



# **MATAVAI**

## **3 PHILLIP STREET, WATERLOO**

### **STRUCTURAL CONDITION REPORT**

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**Report No. DD1375M**

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## **1.0 INTRODUCTION**

The Department of Housing has proposals to assess condition of 29 of its high-rise properties. Three among them have been selected for a pilot study to understand the pros and cons of the process involved and to determine on a reporting format. Matavai, a 29-storeyed building, is one among the three buildings under the current study.

A team of engineers from the Government Architect's Office is involved in the study. Structural Engineers, Vijay Badhwar and Nick Harb carried out a walk through visual survey of some typical units as well as the building facades beginning on 4 April 2005. .

## **2.0 SCOPE OF WORK**

The condition survey has been proposed to enable a budget to be prepared based on the repair priorities. The scope of work is limited as the units are currently occupied. A typical few of the units were inspected from inside from which the general condition of all the units has been interpreted.

Externally, a cherry picker was used to access some wall panels. A non-destructive survey by impulse radar equipment was carried out by a Consultant GBG Australia, to plot reinforcement in the panels, the anchoring points, cover to reinforcement, and degree of carbonation. The data was confirmed by repeating the exercise from inside. Refer to appendix B for a non-destructive survey and report prepared by Consultant GBG Australia.

Included in the scope of work was to remove some concrete near the anchor points to visually assess the condition of the anchors. The anchors are most critical in the stability of the structure.

The uppermost roof structure (above the plant room slab) could not be inspected.

A thorough picture record is maintained to describe the general condition of the building and the nature of defects.

## **3.0 BUILDING STRUCTURE**

Although the structural drawings of the building are not available, inferences are drawn from some of the available architectural drawings and the site visits. Errol Edwards, who was involved with the original construction, was helpful in providing some of the building details.

The site slopes towards the south-west. The footing type is similar to Frankipiles which transfer the load by skin friction rather than being end-bearing, according to Mr Edwards.

The structure comprises of in-situ reinforced concrete slabs which are supported off load-bearing precast concrete walls. There are starter bars from the walls which are grouted in the floor slabs as well as in the precast walls above.

The first floor structure is different from the typical floor slabs. As the structure below does not line up with the structure above, this floor is a post-tensioned transfer floor.

The plant room structure above the roof is again different from the typical floors. The precast plant room walls are suspended from above and are laterally stabilised by the lower roof slab by angle cleats.

The roof slab has been sheeted over, supported probably by the concrete slab.

There are several cast iron water tanks within the plant room structure. These are seated on masonry walls built off the concrete slab.

#### **4.0 SUMMARY**

The building structure is in a sound structural condition. Some of the defects are summarised as follows:

- Signs of early reinforcement corrosion in in-situ concrete above lower roof level.
- Cracking and corrosion in roof sheeting.
- Corrosion in anchors fixing the swinging stage support beams.

Besides the summarised defects it is important to note that the external wall structure being load-bearing, an instability in one wall panel due to an accident (such as the blowing out of a wall panel due to explosion in a gas cylinder) can lead to a major collapse of the walls and floor slabs above the destabilised panel (refer sketches SK1, SK2 & SK3 in Appendix B for typical precast panel connection details).

It is recommended that the Department of Housing undertake a review of restraint requirements in the external load-bearing precast panel walls under current Australian Standards.

In relation to precast panels, Errol Edwards of the Department of Housing briefed that the layer of the exposed aggregate finish on precast wall panels had been cast later on the base concrete panel.

This layer was found to have a weak bond with the base layer as reported by a consultant, GBG Australia.

Although there is no immediate danger presently, according to the consultant, the finishing layer should be further investigated in two years for any cracks or lack of bond. In case these defects become apparent, a significant work will be required to the panels.

While there was no evidence of alkali aggregate reaction, epoxy paint on the panels is at the end of its useful life and it is recommended to jet clean and realkalise all external concrete surfaces and coat with water and pollution repelling protective coating within five years.

A detailed description and condition of the reinforced structure based on non-destructive tests, as well as the examination and testing of external exposed aggregate mortar layer and elastomeric joint compound, carried out by GBG Australia is attached in Appendix C.

The existing water tanks above level 29 are unstable under earthquake forces and they are recommended to be stabilised. Refer to Appendix B for schematic layout and strengthening details for the existing water tanks (SK4, SK5, SK6).

