TWEED SHIRE COUNCIL

Queen Street Toilet Block
Structural Assessment

March 2011

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QUEEN STREET TOILET STRUCTURAL REPORT

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Report Date: 17th March 2011

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1 INTRODUCTION

1.1 SCOPE

Recreation services engaged a Structural Engineer from Councils Engineering Design Unit to visit the Queen Street Toilet Block, in Murwillumbah and record existing damage to the structure and determine the buildings overall structural adequacy. A review of any available plans will be conducted as an aid to determining the buildings possible continued safe performance.

1.2 SITE

The site is located at the junction of two streets, Alice Street and Queen Street. The building site is contained within the road reserve and only has footpath on the eastern side bordering Queen Street. Asphalt is placed against the western wall along Alice Street.

2.0 STRUCTURE REVIEW

2.1 EXISTING STRUCTURE

The structure consists of in-situ concrete, footings, floors and roof slab with clay brick cavity walls. A search for the original plans has yet to yield any documentation. Locals recall a concrete batching plant that was located at the western end of main street (at this time) and concrete was readily available locally. The concrete was delivered by tipping truck, which would tip the concrete on the road (above the building) and construction staff would wheelbarrow the concrete up a timber ramp onto the roof slab.

The existing structure was site measured with plan and elevations drawn to assist in recording crack positions and other possible future alterations of the existing construction. The structure was built in the mid to late 1950's with best estimate being 1956. The existing retaining walls on the southern and eastern sides prevents investigation / determined below floor slab level, with the exception, that two vents (brick cavities) are visible below the slab level. The thickness of walls and positions of wall vents inside adjacent to the roof suggest cavity wall construction continued above the split level floor slab as well.

2.2 STRUCTURAL DAMAGE

2.21 North West Corner

The north-west section of the parapet wall above the roof slab has a fig tree with roots traversing along the damp-proof course (Figure 1). The roots are wedging the brick courses apart, thus rotating the parapet eastward. Some minor cracking of the parapet concrete capping is present and given its shape (length to width), the movement could be attributed to daily temperature variations.

The western cavity brick wall contains an approximately 45 degree inclined movement crack (Figure 2). The crack commences at roof slab support level and is angled down and to the right (south). The western brick wall is adjoining road asphalt at its base and is engaged at the top to the roof slab positioned over the inner leaf masonry. The dark coloured roof slab would expand each day under the influence of the sun and air temperature. There is a fine inclined crack on the northern wall at this corner (Figure 3). Two possible scenarios, which could be attributed to the damage are possible. First is the N-W corner is dropping due to settlement (proximity of buried pipeline) or secondly the brickwork at the corner is moving with the slab and not allowing the roof slab to slip freely. A look at the grouted gutter over (Figure 4) suggests the gutter is grouted to and adhering to the brick parapet. A new water-main and hydrant is positioned midway along the north wall, which may be causing some local sinking at this N-W corner, however it is more likely the temperature movement of the roof is causing these inclined cracks.

2.22 South East Corner

The South East corner has a fine movement crack where the top of the southern curved retaining wall butts mid-height to the eastern masonry wall of the building (Figure 5).

Two cracks are visible at this junction. Firstly a splitting of the lower bricks 300mm along the southern wall from the corner. Retained fill earth pressures are pushing the eastern wall outwards at the junction (Figure 6). Secondly the inclined crack, commencing behind the downpipe and inclined down to the right (north) is accordingly the result of earth pressures at this retaining wall junction.

2.23 Roof Slab

The roof slab is in reasonable condition given it is more than half a century old (Figure 7). Some flexural cracking has occurred on the upper surface cantilevered over the northern wall. Other shrinkage and temperature cracking occurs over the central support wall between the male and female toilets. Water damaged soffits above the eastern wall are positioned directly below roof slab cracking (Figure 8). A roof pressure clean and coating with flexible membrane is recommended. The painting of the ceilings and soffit with permeable paint should reduce overall moisture within the slab. The proximity of overhanging trees has caused a build up of leaf debris within the gutters and water ponds on the roof (Figure 9). Pruning and removal of trees close to the building would mitigate this impact.

2.24 Retro-fitted Floor Topping Slab

There is evidence to suggest the different slab heights between the ladies and gents was varied originally during construction to better match adjacent ground levels on Alice street. One of the original drainers working on the job confirmed the different slab heights required the re-laying of earthenware pipes three times. The position and heights of slab step-downs at the doorways suggests a topping slab and additional tiles may have been added. The topping slab and added tiles appears to be added for aesthetic reasons only and no structural floor slab defects are visible or noted.

