000
B6	310 UB 46	STEEL	POST 2000
L1	100EA x 6	STEEL	POST 2000
CB-1	GRID A - C	CONCRETE	ORIGINAL
CB-2	GRID C - W	CONCRETE	ORIGINAL
CB-3	GRID C - W	CONCRETE	

NOTE:

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FOR MORE ACCURATE PLANS SEE DRAWINGS PRODUCED BY 3D CLOUD POINT (BY OTHERS).

LEGEND

- CURRENT LAYOUT NOM. ±100 mm TOLERANCE
- ORIGINAL BEAMS SUPPORTING SLAB
- STEEL BEAMS SUPPORTING SLAB
- UNDERCROFT WALLS
- CURRENT LOWER SUPPORTING WALLS / COL.

- HATCHED AREA INDICATES TOPPING SLAB OVER ORIGINAL SLAB
- 100mm HIGH CONCRETE PLINTH OVER ORIGINAL SLAB
- NEW CONCRETE SLAB OUTLINE

Check all dimensions before commencement of work. Check Site boundary dimensions from the Title plans Check Building Boundary clearances by set out. Notwithstanding the information supplied on this drawing, the location, depth and extent of underground or overhead services are to be confirmed and protected on site by the contractor prior to commencement of works.

Checked – RG
Design – CJT Drawn – MS
Scales – AS SHOWN
Document Stage – INFORMATION

Issue	Date	Description	By
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A	15.07.2022	ISSUED FOR INFORMATION	MS

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Ph (07) 5443 7777
Fax (07) 5443 7577
E-MAIL: engineers@covey.com.au

Approved

Drawing title – PAVILLION 1 UPPER FLOOR FRAMING STRUCTURE

Project – SUTTONS BEACH PAVILIONS

Client – MORETON BAY REGIONAL COUNCIL

Site – SUTTONS BEACH, REDCLIFFE, QLD, 4021

Project No. 223164 Sheet No. SK102
Digital Ref : 223164_SK102 FLOOR FRAMING STRUCTURE Issue : G

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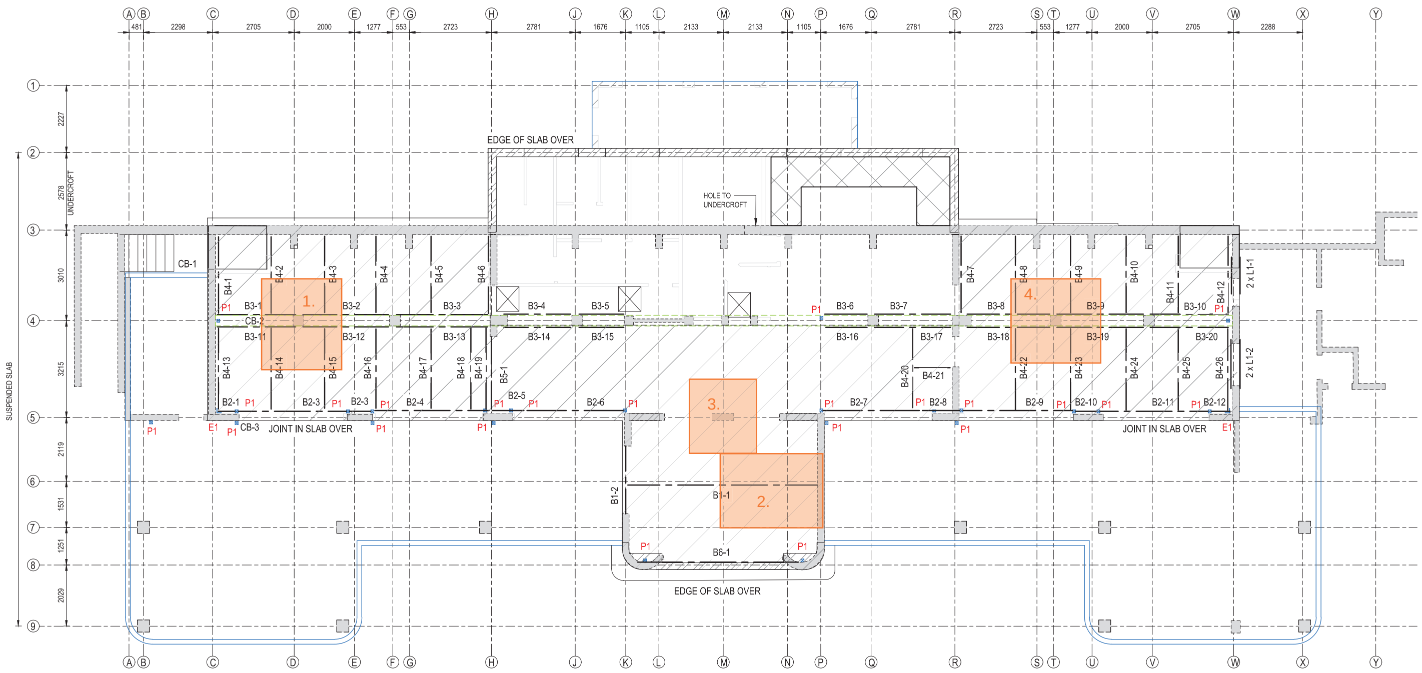
Plot 07 Dec, 2022 - 08:33