## **APPENDIX A**

## Defect Table

BUILDING:	MATAVAI 3 Phillip Street, Waterloo	Date: April 2005
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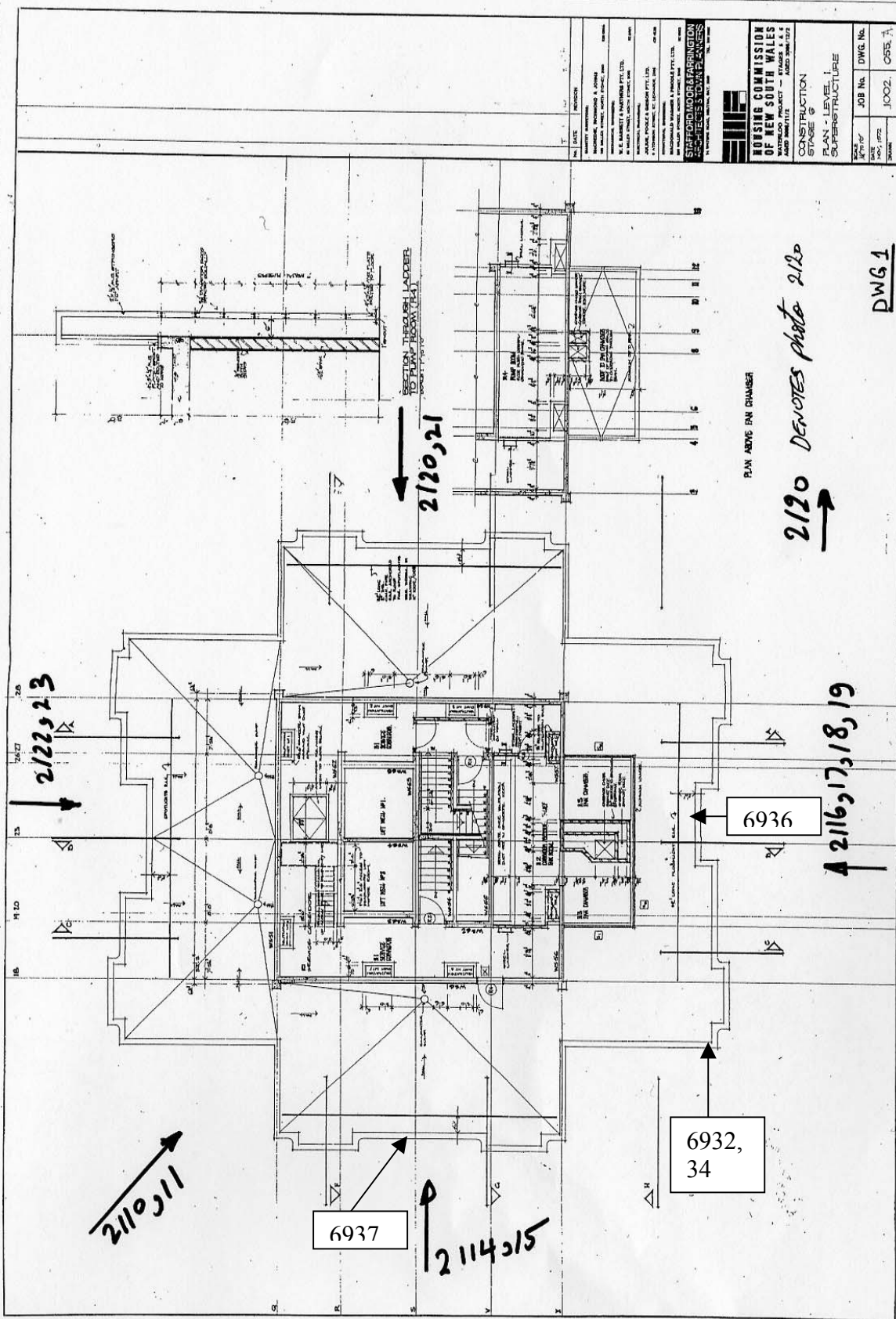
LOCATION	DETAIL/COMMENT	PHOTO REFERENCE
Water Tanks (Internal)	Two water tanks (approx. 3.0x3.0x2.4m high) above level 29 (plant room level). <ol style="list-style-type: none"> <li>1. Cast iron walls with stainless steel through tie rods in between (photo 12). Replace rods with galvanised rods (24mm dia.), allow 12 rods.</li> <li>2. Thoroughly prepare &amp; paint the inside surface of the tanks with approved epoxy based paint.</li> <li>3. Most of the bearing flat steel plates (12mm thick) below the base of tanks are rusting (photos 10, 11). Remove all flat steel bearing plates and replace with nylon pads between tanks and supporting structure.</li> <li>4. Install sacrificial anodes in each tank.</li> <li>5. Carry out above-mentioned recommendations within three years.</li> </ol>	2054, 55, 62, 63, 64.
Plant room Level (Internal)	Anchoring steel brackets to precast panels. Refer to non-destructive testing results carried out by GBG Australia.	2056, 57 2102
Roof (External)	Steel frame for maintenance hanging stage, around the perimeter of the building, showing signs of corrosion at connections between steel members and between steel members and concrete upturns. Remove and replace all bolts and prepare and repaint all steel members. Safety hand-rails around the perimeter of the building including holding down bolts are also showing signs of corrosion. Remove hand-rail and replace. Carry out work within one year.	2067, 68, 69, 70, 71, 76, 77, 79. 2111, 18.
Roof Level – Concrete spalling (External)	Spalling in in-situ concrete walls above roof level. Repair within one year.	2072, 73, 96, 97 2860, 61
Roof level- Duct (External)	Steel brackets supporting duct along the northern wall are showing sign of corrosion at fixing bolts. Remove brackets and replace.	2074, 2075
Roof Level – Metal Roof (External)	Metal roof and gutter are showing signs of rusting, in particular fixing screws, with dented ribs in various locations. Remove & replace within 5 years.	2071, 76, 79
Roof Level – Ladder to upper level	Rusting bolts between steel members and between steel and concrete wall. Replace bolts within 3 years.	2076, 2078