2.25 Recent toilet closure

The toilet was recently closed to the public and maintenance staff fitted ply formboard sheets to the doorways. Significant damage to feature masonry doorway trims occurred from poorly positioned dyna-bolts, one of which expanded when tightened to split the brick (Figure 10). The maintenance staff should have used smaller sized (non-expanding) masonry screw anchors into the mortar beds leaving a simple repair utilising matching coloured mortar. The damage is disastrous and some bolts remain protruding from brickwork doorways at present. A professional repair and possible brick replacement will be required if the building is given historic significance. Further assessment of the repair is needed given the buildings possible heritage value.

3.0 CONCLUSION

The building has footings at various levels to match the adjoining streets. The masonry walls have various shapes, heights and soil levels retained. The suspended concrete slab roof has undergone temperature fluctuations for more than fifty years and the resulting crack widths are considered minor. The building is in very good condition given its age and the complexity of shapes and materials. The building will continue to perform satisfactorily with some repairs recommended below and routine maintenance.

4.0 RECOMMENDATIONS

The repairs are prioritised below.

a) Poison tree and ferns on parapet immediately.

b) Remove trees overhanging north side of building and clean gutters. Poison the tree trunks if species and mature size is not suitable adjacent to masonry buildings.

c) Patch asphalt hole along western wall which may introduce moisture changes to the foundations (swelling clay soils crack walls).

d) Pressure clean top of roof slab and coat with flexible membrane, preferably white to reduce temperature affects. Seal larger roof cracks.

e) Water damaged ceilings, soffits to be cleaned and panted with a permeable paint to allow moisture to escape through roof slab.

f) Pave outside ladies toilet to reduce step height to acceptable limit. Do not glue, or concrete bed pavers but rather open joint paver will enable future removal without damage to the existing.

g) Rectify damage to masonry doorways if possible. Remove protruding bolts.

h) Repair broken steel pipe handrail above retaining wall.

i) Confirm retaining wall backfill has method of surface runoff and ground-water egress (agriculture pipe) outlet, or weep holes.

k) Original terrazzo should be removed and surface ground to restore finish. These may then be used as internal linings. Paint stripper or other chemical paint removal system would remove the gout faster than the stone chips resulting in an exposed aggregate finish, with possible aggregate loss.