APPENDIX D
AREAS FOR GROUND FLOOR COLUMNS



2. DENOTES TRIBUTORY AREA

UPPER FLOOR - SLAB FRAMING PLAN

SCALE A1 - 1:62.5
SCALE A3 - 1:125

STRUCTURAL ELEMENT - IDENTIFICATION			
ID	DESCRIPTION	MATERIAL	ORIGIN
P1	100 SHS	STEEL	POST 2000
EA1	150x10 EA	STEEL	POST 2000
B1	360UB 50.7	STEEL	POST 2000
B2	250PFC	STEEL	POST 2000
B3	200 PFC	STEEL	POST 2000
B4	180 PFC	STEEL	POST 2000
B5	150PFC	STEEL	POST 2000
B6	310 UB 46	STEEL	POST 2000
L1	100EA x 6	STEEL	POST 2000
CB-1	GRID A - C	CONCRETE	ORIGINAL
CB-2	GRID C - W	CONCRETE	ORIGINAL
CB-3	GRID C - W	CONCRETE	

NOTE:

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LEGEND

- CURRENT LAYOUT NOM. ±100 mm TOLERANCE
- ORIGINAL BEAMS SUPPORTING SLAB
- STEEL BEAMS SUPPORTING SLAB
- UNDERCROFT WALLS
- CURRENT LOWER SUPPORTING WALLS / COL.

- HATCHED AREA INDICATES TOPPING SLAB OVER ORIGINAL SLAB
- 100mm HIGH CONCRETE PLINTH OVER ORIGINAL SLAB
- NEW CONCRETE SLAB OUTLINE

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Scales – AS SHOWN
Document Stage – INFORMATION

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B	20.07.22	ISSUED FOR INFORMATION	CJT
A	15.07.2022	ISSUED FOR INFORMATION	MS

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ABN 59 137 305 992
Consulting Civil & Structural Engineers Project Management & Planning
Approved
124 DUPORTH AVENUE
PO BOX 16
MAROOCHYDORE QLD 4558
E-MAIL: engineers@covey.com.au
Ph (07) 5443 7777
Fax (07) 5443 7577

Drawing title – PAVILLION 1 UPPER FLOOR FRAMING STRUCTURE

Project – SUTTONS BEACH PAVILIONS

Client – MORETON BAY REGIONAL COUNCIL

Site – SUTTONS BEACH, REDCLIFFE, QLD, 4021

Project No. 223164 Sheet No. SK102
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APPENDIX O
JOINT REPORT – UPPER FLOOR BRICKWORK

COVEY
ASSOCIATES PTY LTD
Consulting Engineers

JOINT REPORT
UPPER LEVEL BRICKWORK

AT

PAVILION 1, 50 MARINE PARADE, REDCLIFFE

BY

ACOR AND COVEY

FOR

MORETON BAY REGIONAL COUNCIL

PROJECT NO: 223164
REF: RG/RG/37303RPT – ISSUE A
22 DECEMBER 2022

DOCUMENT ISSUE APPROVAL

Project No:	223164
Title:	Upper Level Brickwork
Client:	Moreton Bay Regional Council
Date:	December 2022
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CONTENTS

1.0 INTRODUCTION

Component description:

There were originally a number of brick columns and brick walls on the upper floor as well as a brick parapet on the original central terrace. There have been numerous renovations in which some of these walls, parapets and columns were cut, shortened, or demolished entirely.