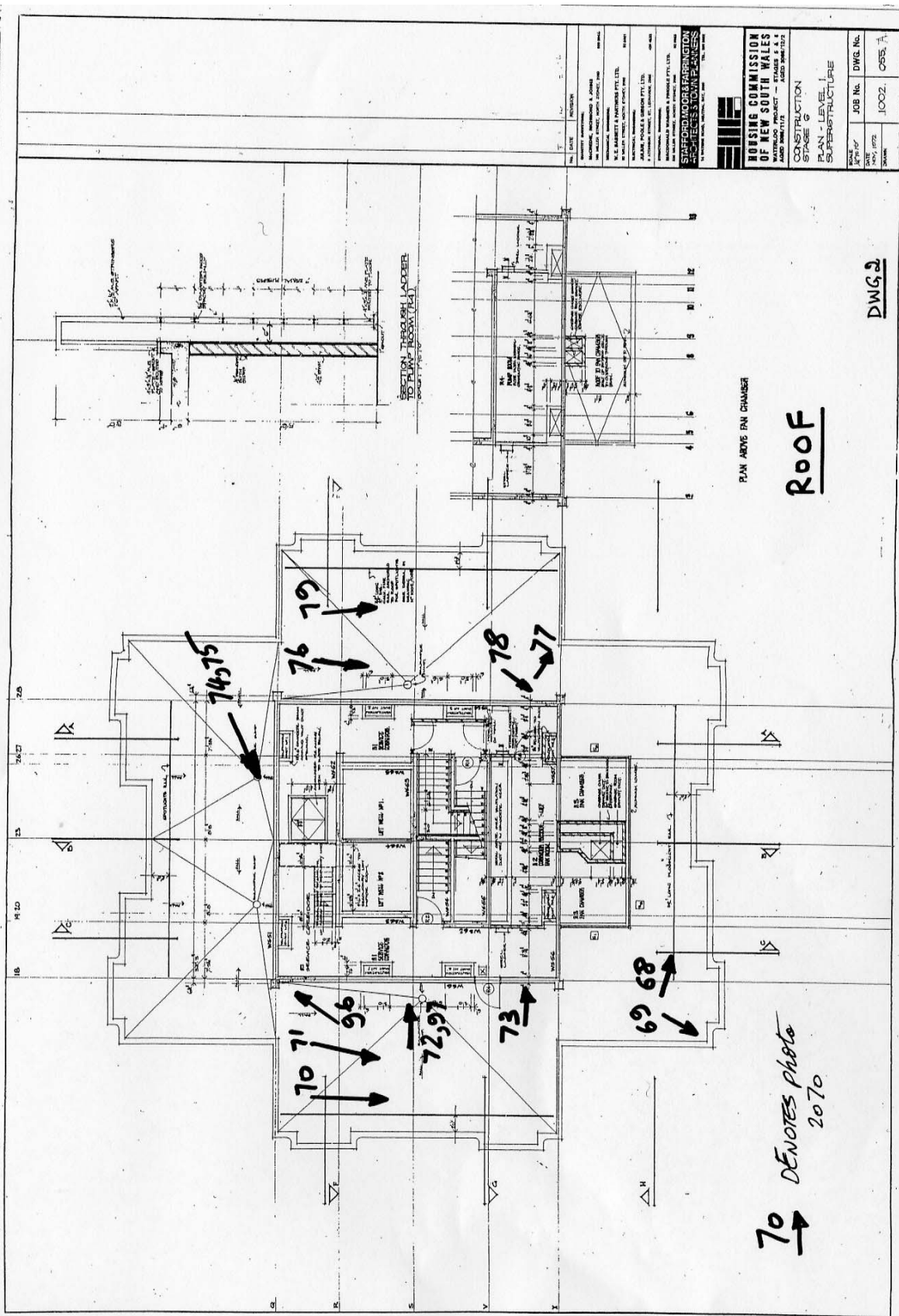


BUILDING:	MATAVAI 3 Phillip Street, Waterloo	Date: April 2005
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LOCATION	DETAIL	PHOTO REFERENCE
Level 6 – Unit 1 (Internal)	Duct in Bathroom & part bedroom contains asbestos. Remove and replace all ducts (all levels, all units) within 5 years. Vinyl floor tile in Bed sitting room including kitchen contain asbestos. Remove floor tiles and replace within five years (all levels, all units).	2080, 81, 82, 83
Level 6 – Railing (External)	External aluminium railing in front of community room (fixed to wall with stainless bolts) showing sign of surface pitting and corrosion.  Remove and replace all external railing with stainless framing and bolts within ten years.	2091, 94
Level 1 – Concrete roof (External)	Concrete roof over lobby / entry (in front of Community room) developed concrete spalling and shrinkage cracks, photos taken from community room.  Clean concrete roof and repair spalling and coat with water and pollution repelling protective coating within one year.	2108, 2109
Level 29 (Internal)	Set ceiling in community room damaged by rain entry.  Remove and replace ASAP	2103, 2104
External facades	Atmospheric pollutants to concrete surfaces. Clean and realkalise all external concrete surfaces and coat with water and pollution repelling protective coating within five years.	2114, 15, 16, 17, 18, 19, 20, 21, 23, 24
External facades	Vertical joints between panels. Replace within ten years.	6933, 34, 36, 37
External facades	Surface pitting & corrosion of aluminium railing in front of windows. Replace within ten years.	2109, 94
External facades	Crack in north east edge of bottom window relief.	005-Appendix C (GBGA0246)