5.0 APPENDIX A

Figure 1 – Fig tree

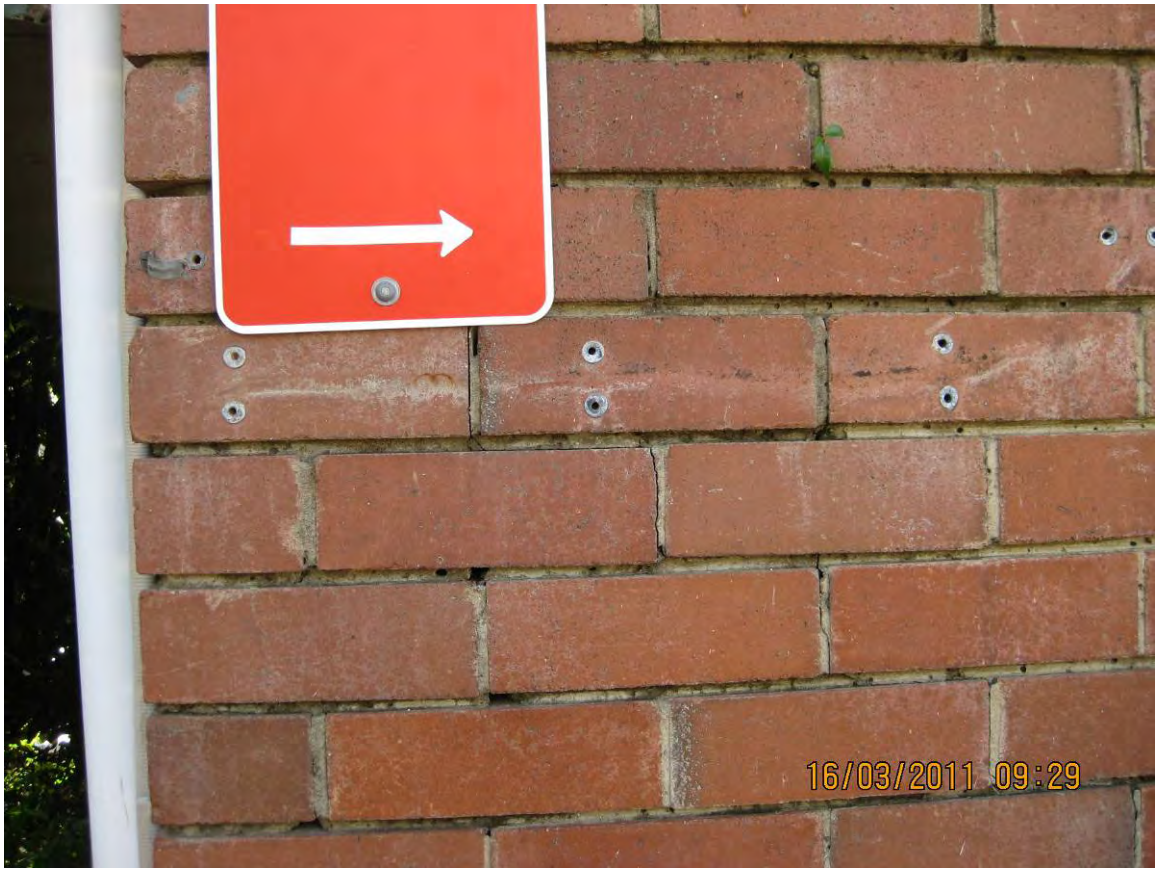


Figure 2 – Western wall crack

Figure 3 – Northern wall crack

Figure 4 – Grouted roof gutter and parapet