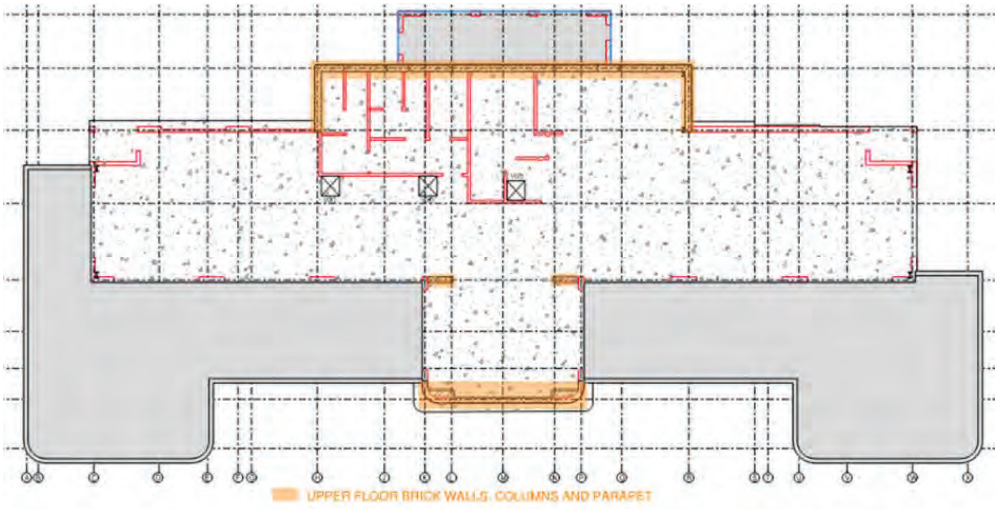

Figure 1: Upper floor brick walls, columns and parapet/dwarf wall

Component reference:

- 2 Brick columns Numerous references U-5-L and U-5-N.
- Original brick parapet references U-8-L, U-8-K/L, U-8-L/N, U-8-N/P AND U-8-N.
- Original double skin brick walls cut off – references U-C-2/3 and U-R-2/3.
- Original double skin brick walls and concrete lintel beams with newer brick infills in openings and cut outs references U-2-H/J, U-2-J.L, U-2-L/M, U-2-M/Q and U-2-Q/R.

See plan SK03 in Appendix. Wall or beam component reference, material and likely origin.

Construction:

- Brick walls and parapets built on suspended concrete slab. There may have been concrete or timber lintel beams above openings and between columns to support the roof structure. This is unknown as many of the upper floor original brick walls and columns have been removed.
- Brick walls are double skin with regular brick ties.
- Originally there were openings in the rear brick wall which have been infilled with more modern bricks and even concrete blocks.
- Originally the brick walls supported a pitched roof thus some tiedown would have been expected to exist for the roof framing.

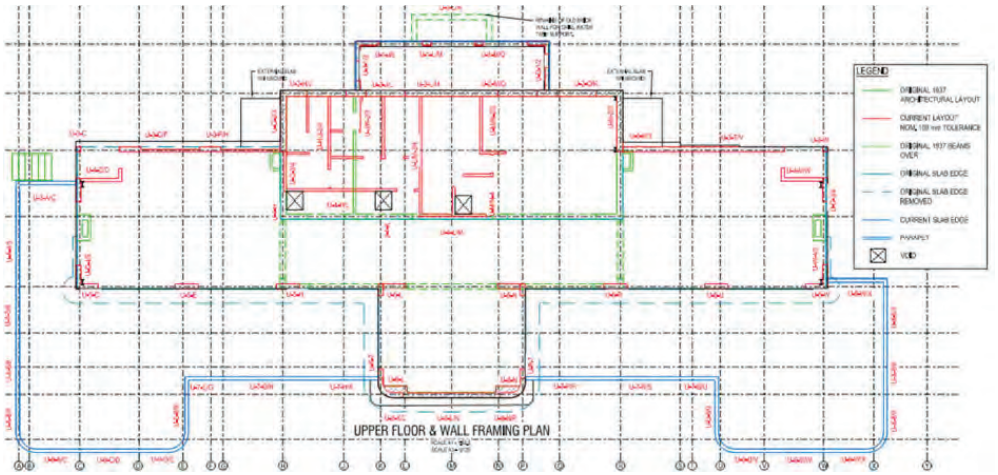

Figure 2: Plan Showing Original Brick walls remaining with black brick hatch and original brick walls removed in green. For clarity see SK03 in Appendix.

Structural Components and details:

- The height of the brick walls on grids 2 to 3 was not high enough so it appears that newer bricks were grout on top to increase the wall height.
- Brick columns (only 2 remaining) are approximately 230mm wide by 930mm long.
- There is a steel portal frame adjacent one of the original brick walls to take bracing loads. Connection to this frame is unknown.

Reinforcement:

- Scans by others revealed no reinforcement in the brick columns or brick walls.
- Scans by others revealed the tiedown rods in the brick parapet walls at U-8-L, U-8-L/N and U-8-N extend between 300 and 450 into the actual bricks. See observations.

Structural design parameters:

- N5 wind rating
- Mortar strength 14 +/-7MPa as per BG&E Condition Assessment report in Appendix
- Adequacy of brick ties to be ignored as per the abovementioned report
- Steel portal bracing capacity is based on 12-13mm deflection of eave under service wind.