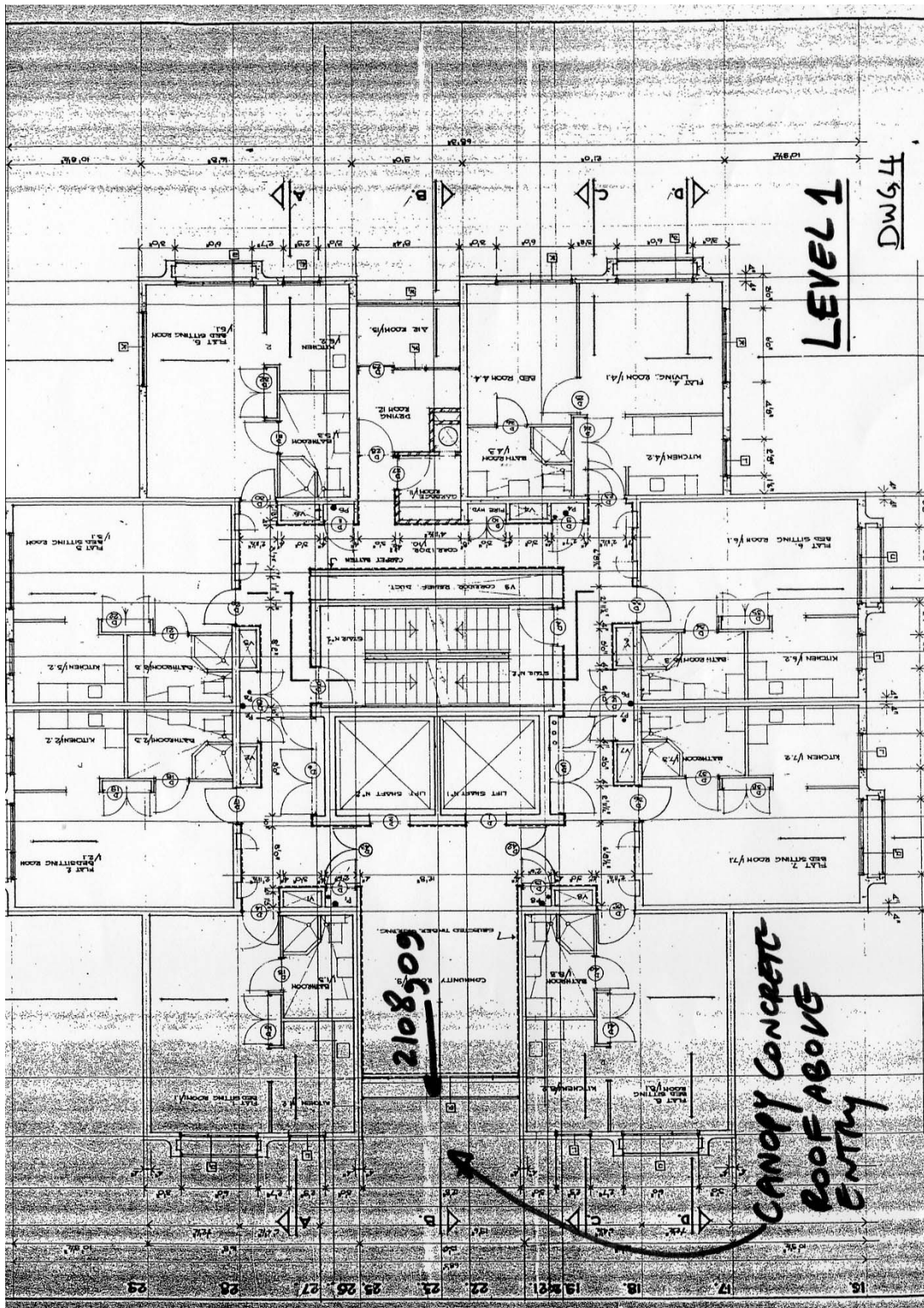
## Sketches

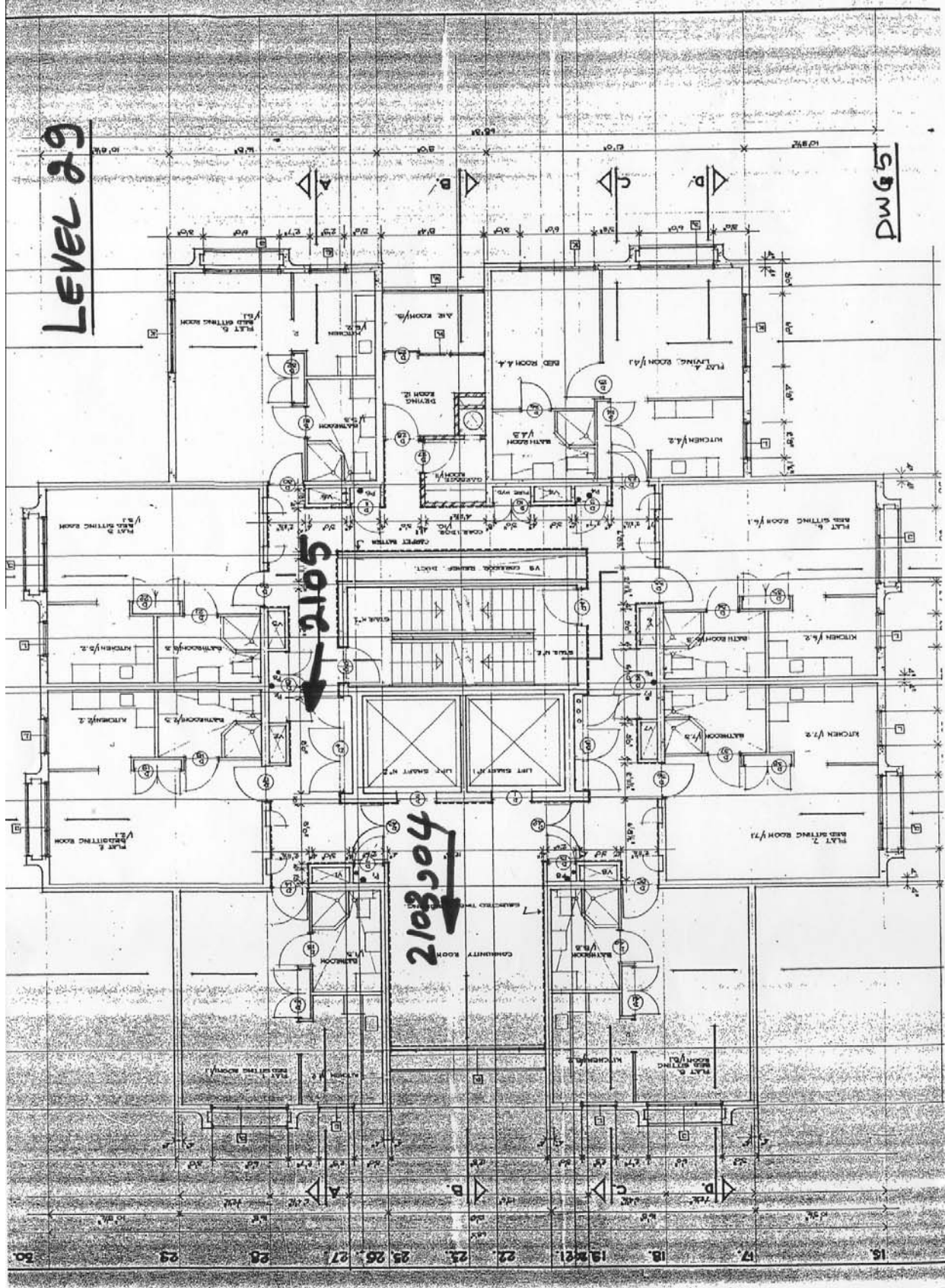












## Photographical Record





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100\_2116.jpg

*MATAVAI – 3 Phillip Street, Waterloo*



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100\_2119.jpg



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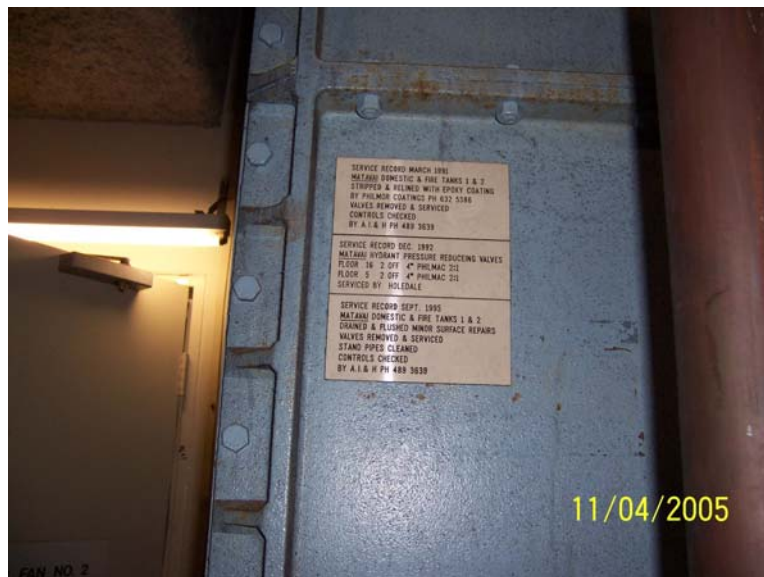