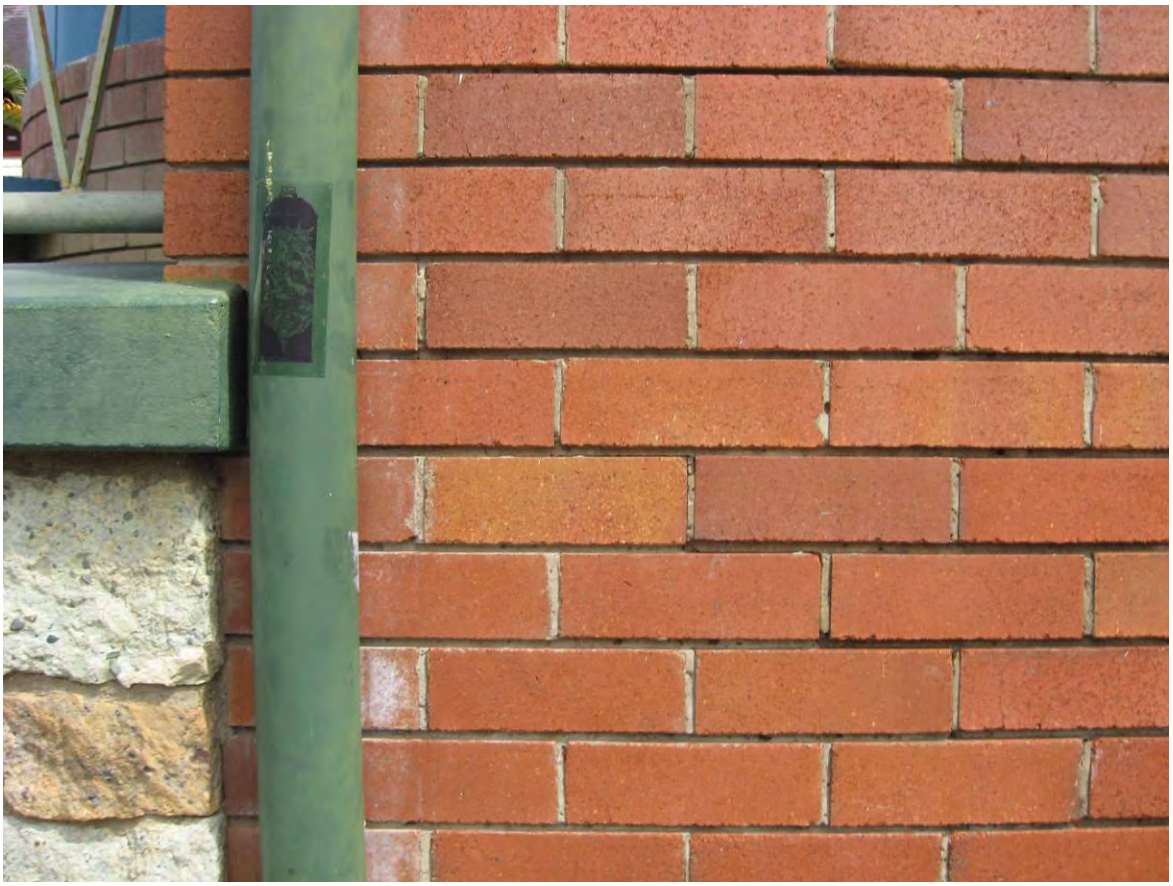


Figure 5 – Eastern Wall Crack

Figure 6 – South east corner

Figure 7 – Roof Slab Cracks

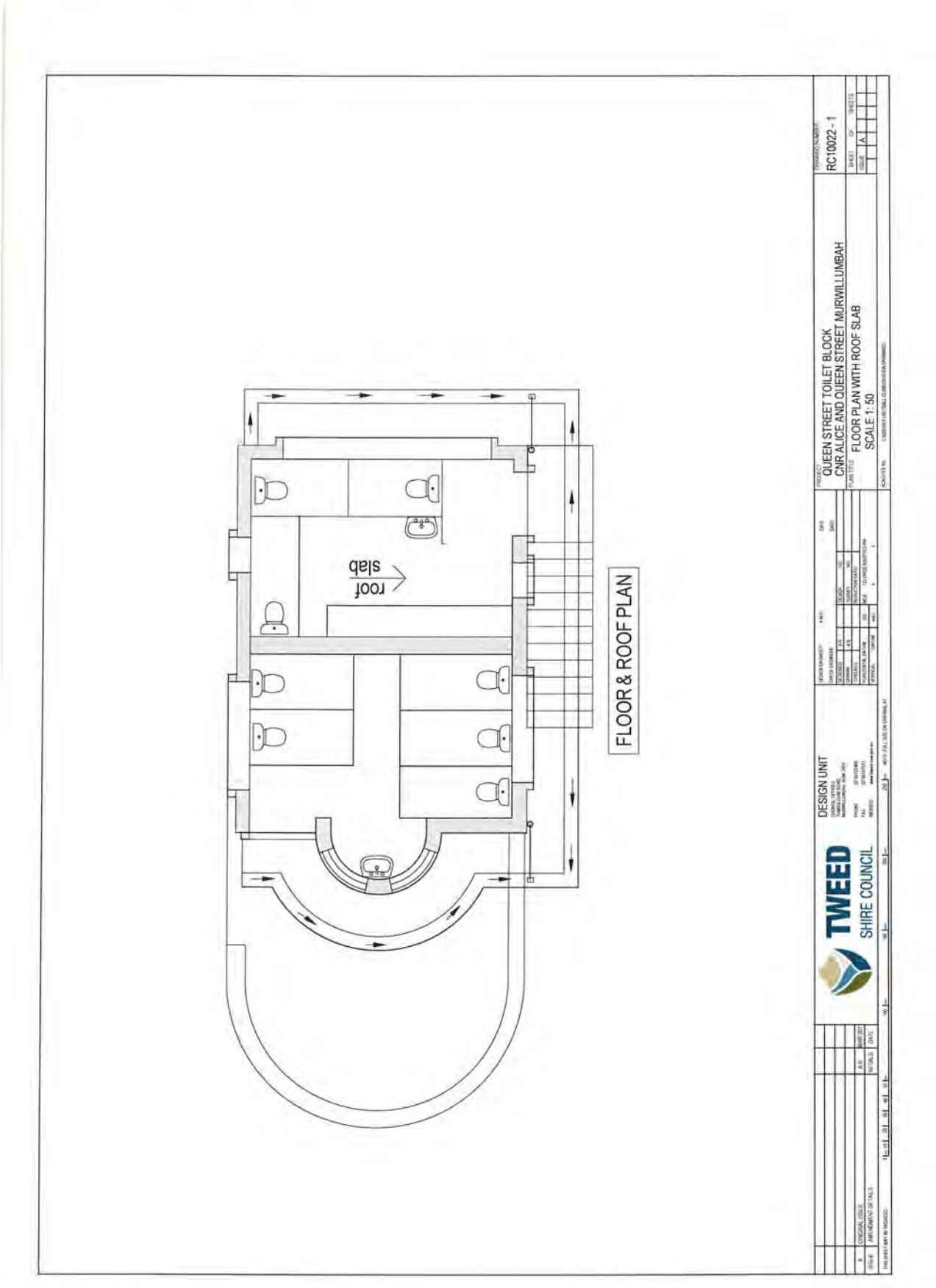
Figure 8 – Cracks over soffit water damage

