

**David Coatsworth**

**From:** David Coatsworth  
**Sent:** Friday, 24 September 2010 4:21 p.m.  
**To:** 'egt@xtra.co.nz'  
**Subject:** 249 Madras Street  
Hi John

Thank you for your time given in discussion with myself regarding earthquake damage to your building at 249 Madras Street. I understand that the building owners are interested in having an independent structural assessment carried out.

CPG NZ Ltd is a multi-discipline consulting practice incorporating structural, seismic and geotech engineering, and surveying and planning disciplines. We have experience in seismic risk assessment and design of seismic strengthening. We also have experience in cost assessment for restoration and strengthening works. We have set up an earthquake response team here in Christchurch and have been carrying out inspections and assessments for property owners including private, commercial and territorial authorities.

I understand that your building is 5 storeys high and is of reinforced concrete beam and column construction. It has a double lift shaft and services shaft. Floors are suspended concrete which cantilever out at the perimeter of the building supporting concrete spandrel panels.

With regard to damage I understand that you have some cracking of internal linings, some broken windows and a door on the top floor that has jammed.

I suggest that we should allow to carry out a thorough inspection of the building. This would include viewing the exterior from the ground, from windows, from the roof and from whatever other vantage points are available. It would also include inspecting all visible internal surfaces. I would propose that we lift ceiling tiles in appropriate places to inspect under floor surface, beams and beam-column joints where possible. For the purpose of this review I would not suggest removing internal wall linings unless there is some obvious reason to want to do this. For instance, if linings were badly damaged around a column base, then it would be logical to remove the linings to observe the structural elements. We would take photos of any damage and record locations on sketches. Structural and Architectural drawings of the building would be very helpful. If these can be made available, they will help with the understanding of the structural systems within the building.

We would then consider the information obtained from the inspection and determine if there are any patterns to the damaged observed that would explain any deficiencies in the performance of the building.

We would then prepare a report describing the building, the damage observed, comment on reasons for the observed damage and briefly comment on possible remedial works. Within the scope of this report we would not anticipate detailing or specifying repair works. Similarly we have made no allowance in our estimate for any analysis of the structure although in the event of significant structural damage it would ultimately be necessary to carry out structural analysis to determine strengthening and repair work requirements.

We believe that for a fee of \$3,000 plus gst we could carry out a reasonably detailed inspection and prepare a report that would be useful to the building owners.

I look forward to your response and if you have any queries regarding the building or our proposal please call me on 374 6515 or 0274 880 300.

Regards

David Coatsworth

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CPG New Zealand Ltd  
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29/09/2010

236 Armagh Street, PO Box 13-875, Christchurch 8141, New Zealand

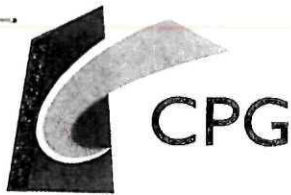
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29/09/2010



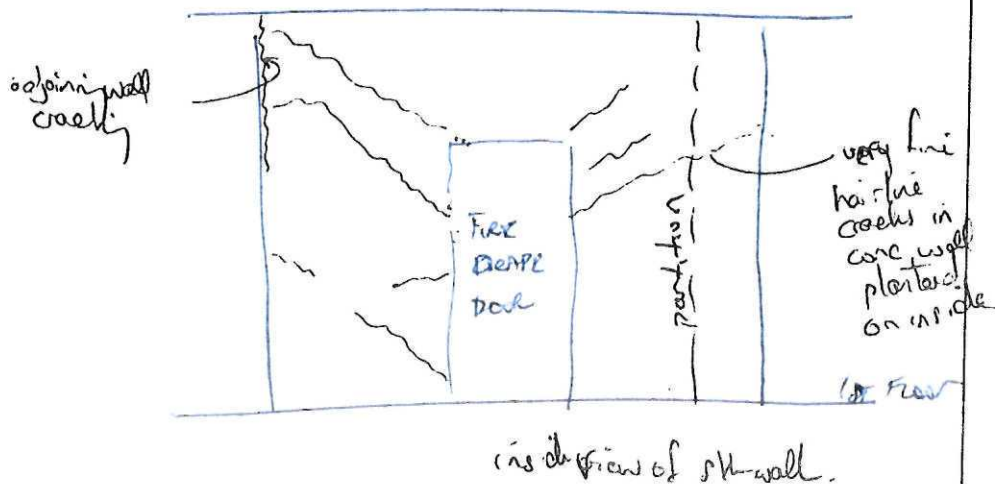
249 MADRAS STREET  
SITE INSPECTION  
29.9.10 10.00am - 2.00pm

Job No. \_\_\_\_\_  
Page No. 1  
Made by: \_\_\_\_\_ Date: \_\_\_\_\_  
WDL 29.9.10

1. Spandrels on sth side each spalled at plaster cover
2. sth side conc. lower than car god slabs possibly spalling rusting rebar
3. spandrels on both sides near NE corner have more clearance from ins. li. concrete
4. Similarly on east face spandrel clearance to ins. li. floor way a bit.
5. To be Draw: Dalg Mangan, Madhan Govindarajan, Leonard Pagan, Rainboon, Peter Brown, CIV
6. Car Floor Met Room sth side CIV. cracking in plaster lining on sth wall
7. Also some minor cracking above doors in plaster board joint in Passage
8. Tray deck flows on concrete beam on block walls.
9. places where plaster board walls adjoin core column - movement - minor 10-2mm
10. Rubber seals around windows popped out