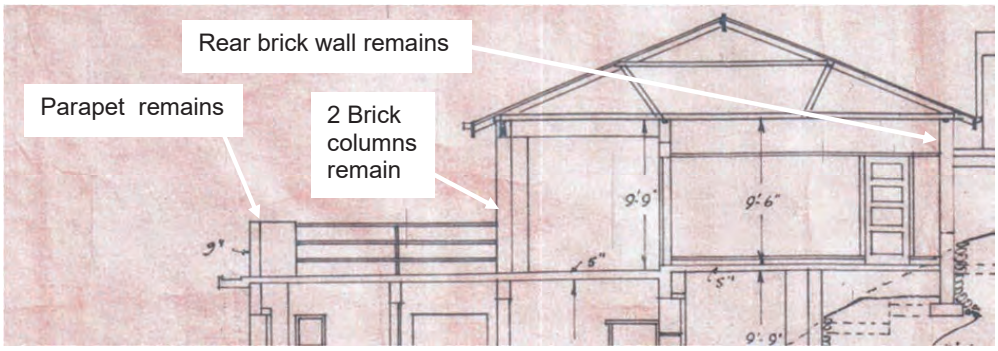

Figure 3: Excerpt from Original blue prints showing section through building.

History:

The history in terms of exposure and demolition is important when assessing the integrity of the structure from strength, serviceability and durability perspectives.

Photo1: from 1937 shows most of the upper floor brick walls and columns were originally rendered and some were not. Original parapet at front terrace was also rendered. Note many upper floor columns and walls have been removed.

Photo 2: Photo of building fully rendered and enclosed in 1975 – photo here from 1991. Original rendered parapet at front terrace still exposed.

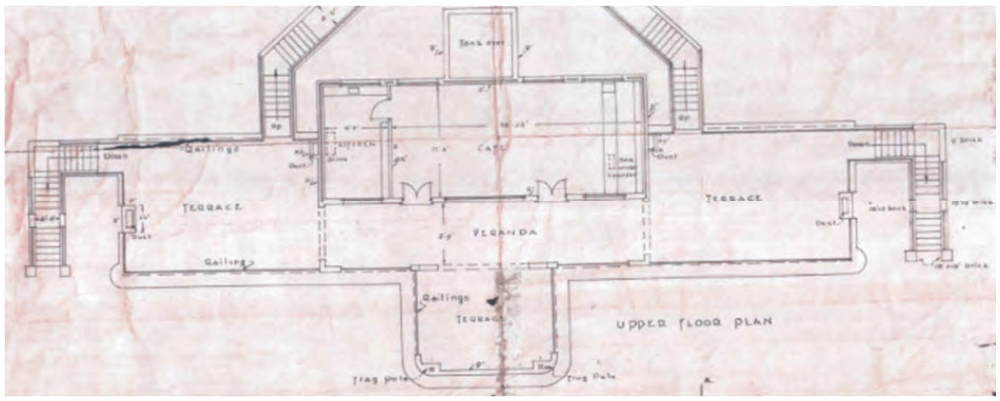

Figure 4: Scan of original blueprints showing upper floor use.

2.0 OBSERVATIONS

Detailed observations, comments with supporting photos taken internally and externally section by section of wall.

2.1 Original rendered dwarf wall

This wall is sometimes referred to as the original parapet.

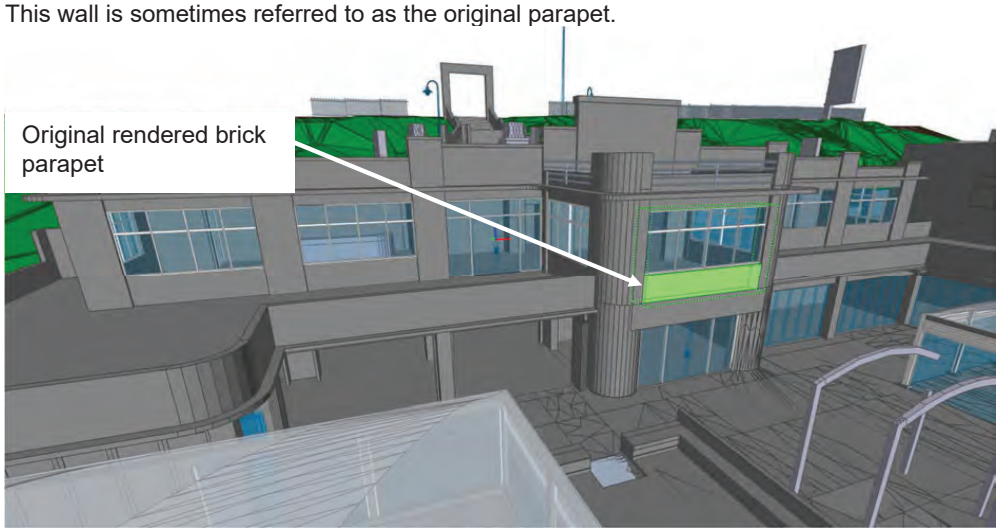

Figure 5: of brick parapet highlighted green, although it does extend to the curved section of the front wall either side.

Photo 3: Parapet enclosed prior to strip out – note the water damage and watermarks along the bottom third of the parapet.

Photo 4: Note mould on removed cladding, grey lining bubbled with water damage.