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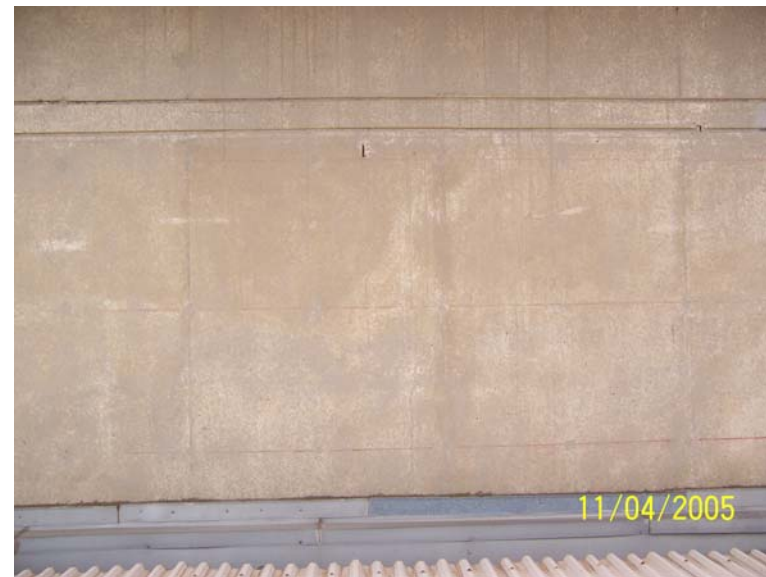
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100\_2108.jpg



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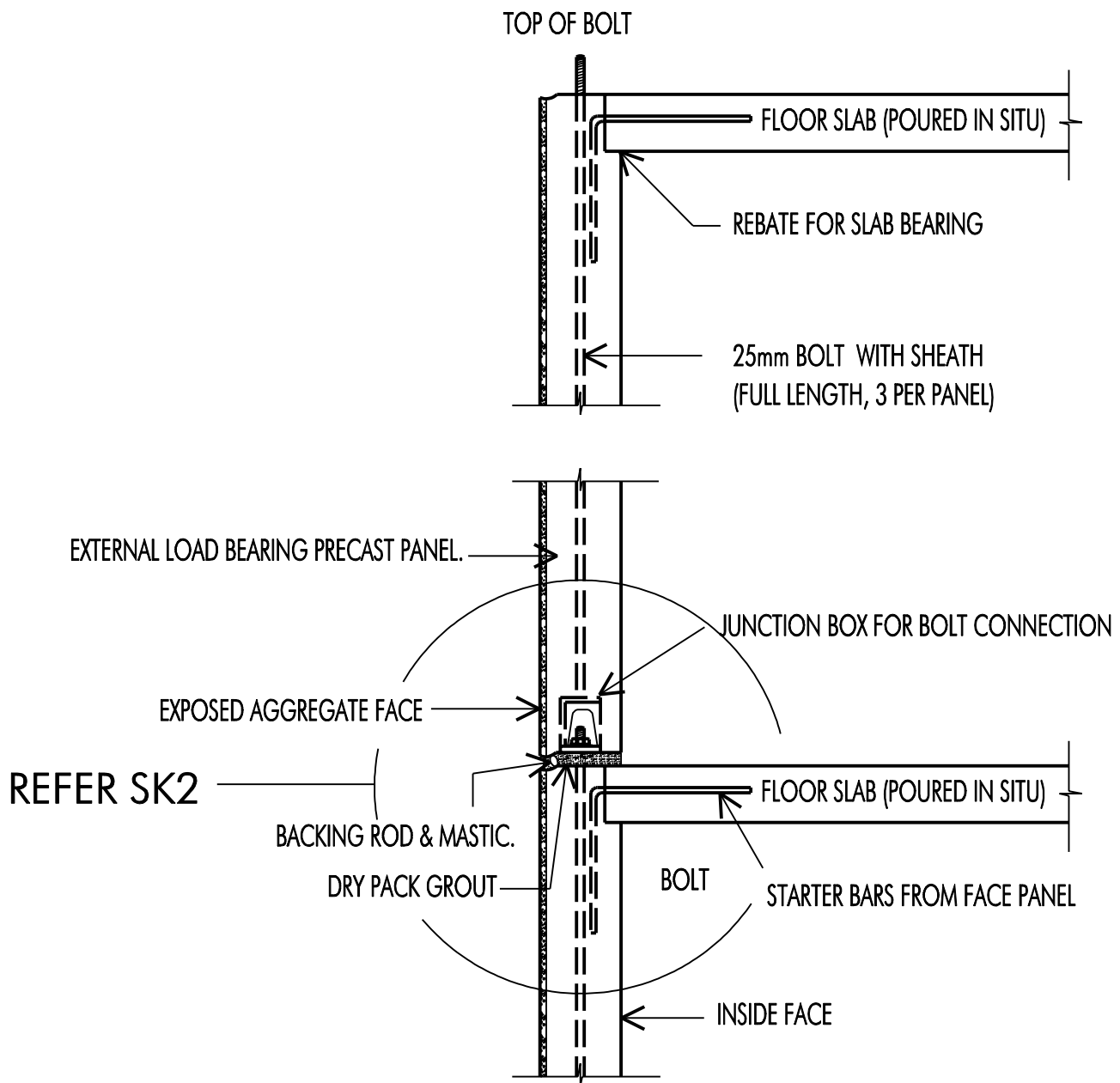
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MATAVAI – 3 Phillip Street, Waterloo

