Bronner, Laura

From: Ben Dare [BenD@holmesgroup.com]
Sent: Wednesday, 12 January 2011 9:44 am
To: BuildingRecoveryOffice
Cc: 'Nick Jennings'; Richard Seville
Subject: Press Building - 32 Cathedral Square: EQ Occupation Certificate
Attachments: 110112_105849_Press Co. EQ Occupation certificate.pdf

Attention: James Clark

Hi James,

Following the aftershock of 26/12/10 Holmes Consulting Group have completed a detailed assessment of the Press Building at 32 Cathedral Square. We have identified all potentially dangerous features and have instructed that they either be secured or removed to ensure that the structural integrity and performance of the building has been restored to at least the condition that existed prior to the earthquake of 26 December 2010. The specified works have subsequently been completed by Ganellen Property Ltd.

Please find attached a copy of our Earthquake Occupation Certificate.

Based on this we believe that the building is now secure and safe to re-occupy and that the existing red safety notice can be removed.

I will call shortly to discuss.

Regards,

Ben Dare
PROJECT ENGINEER

Holmes Consulting Group
PO Box 1266 | Queenstown
Phone: +643 441 3055 | Fax: +644 471 2336| Mobile: +64 21 2742077
Email: HYPERLINK "blocked::mailto:bend@holmesgroup.com"bend@holmesgroup.com

HolmesConsultingGroup

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Offices in
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Hamilton
Wellington
Queenstown
San Francisco

12 January 2011

Christchurch City Council - Building Recovery Office
Ground floor Civic Offices
53 Hereford Street, Christchurch

Attn: James Clark

Statement by Chartered Professional Engineer in respect of the building at:

THE PRESS BUILDING
32 CATHEDRAL SQUARE
CHRISTCHURCH

I, Benjamin Richard Dare, am a Chartered Professional Engineer (No. 1002459) with relevant experience in the structural design of buildings for earthquake actions.

I have been engaged to provide advice to the owner on the interim securing / strengthening of the above building following the earthquake of 26 December 2010. I am aware of all the measures taken to secure or strengthen the building (the work) which were carried out by:

Ganellen Pty Ltd.
150 Gloucester Street
Christchurch 8013
New Zealand

I have inspected the work on completion and am satisfied on reasonable grounds that:

a *Structural integrity and performance.* Where the structural integrity and/or structural performance of the building (or part of the building) was materially affected by the Boxing Day earthquake or any aftershocks to date, interim securing measures have been taken to restore the structural integrity and performance of the building to at least the condition that existed prior to the earthquake of 26 December 2010.

b *Potentially dangerous features.* Potentially dangerous features on the building such as unreinforced masonry chimneys, parapets and walls have been removed or secured so that their integrity and level of structural performance is consistent with that generally achieved in other parts of the building, and so reduces the danger to people's safety and of damage to other property.

c *Threat from nearby buildings.*

- Protective measures installed on the subject building are sufficient in nature and extent to protect its occupants in the event of collapse of potentially dangerous features on *adjacent or nearby buildings.*
- I have identified *all* potentially dangerous features such as unreinforced masonry chimneys, parapets and walls *on all adjacent or nearby buildings* that have potentially dangerous features which threaten the subject building or its occupants.
- Buildings which I have identified in the above category are:
  i 105 Worcester Street.
- I have advised the owner of the subject building that approval for resumption of occupancy and use will be subject to Council approval to remove the red or yellow safety notices from the buildings listed above.

Signed:

B R Dare
CHARTERED PROFESSIONAL ENGINEER

CHRISTCHURCH
CITY COUNCIL · YOUR PEOPLE · YOUR CITY

CHRISTCHURCH CITY COUNCIL

BOXING DAY EARTHQUAKE - FILE CLOSURE *(GREEN)*

Address: 32 Cathedral Sq.