Photo 5: rendered brick parapet with tiles glued on – note water on floor indicates water ingress at front windows/roof. Timber studs and framing above parapet had termite and water damage. Note bottom plate tiedown rod underneath window framing extends approximately 430mm into bricks. Tiedown rod is drilled directly into the inner skin brick. It is not in the cavity and it does not appear to be anchored in the suspended slab.

Photo 6: At U-8-N

Photo 7: Depth of tiedown rod approx. 440mm

Photo 8: At U-8-L

Photo 9: Depth of tiedown rod approx. 300mm

Note: The tiedown rod is drilled directly into the inner skin brick. It is not in the cavity.

Photo 10: Note termite and water damage to timber frame.

Photo 11: Rotten timber base plate removed. Note cracks in brick render.

Photo 12: Hold down washer rusted.

Photo 13: Termite and water damage to timber frame above brick parapet.

Photo 14: More water ingress and termite damage – Note rusted washer and cracking render.

2.2 Remaining Original Brick Columns

There are only two remaining original brick columns on the upper floor at U-5-L and U-5-N.

Photo 15: Original brick columns with Original tiles

Photo 16:Other side of column during strip out.

at top before strip out at U-8-L. Note mould at roof level.


Photo 17: Top of Col. U-5-L Water ingress at box gutter
Photo 18: Top of Col. U-5-N Water ingress at box gutter


Photo 19: Original rendered brick column at U-5-N Note leak at ceiling.
Photo 20: Bottom of U-5-N. Water ingress from box gutter above.

Photo 21: Edge of column where exposed bricks are. Note render removed and some bricks cut back.

The render on these bricks appears to be in good condition even though the roof leaks and they have been exposed to water ingress.

The visible edge of the bricks on U-5-L also appear to be in good condition. No reinforcement was found in the scans.

2.3 Rear Brick Wall

This section of wall was originally the rear café wall. It had window openings that have since been filled in with more modern bricks and even patched with concrete blocks. The original concrete lintels are still noticeable beneath the render.

Photo 22: Section of wall at Grid 2:P-R Note the original bricks and lintel rendered with the openings filled with newer bricks. Outline of the concrete lintel is just visible beneath the render. See close ups below. Also note new bricks along top to increase the wall height. Behind these bricks is the original hardwood top plate with a double pine top plate over (strapped to the HWD). See photo at end of observations section.

Photo 23: Close up of above – Note diagonal crack through render and bricks on RHS.

Photo 24: Wall at 2:N-Q. Diagonal cracks through render and bricks at the edge of the concrete lintel.

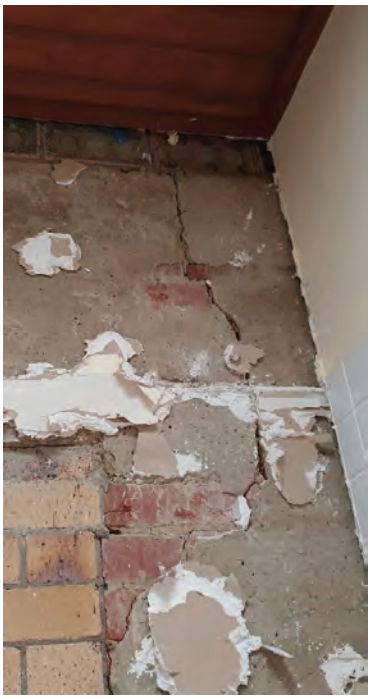

Photo 25: Wall at 2:L
Photo 26: Close up of crack through render and brick at edge of concrete lintel.

Photo 27: Brick walls in other toilets at grid 2:J-K

Photo 28: Cracks around the edge of the concrete lintel again at U-2-J end cubicle.

Photo 29: Brick walls in toilets on grid 2:H-J Note original walls still have original render. The opening is infilled with newer bricks.

2.4 External views of rear wall

Photo 30: Outside wall U-2-H/J Note concrete spoon drain against wall covered in dirt and debris. Other side of wall along Grid 2 is inside the Plant room. But the infill appears to be block.

Photo 31: U-2-Q/N

Photo 32: U-2-L/J

Tiedown along grid 2 is unknown – removal of a top brick exposed the original hardwood top plate with a double pine top plate over (strapped to the HWD). But no tiedown of the original HWD plate could be seen.

Photo 33: Approx location Grid 2:N removed brick shows top plates.
Note double 90x35 strapped to original HWD top plate.

2.5 Perpendicular walls

There are two remaining brick walls that are perpendicular to the rear retaining wall along grids H and R. The one on Grid R has a steel portal frame against it.

Photo 34:Top of wall U-C-3/4 taken from inside the amenities. Note original double skin brick wall cut. Also new brick infill above original rendered bricks.

Photo 35: Outside wall U-R-2/3 Note the smaller portal frame is on the inside of this wall. Also note the horizontal crack along the top of the wall and lighter cracks in the vertical tile section.