1st Floor

11. sth side office on core wall

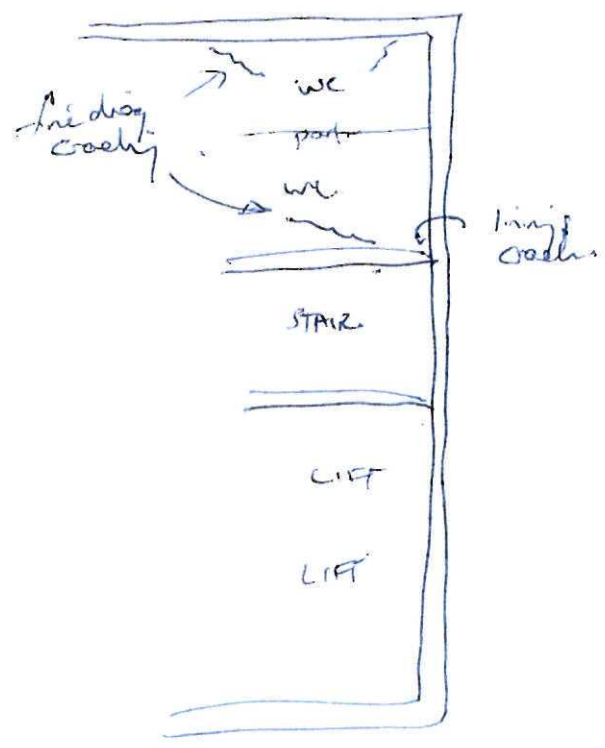




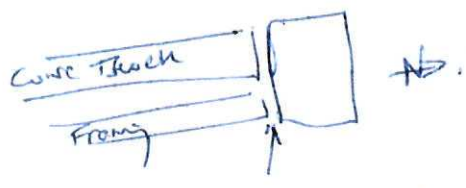


Job No.  
Page No. 3  
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14 Toilets on NW wall at 1st floor



15. 1st floor NW corner body



Joint moved  
5mm. can  
see daylight  
right through  
wardrobe in the  
point between  
gib & core  
but only about  
5mm wide  
& no strength  
movement  
accommodation



Job No.

Page No.

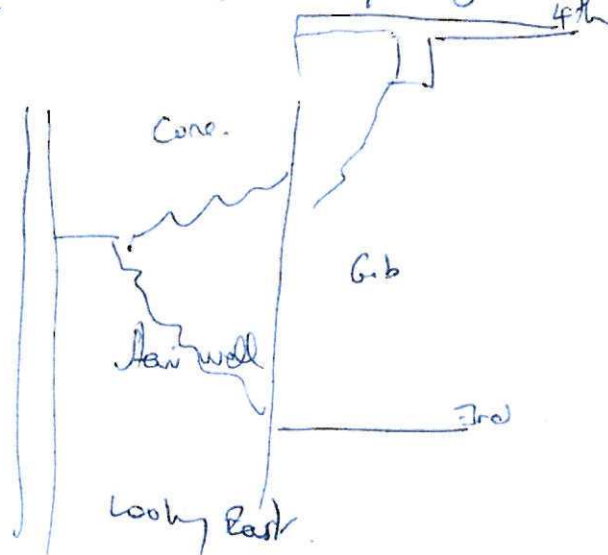
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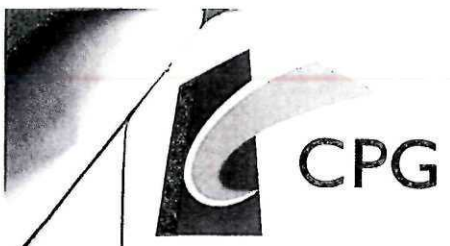
16. At 3rd floor the south side room transmission room exterior sth wall is dropped & lined on the inside but that lining has cracking in diagonal pattern exterior of this wall has small heavy cracks just below half h/w star (only for escape)

17 3rd floor stair well - large cracking - g.b on east side wall



18 3rd level toilet at stair walls virtually no cracking a little vertical crack in cross western north stair wall

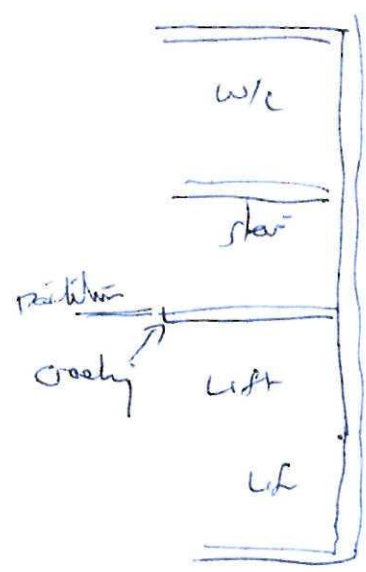
19 X12 column (round) immediately above 3rd floor ponded for minor cracking, probably tension



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20. Stained btwn 3rd & 4th  
 horizontal cracks in 3 sides at 4th floor level?  
 could be old shrinkage ??  
 Another horizontal crack in north wall only  
 about 200mm below ~~3rd~~ landing and 4-5th floor

21



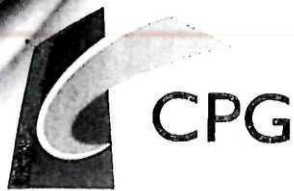
22. Again fine long crack ~ NE column (round)  
 above 4th floor spandrel

23. 4th floor separation gap btwn gibs wall & struck  
 round column @ gap @ floor - 7-8mm at ceiling

24. 4th floor saw concrete core again  
 crack btwn plaster board & core column  
 & in plasterboard under windows on Sth wall

25. Movement seems to have been more in  
 X-D direction than EW. 4-5mm displacement  
 at only

26.



Job No.

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Made by:

Date:

- 26. Age in stair well bet 4 & 5  
 horizontal crack in 3 walls at 5th floor  
 level.  
 Also slightly sloping crack (nearly horizontal)  
 inth wall only 1/2 m below roof level  
 water leak stains dot
- 27. 5th floor column on nth face one west of NE cor.  
 in line with east end of lift shaft -  
 yield lines in column
- 28. Damage in west wall very little at 5th floor
- 29. west-wall of shaft (core) minor diagonal crack  
 inth east wall
- 30. Tank room over 5th floor w/c area  
 minor crack in north & west walls.
- 31. LMR. 3 vert. cracks in wall east-side  
 in showing signs of efflorescence so not  
 new.
- 32. Level 2. Double doors in N-S partition  
 adj to 5th wall not shown







Job No.	
Page No.	7
Made by:	Date:

- 33 2nd floor west wall damage jib to core
- 36 2nd floor NW partition in front west wall  
has buckled at core column
- 25 2nd floor w/c shear walls  
only very minor cracking diagonal  
one only
- 26 No apparent cracking in NE column