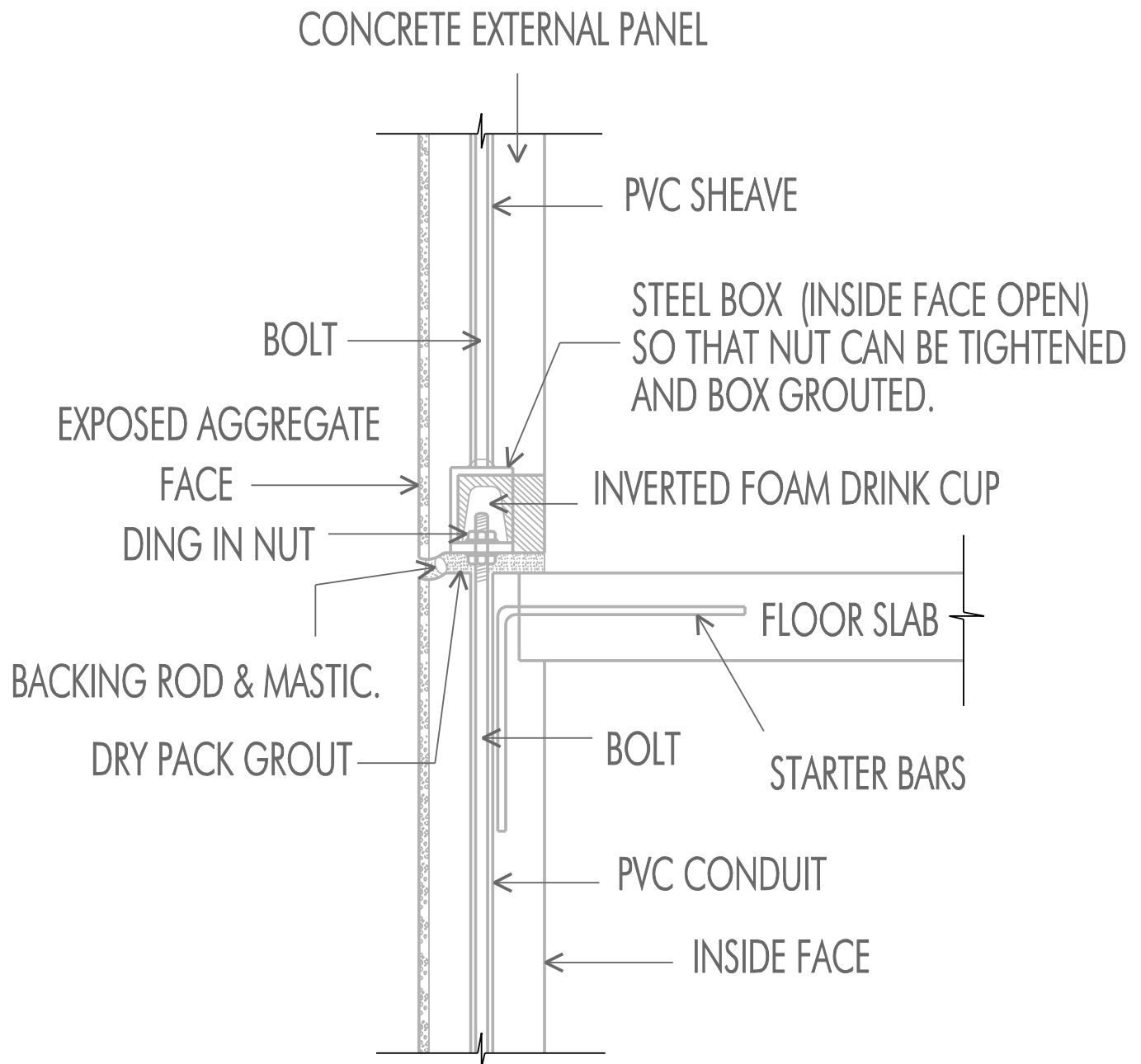
## Appendix B



## TYPICAL SECTION THROUGH WALL/FLOOR (SK1)

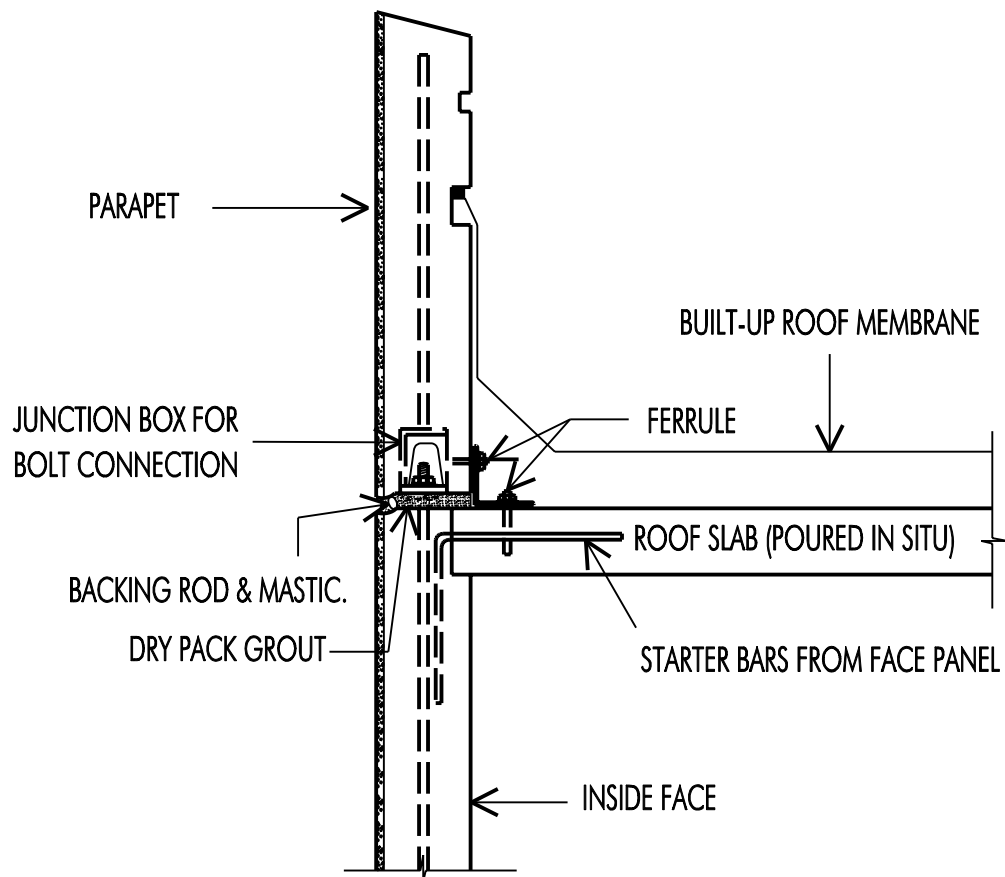