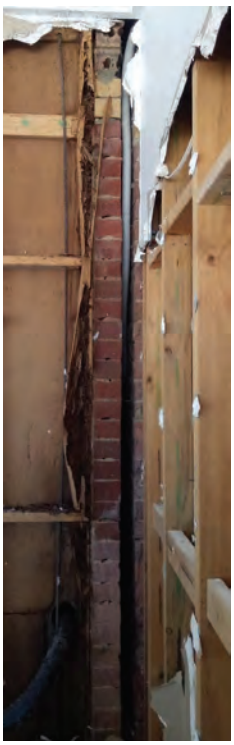


Photo 36: End view of Wall U-C-3/4
Photo 37: View of cut end of brick wall U-R-3/4. Note rusted brick tie and steel portal frame adjacent wall.


Photo 38 / 39: Close up of above view of the above cut wall edge half way and at top. Note discolouration and water stains on bricks and render and initial stages of decay. Also note cracks and gaps.

3.0 Summary of issues:

1. **Water ingress:**
   Damages timber frame and leads to decay of exposed bricks, render and grout over time.
2. **Sections of brick walls cut and removed:**
   This reduces the lateral support for the remaining brick walls.
3. **Cracking through bricks:**
   Including diagonal cracks in bricks at concrete lintel.
4. **Tiedown rods in brick parapet:**
   Tiedown rods do not extend to the slab, they are drilled into the brickwork and stop short of the concrete slab. Thus tiedown is reliant on the weight of the bricks.
5. **Entrapped moisture:**
   Trapped moisture has led to degradation of some brick surfaces and affected the mortar in a few areas. Generally the bricks appear in good condition though.
6. **Brick ties no longer fit for purpose:**
   Brick ties are rusted and discounted by BG&E – hence the external brick skin is not tied back and supported.
7. **Other issues are mentioned in the BG & E testing report.**
8. **Upper floor does not have enough bracing capacity:**
   In both directions.
9. **Tiedown to brick wall along grid 2 unknown:**
   The 2 top plates are strapped to the HWD top plate but the tiedown of the hardwood top plate is unknown.
10. **Brick wall at Portal frame:**
    Brittle materials should not be connected to a sway frame. The bricks will crack when portal is under load. This may not be obvious as there is no evident load path via roof bracing etc to transfer wind or earthquake loads to portal frame.

4.0 STRUCTURAL ASSESSMENT AND REMEDIAL

Structural assessment of the remaining original upper floor brick components.

The structure, condition and amenity of the Pavilion is addressed by others (within this report).

This (ACOR) section addresses structural issues with the existing brickwork on both lower and upper levels and provides comment on fixings and bracing capacity.

4.1 General background

The building is a two (2) storey structure. There are masonry walls on both levels.

At the ground level, the masonry walls:

- Support the concrete, masonry, and timber framed structure above, and
- Contribute to the lateral stability of the building.

At the upper level, the masonry walls:

- Support the roof structure above, and
- Contribute to the lateral stability of the building.

Photo 40 – Typical masonry wall - ground level

Photo 41 – Typical masonry wall - upper level

4.2 Assessment assumptions

Bricks

The original bricks are "dry pressed" (ie; solid), with the following dimensions
– 230mm long x 110mm wide x 76mm high

These were standard dimensions for bricks at the time of construction and (with some exceptions) remain standard currently.

Such bricks typically have a compressive strength capacity of (approximately) 15 – 17 MPa.
The wall heights are:

- Lower level – 9'9' ~ 3.0 metres
- Upper level – 9'6' ~ 2.9 metres

Regarding the masonry compressive strength, we note from BG& E engineering, Condition assessment report results, Aug 2022, section 8, that;

Table 18 – Brickwork estimated in-situ strength

Brickwork	Estimated in-situ Strength (MPa)
Columns	12 ± 7
Walls	14 ± 7

In qualifying these results reports also says,

A relatively high degree of variation in the estimated mortar strength has been identified and is consistent with the expectations of hand mixed mortar.

We acknowledge the wide range of these values. Our assessment has adopted these (table 18) values and applied the modification factors required of the Code (AS 3700) to assess the in-situ capacity of the brickwork, at the locations as noted. In the areas where the design loads have proved critical, we have taken a conservative approach and adopted the lower in-situ strength values.

Wind Loads – on consultation with Covey Consulting Engineers, and after discussion of the merits of the available sources for wind assessment, the two primary sources for estimating wind loads are contained within AS4055, "Wind Loads for Houses" and AS 1170.2 "Wind Loads".
We note that the Covey Consultants assessment for lateral wind loads has used AS4055, specifically, N5 category.