Table of David Coatsworth's Handwritten Notes 1-36

Item Number(s)	Explanation
1.	<p><i>Spandrels on south side, ends spalled of plaster.</i></p> <p>This comment relates to Photos 52 and 76 – plaster was observed to be spalling off the ends of the precast spandrel panels adjacent to the fire escape on the south side of the building. This was likely the result of movement of the building during earthquake.</p>
2.	<p><i>North side concrete tower, North west corner ground storey, possibly spalling, rusting reinforcing steel.</i></p> <p>On the northwest corner of the north side concrete shear tower at the ground storey. The spalling observed was not in my view earthquake damage. It was likely caused by corrosion of reinforcing steel. This was a structural defect but it was not critical nor, in my view, did it relate to failure of the building.</p>
3.	<p><i>Precast spandrels on the north side near north east corner have more clearance from in situ concrete.</i></p> <p>I observed variation in clearance between precast concrete spandrel panels and in situ concrete beams/floor slabs on the north side of the building near the north-east corner. I considered this to be construction variation and not earthquake damage. <b>Refer Photos 4 and 5.</b></p>
4.	<p><i>Similarly on east face spandrel clearances to in situ floor vary a bit.</i></p> <p>This refers to the same observed variation in clearance between precast concrete spandrel panels and in situ concrete beams/floors slabs as observed in Item 3 above, but on the east side of the building. <b>Refer Photo 6.</b></p>
5	<p><i>John Drew, Building Manager, Madras Equities; Leonard Pagan, Rawlinsons; Peter Brown, CTV.</i></p> <p>People present at inspection.</p>

Item Number(s)	Explanation
6.	<p><i>Ground Floor MCR Room, south side of CTV, cracking in plaster lining on south wall.</i></p> <p>Internally, on the south side of the building on the ground floor, I inspected the MCR Room. There was cracking evident in the plaster wall lining. This was partition walling and not structural. <b>Photos 7 – 13</b> show typical damage.</p>
7.	<p><i>Also some minor cracking above doors in plaster board joins in passage.</i></p> <p>In the ground floor passage, minor cracking was also evident in the plaster wall lining. Again, <b>Photos 7 -13</b> identify typical damage.</p>
8.	<p><i>Tray deck floors on concrete beams on block walls.</i></p> <p>At this location, I lifted a ceiling tile and examined the ceiling space, I observed the concrete block firewall which separated the CTV tenancy from the ground floor stair well. I observed no damage. <b>Refer Photos 16 and 17.</b> (This handwritten note reads as if the floor were supported on block walls. That is incorrect; it was my understanding that the floor was independent of the block walls. I just wrote the note unclearly.)</p>
9.	<p><i>Places where plaster board walls adjoin concrete columns – movement minor 1mm or 2mm.</i></p> <p>On the ground floor there were a number of locations where minor separations in the order of 1 – 2mm were observed between structural columns or structural walls and adjoining timber partition walls. These separations were caused by building sway and, in my view, were not evidence of structural damage. <b>Refer Photos 10, 22, 24, 25 and 74.</b></p>
10.	<p><i>Rubber seals around window popped out.</i></p> <p>I observed a rubber seal to an east elevation ground floor window partly out of the frame. <b>Refer Photo 19.</b> I also observed a broken window (<b>Photo 67</b>) at the 3rd floor also on the east elevation of the building. This was probably caused by movement of the building during earthquake.</p>

Item Number(s)	Explanation
	<i>1<sup>st</sup> Floor</i>
11.	<p><i>South side office on concrete wall. Adjoining wall crack. Fire escape door. Partition. Very fine hairline cracks in concrete wall plastered on inside. 1<sup>st</sup> floor. Inside view of south wall.</i></p> <p>The inside face of the coupled shear wall on the south side of the building at first floor level was finished with a thin skim coat of gypsum plaster. I observed very fine diagonal hairline cracking in the plaster. I identified this as earthquake damage. However, the cracks were very fine, indicating that the reinforcing steel had not yielded, that the aggregate in the concrete was still interlocking and that the general integrity of the concrete wall was not compromised. I considered that epoxy injection of the cracks would be appropriate remediation.</p>
12.	<p><i>West wall 1<sup>st</sup> floor. Concrete column. Cracks in plaster lining (not separated from concrete columns). Block behind presumably separated from columns by sealant joint as per ground storey.</i></p> <p>This observation was made on the west wall of the first floor. Here the plasterboard was hard against a concrete column and movement caused fracturing of the plasterboard. <b>Refer to Photos 24 and 25.</b></p>
13	<p><i>Left hand sketch with notes. Slip crack at floor/construction joint level. Diagonal cracks. Ground.</i></p> <p><i>Right hand sketch with notes. Ground floor. Switch room. Partition. Toilet. Stair. Lift. North lift wall. Horizontal crack at 1<sup>st</sup> floor level.</i></p> <p>These observations were made on the first floor in and around the north side concrete shear tower. I observed fine hairline cracking in both horizontal and diagonal directions. The horizontal cracking occurred at floor levels and appeared to coincide with construction joints in the walls. Although the note to the left hand sketch uses the term “slip crack” to refer to this horizontal cracking, I observed no actual slippage at the joints. <b>Refer Photos 34, 42, 43, 44.</b> I further confirmed this when I</p>