SCALE 1 : 20





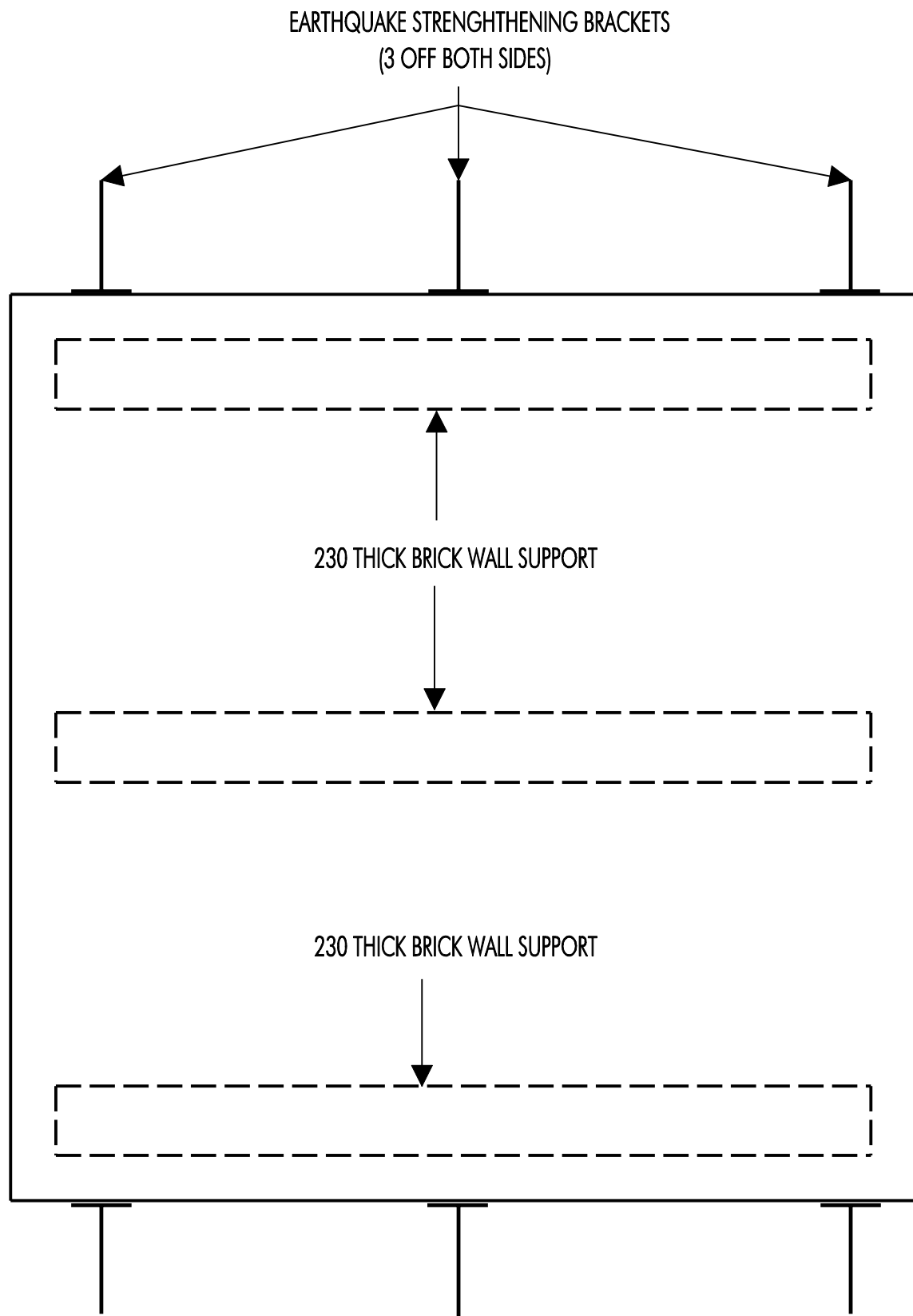
TYPICAL FLOOR / WALL CONNECTION DETAIL (SK2)