The following report addresses the specific areas identified in our site inspections of 28 July 2022 and 25 August 2022 as requiring review. Specific items are as referenced on the following figures 1 and 2

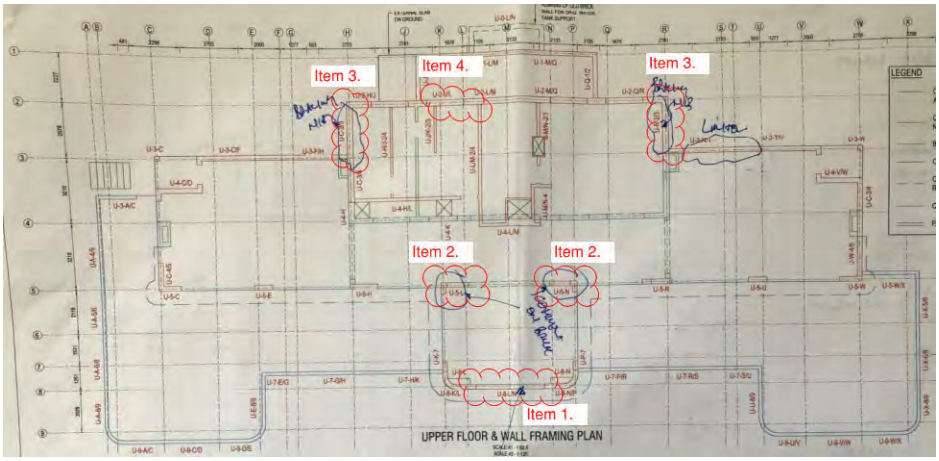

Figure 1 – site notes and references – upper-level brickwork

4.3 Item 1 – Dwarf Wall

Comment on capacity of dwarf wall to accommodate a handrail/crowd loading.

Design assumptions
The wall is double leaf brickwork and is approximately 1.0m high.

AS1170.1, table 3.3, clause C5, "Areas susceptible to overcrowding" – design load is 3.0 kN/m. Further, at N5 wind classification, the wind loads mimic those required for crowd loading.

We consider this loading necessary as it is highly likely that such a load will be encountered.

Photo 42: Dwarf wall, south end

Photo 43: Dwarf wall, north end

Our review suggests that it its current configuration, the dwarf wall is not adequate to accommodate these loads.

By simple statics, the wall would need to be self-supporting under self-weight to comply. If there is a cavity, it will not work.

Further, the anchorage of the rods within the concrete would need to be sufficient to develop the capacity of the rod.

The current wall is not constructed in this manner.

In a remedial sense, without largely demolishing the brickwork, it would not be possible to successfully retrofit the use of a sill beam.

We suggest that if the area is going to be used for congregation, and if the dwarf wall is required as a crowd barrier, then a separate steel structure be constructed inside the existing dwarf wall.

The structure should be appropriately designed to both accommodate the anticipated loads and support the dwarf wall.

4.4 Item 2 – Rendered Brick Columns

Comment on capacity of masonry walls to support roof loads.

Condition - Brick work remains in serviceable condition.

Glue laminated beam supporting roof loads only.


Photo 44: Item 2 south end


Photo 45: Item 2 north end

Masonry assumptions
- Dimensions of wall elements 230 wide x 1300mm long x 2900mm high
- Nature of construction – double brick
- Mortar strength – 14 MPa +/- 7

Area of roof supported (per element) – 31 square metres

Approximate ultimate dead and live (gravity) load combination force ~ 30 kN

Approximate ultimate uplift force ~ 102 kN (at design category N5, as per AS4055 “Wind Loads for Houses”)

Summary of wall capacities for Item 2

- Gravity Loads – (assuming grout min. strength: 14 – 7 = 7 MPa), the wall is compliant.

- For the wind load case, the quantity of masonry (contained within this wall) does not provide sufficient dead load to resist the ultimate wind uplift forces.

Therefore, the roof beam needs to be connected to the floor, independently of the brick wall, in order to effect an appropriate level of tie down. This may take the form of a steel column, steel rods (of appropriate size) or steel plate. If we accept N5 as the appropriate wind category, these members would need to be (approximately):

- Rods – M24
- Plate - 10mm thick x 50mm wide
- Column ~ 75 x 4 SHS

The connection with the floor (RC slab) needs to be appropriately designed to transfer the design forces from the roof beam to the structure below.

4.5 Item 3 – Brick Walls as Bracing Elements

Comment on capacity of masonry walls to act as bracing elements.

Condition - Brick work remains in serviceable condition.

Noted – a UB structural steel portal frame has been incorporated into the timber framing, immediately adjacent to these two (2) walls.

Photo 46 – portal framed bracing wall

We note from Covey Engineers calculations that this bracing element is required to resist a wind lateral load of approximately 30 kN.

Masonry assumptions

- Dimensions of wall elements 4200mm long x 2900mm high.
- Nature of construction – double brick.
- Mortar strength – 14 MPa +/- 7.