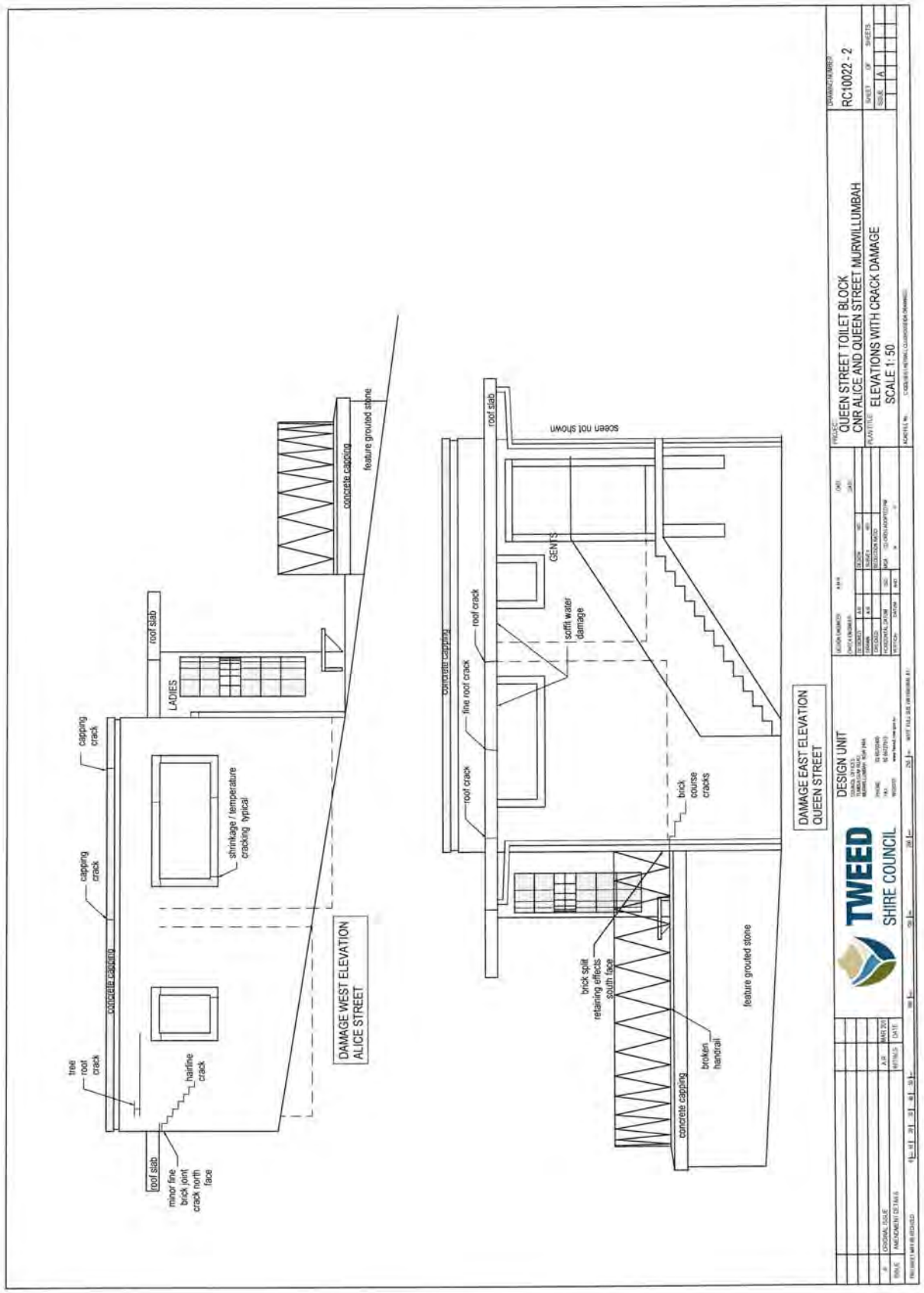
Figure 9 – Cantilever cracking and gutter debris

Figure 10 – Bolt damage to doorway

Figure 11 – Bolt Damage splitting brick

6.0 APPENDIX B




DAMAGE WEST ELEVATION
ALICE STREET
roof slab
LADIES
capping crack
concrete capping
shrinkage / temperature cracking typical
capping crack
concrete capping
feature grouted stone
tree root crack
hairline crack
roof slab
minor fine brick joint crack north face
DAMAGE EAST ELEVATION
QUEEN STREET
roof slab
soffit water damage
GENTS
roof crack
fine roof crack
roof crack
concrete capping
brick course cracks
brick split retaining effects south face
feature grouted stone
broken handrail
concrete capping
DESIGN UNIT
TWEED
SHIRE COUNCIL
QUEEN STREET TOILET BLOCK
CNR ALICE AND QUEEN STREET MURWILLUMBAH
ELEVATIONS WITH CRACK DAMAGE
SCALE 1: 50
RC10022 - 2

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