Item Number(s)	Explanation
	<p>returned on 6 October and prepared my detailed elevation sketches.</p> <p>Similar effects were observed at other levels in the shear tower.</p> <p>For the same reasons set out in item 11, I believe that the integrity of the shear tower walls was not compromised.</p> <p><i>Bottom sketch with notes. 1<sup>st</sup> floor crack in beam at column joint. Horizontal force. Yield.</i></p> <p>My sketch shows two diagonal cracks which indicated shear in the beam. I do not know why I wrote “yield” since the crack width was so fine that I in fact concluded that no yielding had occurred. This is evident from <b>Photo 45</b>, which shows two very fine diagonal cracks. I observed these cracks a second time when I re-inspected the building on 19 October and observed no change in them. <b>Refer Photo 19Oct10 01.</b></p>
14	<p><i>Toilet on north wall at 1<sup>st</sup> floor. Fine diagonal cracking. WC. Partition. Stair. Lift. Linings crack.</i></p> <p>This note described cracks in the north shear tower walls. The sloping wiggly lines indicated diagonal cracks in the walls, not the floor.</p>
15.	<p><i>1<sup>st</sup> floor north west corner of building. Concrete block. Framing (<b>this referred to timber framing</b>). Joint moved 5mm. Can see daylight right through. Was sealant in this joint between Gib and concrete (<b>referring to concrete column</b>) but only about 8mm wide and not enough movement accommodation.</i></p> <p>These observations were made on the first floor, at the northwest corner of the building.</p> <p>Here, the west wall consisted of a concrete block outer skin and a timber frame and plaster board inner lining. The timber frame had separated from the concrete column leaving a gap. What appeared to be sealant in the joint between the concrete block wall and the column had fallen out and it was possible to see clear through to the outside of the building.</p>

Item Number(s)	Explanation
	<p>The gap wasn't big enough to see the block in-fill panel and any remaining sealant clearly.</p>
16.	<p><i>At ground floor, the south side room, transmission room, exterior south wall is strapped and lined on inside but that lining has cracking in diagonal pattern. Exterior of this wall has small horizontal crack just below half height landing, fire escape.</i></p> <p>This observation was made in the transmission room on the south side of the building at ground floor level. The exterior wall of this room comprised the coupled shear wall which at this level was lined inside with GIB over timber strapping (or framing). At higher levels this wall was lined with a thin coat of gypsum plaster directly over the concrete.</p> <p>I observed diagonal cracking in the internal GIB lining at ground storey. On the exterior face of the wall at ground storey level, I observed one small horizontal crack under the half storey landing of the fire escape stair. At higher levels no cracking on the exterior face of the south elevation coupled shear wall was observed. I observed very fine cracking on the inside face of this coupled shear wall at first floor level, (refer item 11 above), but not at any higher levels.</p> <p>In the transmission room, a limited portion of the inside of the coupled shear wall above the ceiling level and below the first floor slab was viewed by removing a ceiling tile. I observed no cracking, but considered it prudent to check the remainder of the wall at ground storey level by removing the wall lining below ceiling level. This was recommended in my report. Given the very limited damage observed on the outside of this wall I did not expect the removal of the internal linings to reveal significant damage.</p>
17.	<p><i>3<sup>rd</sup> floor stair well, large crack in Gib on east side wall. Concrete. Satirwell. Looking east. Gib. 4<sup>th</sup>. 3<sup>rd</sup>.</i></p> <p>This observation was made in north side shear tower stair well between third and fourth floor levels. A larger crack in the GIB lining to the east side non-structural partition wall was evident. <b>Refer (possibly) Photo</b></p>

Item Number(s)	Explanation
	57.
18.	<p><i>3<sup>rd</sup> floor level toilet at shear walls virtually no cracking, a little vertical crack in mens (<b>reference to men's toilet</b>) westernmost shear wall.</i></p> <p>This observation was made in the third floor toilets in the north side shear tower. No cracking was observed, with the exception of a small vertical crack in the western shear wall.</p>
19.	<p><i>North east column (round) immediately above 3<sup>rd</sup> floor spandrel has minor cracking probably tension. (<b>reference to "tension" was an error; should have been "flexure"</b>).</i></p> <p>This observation was of a column on the north east corner of the building at the third floor. This is depicted in <b>Photo 68</b>. Minor flexural cracking was observed. This was likely earthquake related. It was structural but minor.</p>
20.	<p><i>Stairwell between 3<sup>rd</sup> &amp; 4<sup>th</sup>. Horizontal cracks in 3 sides at 4<sup>th</sup> floor level? Could be old shrinkage?? Another horizontal crack in north wall only about 200mm below landing mid 4<sup>th</sup>-5<sup>th</sup> floors.</i></p> <p>This observation was made in the north side shear tower stairwell between the third and fourth floors.</p> <p>Horizontal cracks were observed on three sides at this location. The cracking was fine and locations probably coincided with construction joints. There was also a horizontal crack 200mm below the stair landing between the fourth and fifth floors. I believe this is depicted in <b>Photos 70 and 71</b>.</p> <p>For the same reasons set out in item 11, I believe that the integrity of the shear tower walls was not compromised.</p>
21.	<p><i>Partition cracking. W/C. Stair. Lift.</i></p> <p>I believe that this observation was made on the third or fourth floor.</p> <p>A crack was evident in the lift lobby between a timber framed partition</p>

Item Number(s)	Explanation
	wall and the structural shear wall. Movement of the structure had pushed the timber framed wall. The damage was not structural.
22.	<p><i>Again fine horizontal crack in north east column (round) above 4<sup>th</sup> floor spandrel.</i></p> <p>This observation was made of the north-east corner column on the fourth floor.</p> <p>As with the observation at item 19, fine hairline flexural cracks were evident in the north east column above the fourth floor spandrel.</p>
23.	<p><i>4<sup>th</sup> floor separation gap between Gib wall and structural round column 0mm gap at floor, 7-8mm at ceiling.</i></p> <p>This observation was made on the fourth floor.</p> <p>A gap between the plaster board wall and structural column was evident. There was no gap at the floor level but a gap of approximately 7 to 8mm at the ceiling.</p> <p>This movement was likely caused by building sway and, in my view, was not evidence of structural damage. I believe this is depicted in <b>Photo 74</b>.</p>
24.	<p><i>4<sup>th</sup> floor south west corner room again, cracking between plaster board and concrete column and in plaster board under windows on south wall.</i></p> <p>This observation was made in the south west corner of the fourth floor. The west wall of the building at this level consisted of a timber frame with long run iron on the outside and GIB lining inside. The timber frame and GIB lining were finished hard against the concrete columns.</p> <p>Cracking was evident in the plaster board where it came in contact with the structural column. This cracking was likely caused by building movement. This was not structural damage. I believe this is depicted in <b>Photos 77, 78, 90</b>.</p>
25.	<p><i>Movement seems to have been worse in the north-south direction than east-west direction, 4-5mm displacement at ceilings.</i></p>