NTS



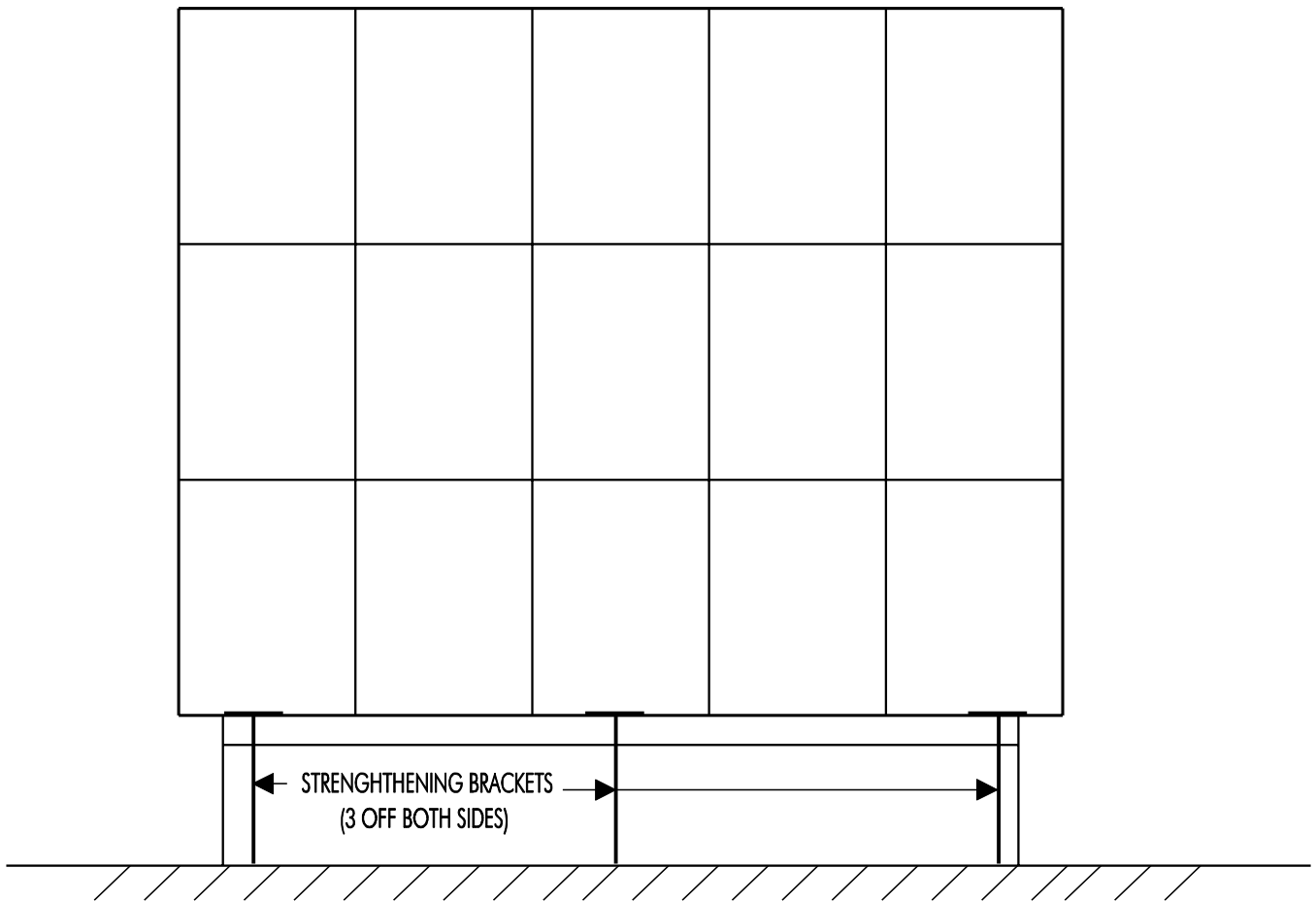
## TYPICAL PARAPET SECTION (SK3)

SCALE 1 : 20



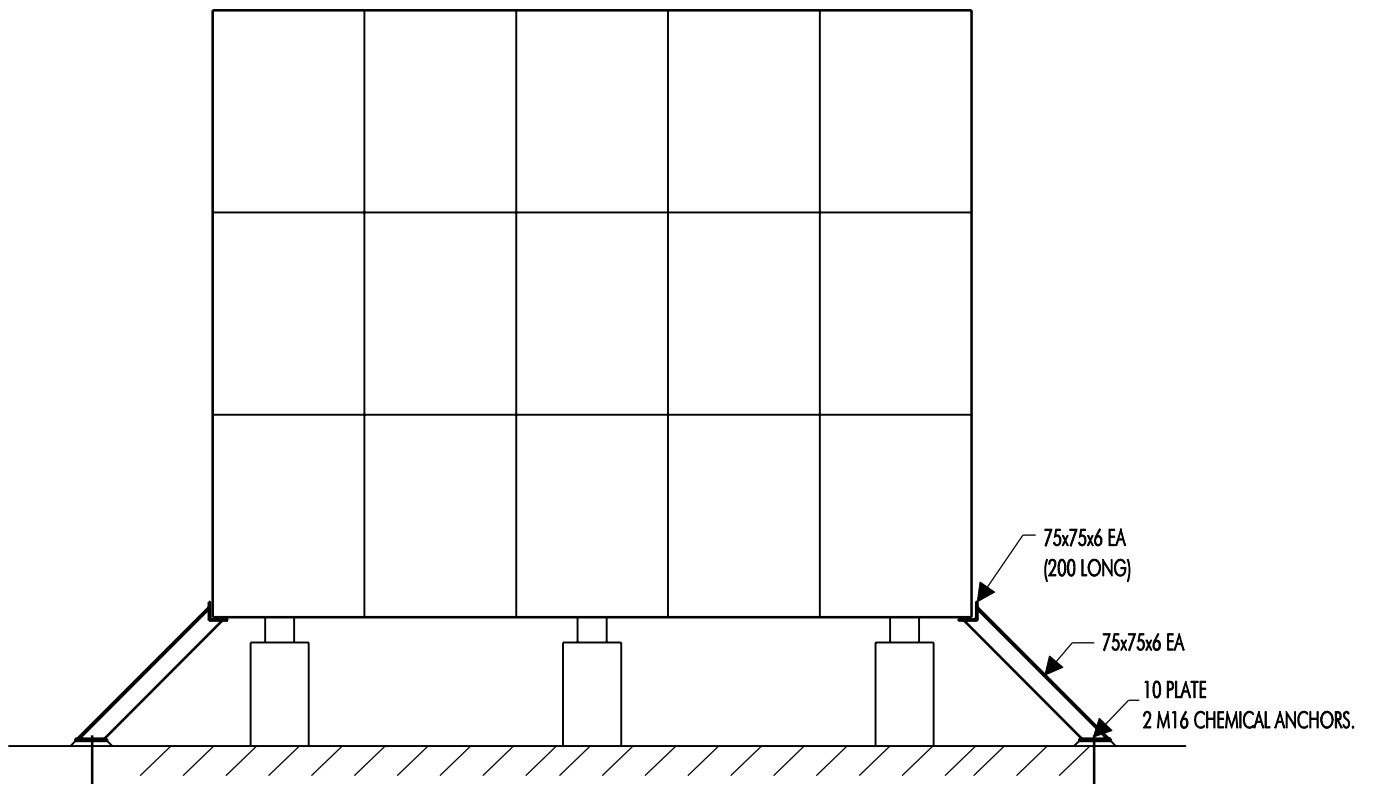
## WATER TANK PLAN (SK4)

SCALE 1 : 20



SIDE ELEVATION (SK5)

SCALE 1 : 20



# FRONT ELEVATION (SK6)

SCALE 1 : 20

## **APPENDIX C**