CSR Number: 91224426

Building Evaluations Transition Team – Actions	**Completed**	**Date**
Level 1 Assessment Sheet completed (attached)	Yes / No	
Level 2 Assessment Sheet completed (attached)	Yes / No	
1. Structural report received , reviewed & accepted Name; (print)	Yes / No	
Comments: (Use reverse or add attachment)		PROCESSED
1.1 Property owner / agent advised via Email / Writing – copy attached to file and saved Trim		
2. Final Structural report received , reviewed & accepted Name; PAUL CAMPBELL CPEng (Opus) (print)	Yes / No	
Comments: (Use reverse or add attachment) Accept certificate to use/occupation of building by Ben Dave CpEng remove ~~Sept~~ Dec 26 Section 124 Paul A Campbell 12/1/11		
2.2 Property owner / agent advised via Email / Writing – copy attached to file and saved Trim		
Final Action:		
Barricades removed	Yes / No	
Notices removed	Yes / No	
Data Entry - Updated	Completed	Date
CSR Records Updated	Yes / No	
XL Spreadsheet Updated	Yes / No	
Completed By : (Print Name)		

Telecon Campbell/John Here
20/1/11 Barricades can be removed
Paul A Campbell 21/1/11

Bronner, Laura

To: CDRescue
Cc: Ben Dare
Subject: Press Building

Hi Ben,

Thank you for sending in the report for 32 Cathedral Square. Please be advised that the building is now safe for occupancy. Any placards can be removed and business can resume. Please advise the owner.

Kind Regards,

Laura Bronner
Building Recovery
Christchurch City Council
53 Hereford Street, Christchurch 8011
PO Box 73014, Christchurch 8154
Phone: (03) 941 5481
E-mail: Laura.Bronner@ccc.govt.nz

Baker
Kavanagh
architects

Damage Report, JANUARY 2011

The Press Heritage Building
Cathedral Square, Christchurch New Zealand
Buildings 1 of The Press Precinct

- Building 1 being 32 Cathedral Square, Sec 698 23B/71

27th January 2011

Survey carried out on 19th and 20th January 2011 by Christian Tonnius, BKA for Ganellen, 150 Gloucester Street, Christchurch 8013, New Zealand.

The Press Building on Cathedral Square

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Architects Pty Ltd
ABN 88 081 700 352

Index

References and Appendices

Introduction

Baker Kavanagh Architects were commissioned by Ganellen Pty Ltd, the owner of Building 1 of The Press Precinct as described on the cover page, to carry out a survey of damages of mentioned building after the earthquake that struck Christchurch on 4th September 2010 and subsequent major aftershock on Boxing Day 2010. This report describes all damage after mentioned aftershock, damages from main earthquake are excluded and described in previous report dated 16th September 2010.

The site inspection was carried out on 19th and 20th January 2011.

Property Description

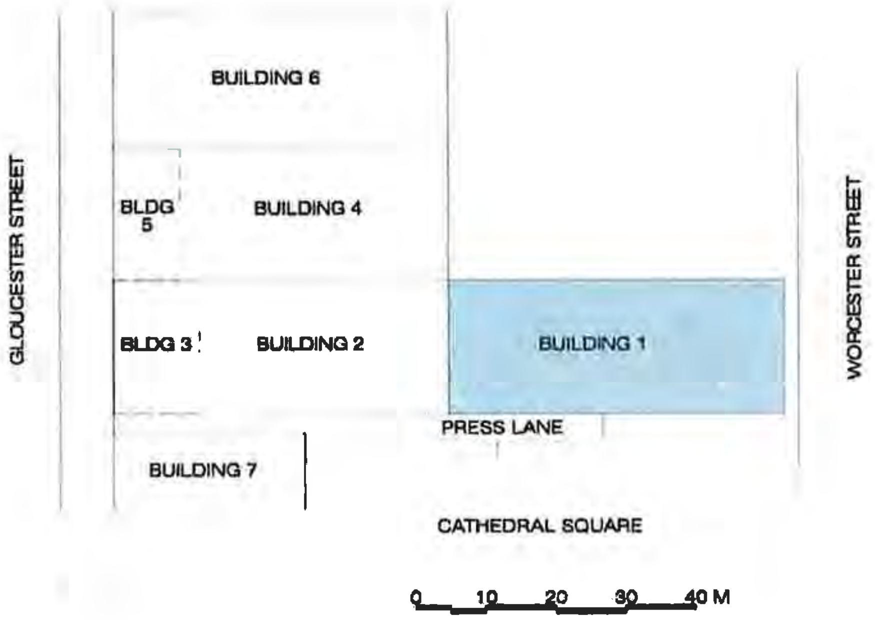
The Press building is an intrinsic part of the group of protected heritage buildings around the perimeter of Cathedral Square, the city's premier urban open space. The Press, Christchurch Cathedral, Warner's hotel, the Lyttelton Times Star building and the former government buildings form a significant group of late Victorian, early Edwardian, buildings which define the north east quadrant of Cathedral Square. The location is vitally important in the historic fabric of the city, being a focal point for urban development since the regions' inception.