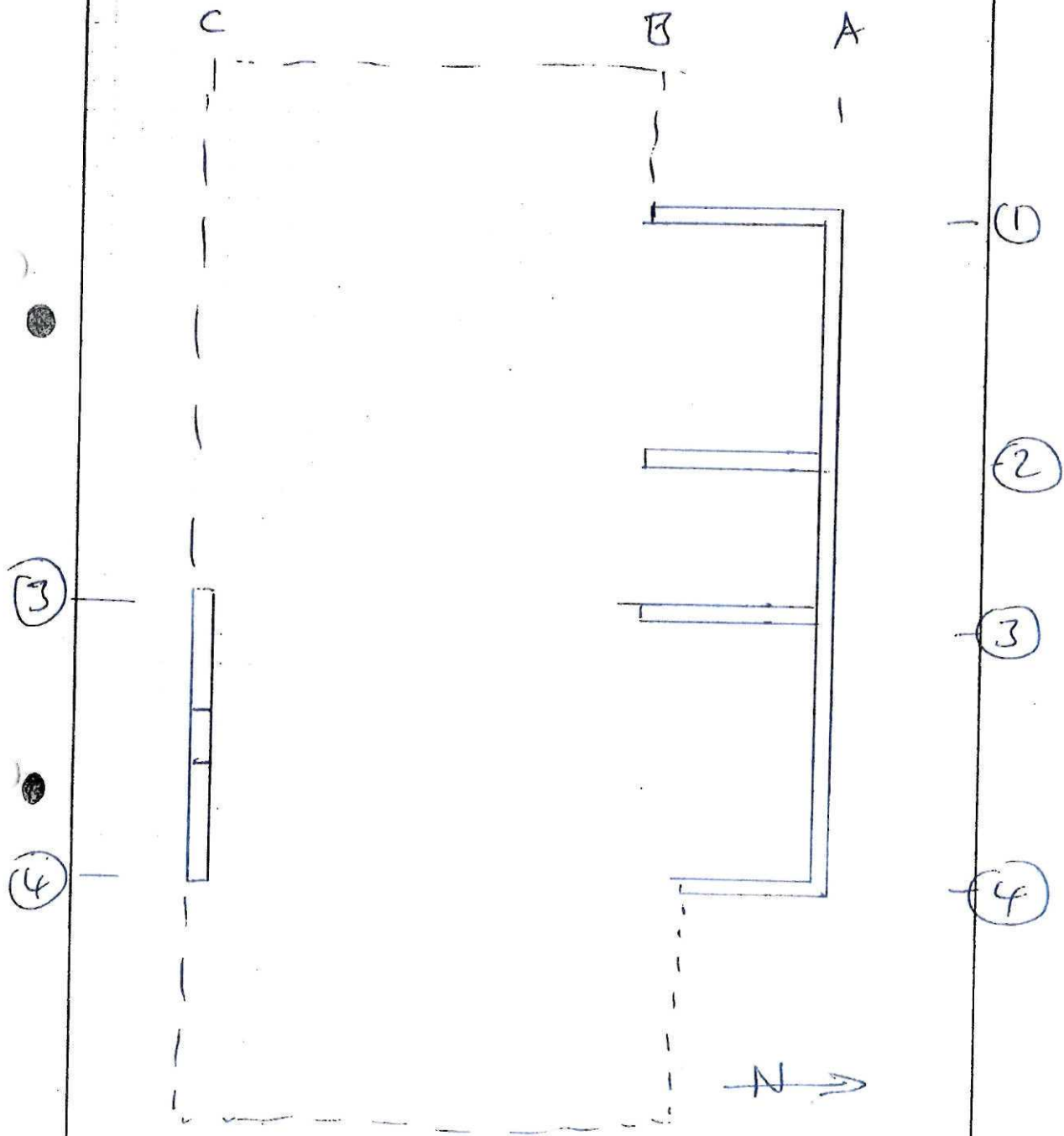
Item Number(s)	Explanation
	<p>My observation is in respect of the damage to plaster board linings. It was my view that there was greater differential movement in the north – south direction than there was in the east – west direction. This is apparent in <b>Photo 102</b>.</p>
26.	<p><i>Again in stairwell between 4<sup>th</sup> and 5<sup>th</sup>, horizontal cracking in 3 walls at 5<sup>th</sup> floor level. Also slightly sloping crack (nearly horizontal) in north wall only 1/2 m below roof level, water leak stain old.</i></p> <p>This observation was made in the northern stairwell between the fourth and fifth floors.</p> <p>Minor horizontal cracking was evident in three of the walls at the fifth floor level. There was also a minor slightly sloping crack in the northern wall 500mm below the roof level. The water staining about this crack indicated that it had been there for some time and was not earthquake related.</p> <p>This is evidence of minor structural damage. For the same reasons set out in item 11, I believe that the integrity of the shear tower walls was not compromised.</p>
27.	<p><i>5<sup>th</sup> floor column on the north face one west of the north east corner in line with east end of lift shaft, yield lines in column.</i></p> <p>This observation was made in the lift lobby to the fifth floor round column on the north side of the building in line with the east side of the shear tower.</p> <p>The reference in the note to “yield” lines is not correct. The cracks observed were fine flexural cracks. This is depicted in <b>Photos 87 and 88</b>.</p> <p>As per items 19 and 22, these cracks were likely the result of the earthquake but did not amount to significant structural damage.</p>
28.	<p><i>Damage in west wall very little at 5<sup>th</sup> floor.</i></p>