Typically, an unreinforced 110mm masonry leaf, not exceeding 3.0 metres in height, will provide approximately 10 kN of bracing resistance.
Given that there are two (2) leaves (ie; double brick), this wall can be relied on the provide a maximum of 20 kN bracing resistance.

This is less than the 30 kN capacity required.

As a bracing element, the portal frame is not rigid. It will deflect (laterally) under wind loads. The brick wall, being rigid, cannot tolerate such movement.

Therefore, while the steel portal maybe be adequate as a bracing element on its own merits, being immediately adjacent to this brick wall, it is not appropriate in this location.

We recommend that the portal frame is augmented with cross braces (either threaded rod or steel plates) of appropriate size, to limit the lateral deflection under wind loads.

4.6 Item 4 – Brick Walls Supporting Roof Loads

Comment on capacity of masonry walls to support roof loads.

Condition - Brick work remains in serviceable condition.

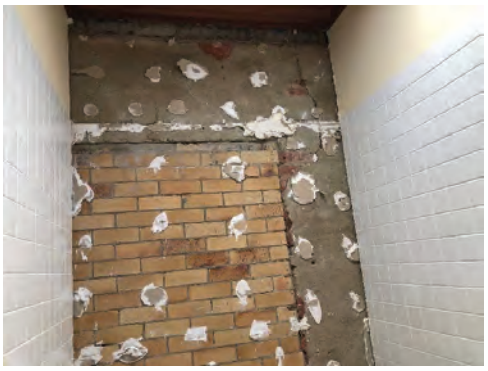
Photo 47: Item 4 – back wall


Photo 48: back wall at former lintel support

Masonry assumptions
- Dimensions of wall elements – 13.0m long x 2.9m high
- Nature of construction – double brick
- Mortar strength – 14 MPa +/- 7

Roof load width supported by wall – 6.0 metres

Approximate ultimate dead and live (gravity) load combination force ~ 5.85 kN/m

Approximate ultimate uplift force ~ 13.2 kN/m
(at design wind speed as per AS1170.2 “Wind Loads”)

Summary of wall capacities for Item 4

- Gravity Loads – (assuming grout min. strength: 14 – 7 = 7 MPa), the wall is compliant.

- Both photos 8 & 9 show that part of the wall was formerly an opening, and that part of the wall has now been infilled with brickwork. Regarding vertical support, this is adequate. Regarding resistance to uplift, our inspection suggests that there is no mechanical connection between the old and new brickwork. Therefore, the new brick panel is not contributing to the hold down of the roof.

We estimate that the former brick lintel is approximately 700mm deep. Therefore, there is insufficient brickwork to resist the wind uplift forces generated on the roof structure.

Given that the roof cladding consists of corrugated light weight material, and the wind classification is (approximately) N5, we estimate that the entire depth of the wall (ie; 2.9 m) would need to be engaged to provide the required resistance to uplift.

Therefore, additional structural members are required to restrain the roof structure in uplift.

As with item 2, these members may be steel columns, steel rods (of appropriate size) or steel plate.

Further, the connection with the floor (RC slab) needs to be appropriately designed to transfer the design forces from the roof beam to the structure below. Such connection would comprise steel plate and masonry anchors of appropriate capacity.

In addition, refer to photo 9, we note that the brickwork abutment that used to support the lintel is noticeably cracked. Crack width is up to 4 – 5mm. Such cracking (in this location) is typically due to shear failure.

As mentioned, while the former opening is infilled with new brickwork, vertical support is not a problem. However, we recommend that:

- The crack is filled with an appropriate product (such as Sikaflex Pro, or a normal sand/cement mix), that will allow for movement within the brickwork, as would usually be expected during normal serviceability conditions.
- That the crack (and any similar) is monitored regularly (say every six months. This report can be used as a benchmark. Any change should be reported to the structural engineer in the first instance.

5.0 CONCLUSIONS

From a structural perspective:

Compression - In general terms, even when the lower values for the mortar are used, in terms of vertical (compressive) ability, in all areas assessed, the existing brickwork was compliant.

Uplift – given that the building is located on Moreton Bay, and is, by definition, in a high wind area, we found that in most cases the tie down of the roof frame, and the ability of the brickwork to accommodate that tie down, was inadequate.

Support conditions - Without exception, the supported roof members did not place any undue eccentric loads on the wall (ie; there is no “face” fixing).

6.0 LIMITATIONS

The opinions, conclusions and any recommendations in this report are based on information from, and testing undertaken at or in connection with, specific sample points. Site conditions in other parts of the site may be different to those found at the specific sample points.

The opinions, conclusions and recommendations in this report are based on the assumptions made by Covey Associates and ACOR described in this report. Covey Associates and ACOR Consultants disclaim any liability arising from any of these assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on the conditions encountered and information reviewed at the date of preparation of the report. Covey Associates and ACOR Consultants have no responsibility or obligation to update this report to account for events or changes subsequent to the date the report was prepared.