For location of the sites, please refer to site plan below.

The Press building consists of four levels plus basement, which also includes a turret at the southwestern corner of the building continuing above the parapet.

It is currently used by Fairfax Media as their head office of the Christchurch Press newspaper. The basement is used as a carpark, the upper levels as office space.

The structure is a combination of structural steel, ferro cement (reinforced concrete) and brickwork infill with architectural stone applications around windows and other parts on its façade.



Site Plan, not to scale.

The Report

This report is to identify any damage to the buildings that occurred after the major aftershock dating Boxing Day 2011. It assesses any work required to reconcile damage to the building to reinstate the condition before the aftershock.

Great care has been applied to survey all architectural and decorative damages, notwithstanding that certain reported damage may be structural as well.

This is not a structural dilapidation report. For structural integrity of the building please refer to report prepared by Holmes Consulting Group.

This report has been prepared by Mr. Christian Tonnius of Baker Kavanagh Architects to document the stage of the property after the aftershock until the day the survey was completed (20th January 2011)

This report is not to be used for any other purpose. The report is for the exclusive use of Ganellen Pty Ltd and Baker Kavanagh Architects and no responsibility/liability is accepted as the result of the use of this report by any other party.

This inspection is a visual inspection only of areas where they are not obstructed by vegetation, building finishes, fixtures, furnishings, building materials and the like. We have not moved any objects that could be covering the structure. No testing has been carried out. Pit lids have not been lifted to inspect pit interiors. The building at the time of the inspection is tenanted by Fairfax Media, The Christchurch Press.

There were walls and floor areas which were concealed by those materials. The report does not cover issues such as building services, hazardous materials, fire safety, drainage, plant, machinery, illegal building works, nor does it consider requirements of the Building Code of New Zealand.

Certification of any building or road works is excluded from this report. The existence or damage of asbestos products or other hazardous material has not been reported on.
The purpose of the report is to record the condition of the property and any major defects of the building or areas surveyed at the time of the inspection after the earthquake.

This report is not a structural report or a minor defects report but is a visible/photographic recording at the time of the survey.

Recommendation

We recommend a report, which records significant defects and tests to be done to ensure the building is structurally sound and acceptable to be occupied by the tenant again.

We recommend a consultant from each discipline to report on the different trades associated with the building to ensure all damage be covered.

Whilst this report may show or comment on the following services: electrical, gas, plumbing, drainage, fire, air-conditioning etc, we claim no expertise and advise that the relevant qualified expert be consulted for further advice.

Condition of the Property

The general defects are commonly associated with:

- Cracking
- Water ingress
- Possible lack of general maintenance

Any cracking noted in this report is a record only of the existence of the cracks. A structural engineer should be consulted to advise on the seriousness of the cracks and to make any recommendations.

Generally the areas inspected are in average to minor damaged condition for a building after a 7.1 earthquake and subsequent 4.9 aftershock. There is significant cracking occurring around the windows, in from level 1 on, at the edges of the external sills and the arched lintels.

These are not described in further detail in this report, please refer to original report dated 16th September 2010. Where additional damage to these areas occurred these will be picked up in this report.

As far as damage on internal/external paint work on existing window frames is concerned, it can be noted that additional damage after the Boxing Day event occurred throughout the building

Suspended ceilings have collapsed in areas and have been moved around considerably, which shows in misalignment of whole areas of ceiling.

Superficial cracking of paint and plasterboard occurs mainly in corners and along edges.

Some window glass has cracked and is described separately where it occurs.

Some leaking has been observed on level 3 and on ground floor, separately described n the list and photos.

The area around the north end of the building, in particular the north western and north eastern corners, seems= to have been hit the worst by the aftershock and at the time of the inspection was already visited by a structural engineer and appeared to have been secured as good as time allowed.

Ground floor female bathroom in the northern half of the building experienced major damage from a neighbouring building falling parapet. This damage was so severe that it had to be repaired before the inspection took place to allow the building to be used by the tenant continuously.

The internal lightweight partition walls seem to be generally in ordinary condition. Again cracking could mainly be found around the edges and corners.

This report has taken great care to only include new, after-aftershock damage but it can't be determined unreservedly by the author that the damage observed was caused by the aftershock or not.

This report is a true record of the existing condition of the above property at the date of the inspection.