Item Number(s)	Explanation
	Observed very little damage to west wall at fifth floor level.
29.	<p><i>West wall of toilet (concrete) minor diagonal crack, ditto east wall.</i></p> <p>This observation was made in the toilets in the north shear tower on the fifth floor.</p> <p>I identified a single minor diagonal crack on each of the east and the west walls.</p>
30.	<p><i>Tank room over 5<sup>th</sup> floor W/C area minor crack in north and west walls.</i></p> <p>This observation was made in the tank room in the north shear tower. Minor cracking in the north and west walls was observed. I believe this is depicted in <b>Photo 95</b>.</p>
31.	<p><i>LMR. (Lift machine room) 3 vertical cracks in the wall east side but showing signs of efflorescence so not new.</i></p> <p>This observation was made in the Lift Machine Room in the north shear tower. The three vertical cracks that were observed showed signs of efflorescence, which indicated that water had been leaking through these cracks and suggested that they had pre-existed the September Earthquake.</p>
32.	<p><i>Level 2, double doors in north-south partition adjacent to south wall not shutting.</i></p> <p>This observation was made on the second floor.</p> <p>The double doors in the north – south partition were out of alignment. This was a consequence of the partition walls having been racked during the building movement. This is depicted in <b>Photo 102</b>.</p>
33.	<p><i>2<sup>nd</sup> floor, west wall damage Gib to concrete.</i></p> <p>This observation was made on the second floor along the west wall.</p> <p>GIB linings were damaged where they butted hard against concrete</p>

Item Number(s)	Explanation
	columns.
34.	<p><i>2<sup>nd</sup> floor, N-W partition in from the west wall has buckled at concrete column.</i></p> <p>This observation was made on the second floor.</p> <p>I believe that the reference to N-W is wrong, and it should have been N-S. On the north-south partition wall near west end of building, GIB linings were damaged where they butted hard against the concrete columns.</p>
35.	<p><i>2<sup>nd</sup> floor, W/C shear walls, only very minor cracking, diagonal, one only.</i></p> <p>This observation was made in the north shear tower toilet area at second floor level. One very minor diagonal crack was observed.</p>
36.	<p><i>No apparent cracking in NE column.</i></p> <p>This observation was made on the northeast corner of I think the second floor.</p> <p>I checked this column as a consequence of the damage that I had identified higher in the building. I saw no damage at this location.</p>



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PLAN . SHEARWALL



Job No.

Page No.

Made by:

Date:

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②

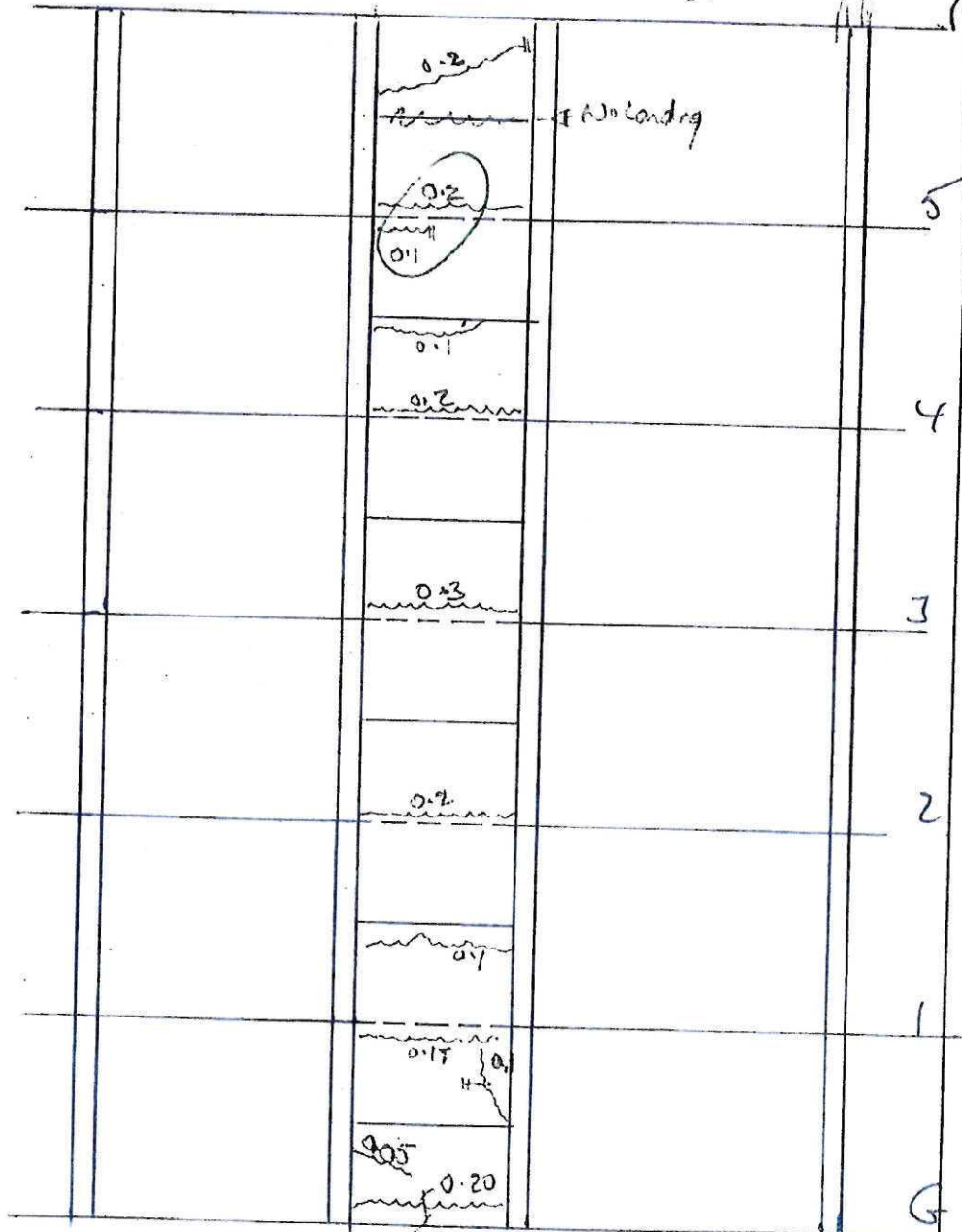
③

④

DATA ROOM

STAIR

CRFT. SHAFT



200

WALL A

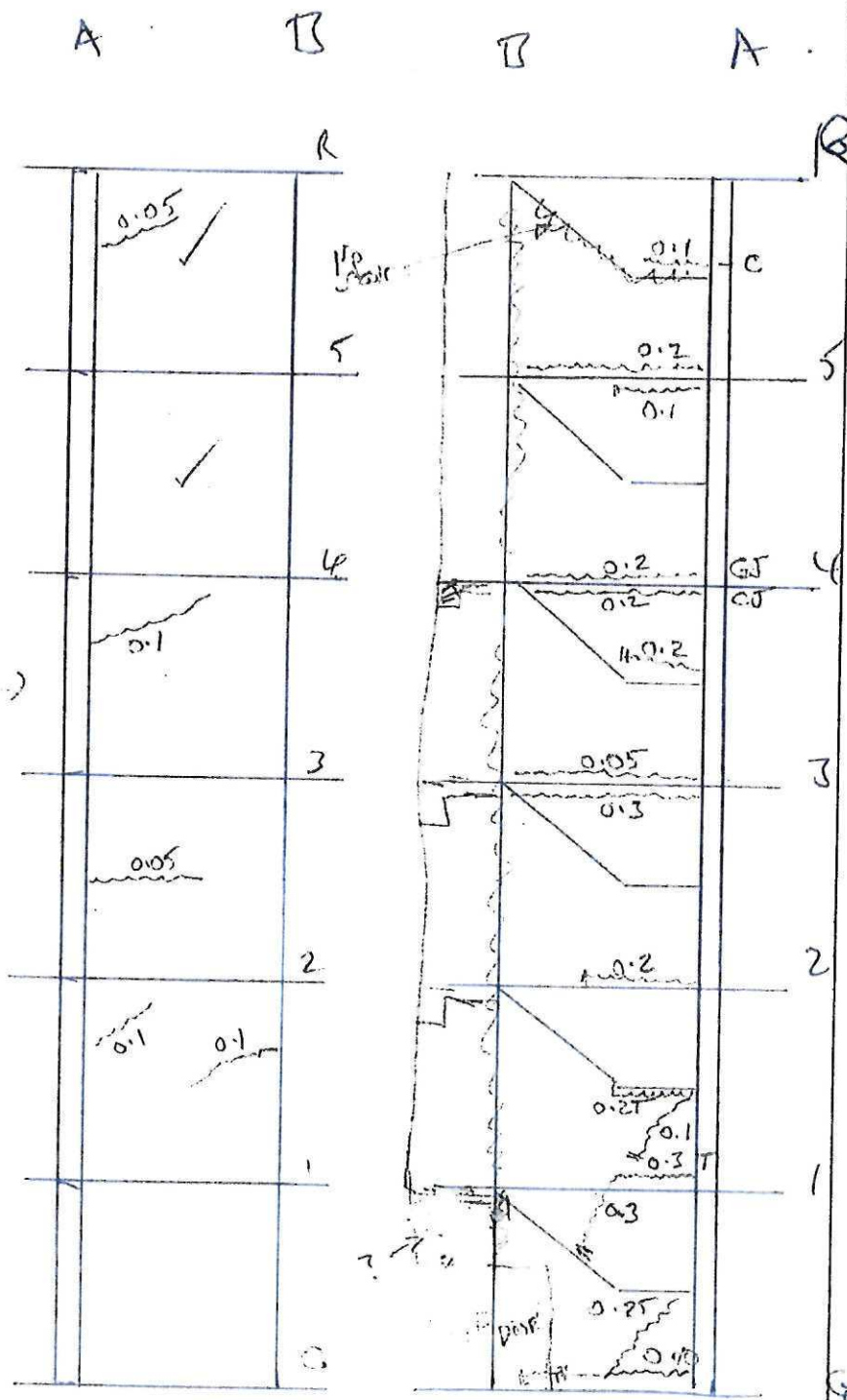




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WALL 2 FROM BATHROOM

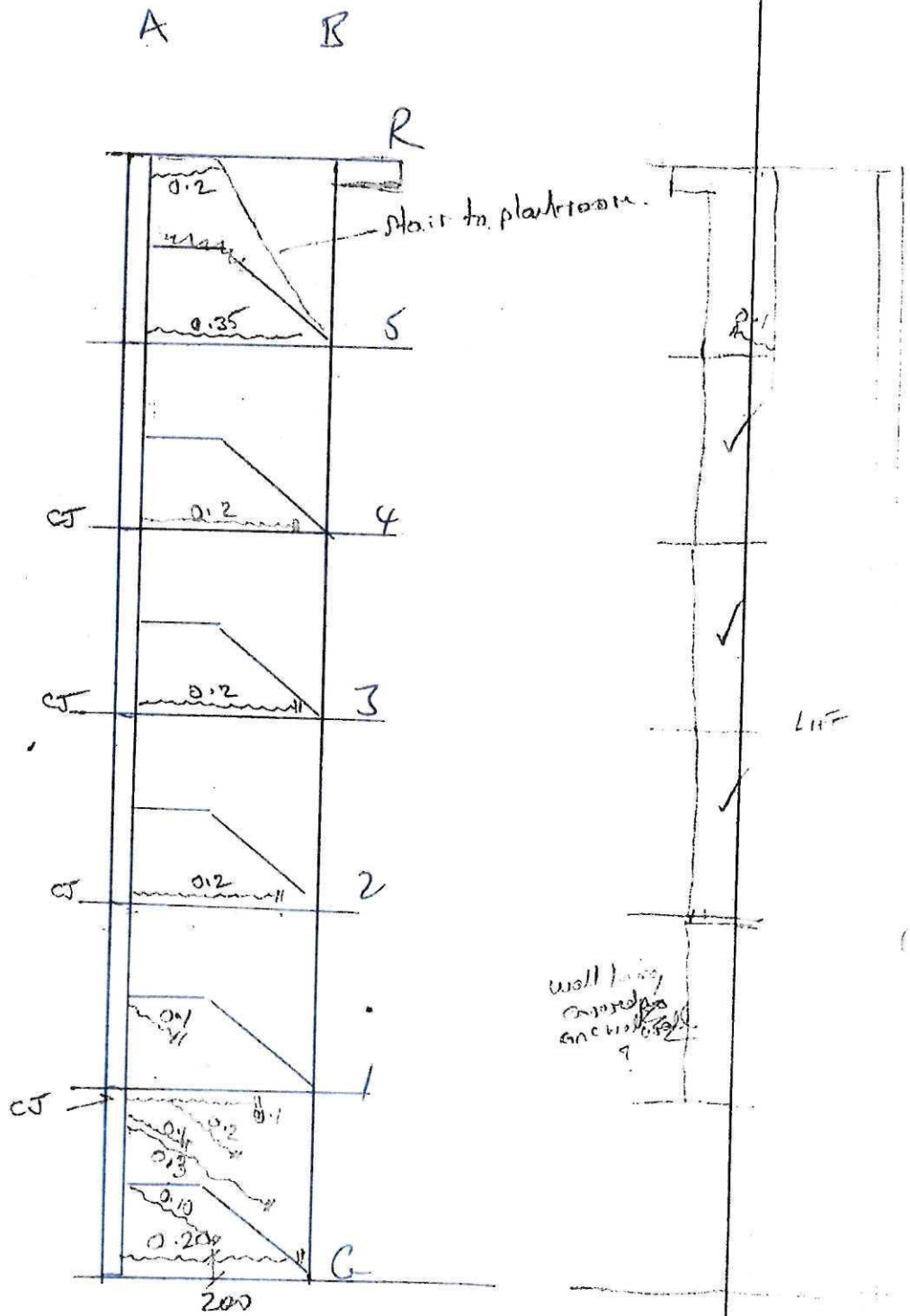
WALL 2 FROM STAIRWELL

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wall 3  
FROM STAIRWELL



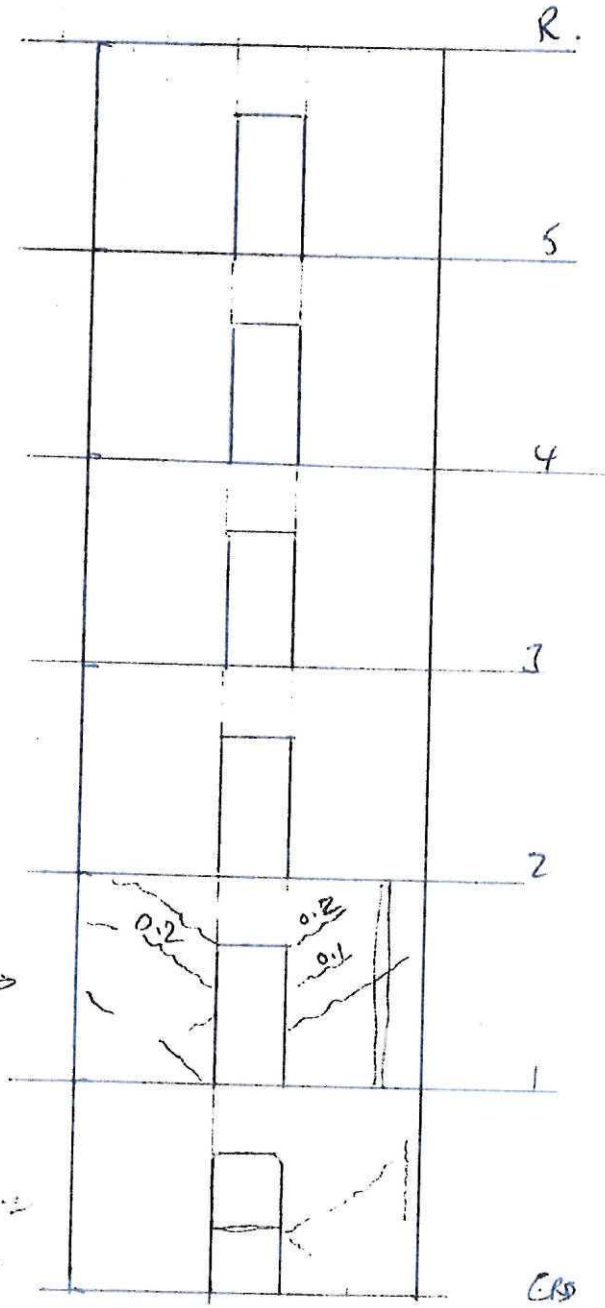


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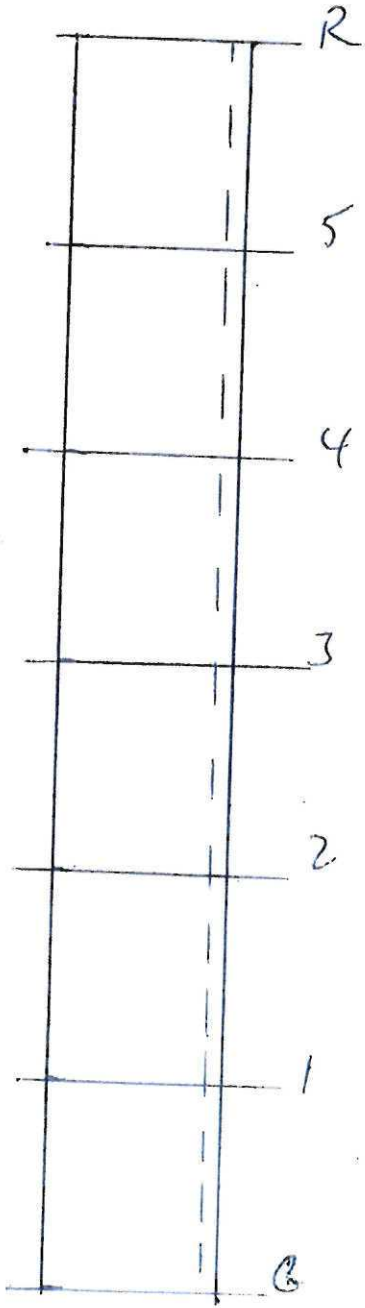
CRACK IN GYPSUM  
DUMPER OVER  
STEEL CONC →

THESE CRACKS ARE  
IN PLASTERBOARD  
LINING. ABOVE  
CEILING TILES INSIDE  
OF GRID FLOOR WALL  
IS PWSHAPT, CANT  
DETERMINE CRACKS.

INSIDE OF SOUTH WALL C.



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*This is an outside wall. Inside face is in the lift shaft.*

*WALL 4 FROM EAST SIDE*