Please refer to appendices and photos for further information of building condition and any other reports commissioned by Ganellen (structural, Urgent Remedial Works, etc).

All cracks observed and described in attached list and photos may well be more than superficial cracks and will have to be checked by a structural engineer.

Terms and Conditions

1. SPECIAL CONDITIONS

1.1 The basis for this Report is that BKA has been appointed solely to conduct an inspection of the premises and to provide an evaluation on the matters contained within the Report.

1.2 The Report is not a guarantee or warranty, but is a professional opinion on the condition of the subject property.

1.3 The Report is only valid for the date of the inspection and is based on the condition of the property and the prevailing structural, soil and weather conditions at the time of the inspection.

1.4 The Report overrides any verbal report provided by BKA or architect or any conversation that may take place between BKA or its architect and Ganellen.

2. SCOPE OF THE INSPECTION & THE REPORT

2.1 The purpose of the inspection is to provide advice to Ganellen regarding the condition of the property at the date and time of inspection.

2.2 The Report is not a certificate of compliance that the property complies with the requirements of any Act, regulation, ordinance, local law of by- law, or as a warranty or an insurance policy against problems developing with the building in the future.

2.3 The Report is prepared and presented, unless stated otherwise, under the assumption that the existing use of the building will continue as a commercial property.

2.4 Areas for Inspection shall cover all safe and reasonably accessible areas. This means the Report will not extend to any areas where there were physical limitations which inhibit or prevent access and inspection, including but not limited to fixed ceilings, wall linings, floors covered by floor coverings, fixtures, fittings and furniture containing clothes and other stored article/materials, thermal insulation, etc.

2.5 BKA will report individually on major defects and safety hazards evident and visible on the date and time of the inspection.

2.6 Where a major defect has been identified, BKA will give an opinion as to why it is a major defect and specify its location.

3. LIMITATIONS

3.1 Areas where reasonable entry is denied to the architect, or where safe and reasonable access is not available, are excluded from and do not form part of the inspection. Those areas may be the subject of an additional inspection upon request following the provision or reasonable entry and access.

3.2 Nothing in the Report and this Agreement implies that the inaccessible areas are free from defects.

3.3 If the property to be inspected is occupied then Ganellen must be aware that furnishings or household items may be concealing evidence of problems, which may only be revealed when the items are moved or removed.

4. EXCLUSIONS

4.1 The Inspection excludes:

the inside of walls; between floors; inside skillion roofing; inside eaves;
behind stored goods in cupboards; and any other areas that are concealed or obstructed. gouge; force; move any items on the properties we inspect; or perform any other invasive procedure.

4.2 Insulation and sisalation in the roof void will conceal timbers and may make inspection of the area unsafe for architect. An invasive inspection will not be performed unless a separate agreement is entered into.

4.3 Where the Report states that insulation is present in the roof in accordance with Clause 4.2, it is strongly recommend that Ganellen engages an electrician to check that the insulation has not been placed over lights or electrical cables since this condition can present a substantial fire risk.

4.4 The Inspection WILL NOT:

make reference to the testing of any electrical appliances on the property, nor any opinion as to the working order of electrical circuitry or appliances. If further investigations are required, it is recommended Ganellen consults with an electrician. BKA takes no responsibility for these matters.

make any reference as to plumbing and BKA take no responsibility for these matters.

report on any defects which may not be apparent due to prevailing weather conditions at the time of the inspection. Such defects may only become apparent in differing weather conditions.

involve any invasive inspection including cutting, breaking apart, dismantling, removing or moving objects including, but not limited to, roofing, wall and ceiling sheeting, ducting, foliage, mouldings, debris, roof insulation, sarking, sisalation, floor or wall coverings, sidings, fixtures, floors, pavers, furnishings, appliances or personal possessions.

report on minor defects and imperfections.

guarantee that the property is free from defects or does not require maintenance. The Report may not cover all maintenance items, such as jamming doors, windows or catches,

decorative finishes and hair-line or slight cracks.

disclose defects which have not yet arisen. Changes in usage can cause defects and any abuse of the premises is likely to do so.

report on the structural design or adequacy of any element of construction.

report on the operation of fireplaces and chimneys.

report on any appliances such as dishwashers, insinkerators, ovens, stoves and ducted vacuum systems.

report on whether the ground on which the building rests has been filled, is liable to subside, is subject to landslip tidal inundation, or if it is flood prone.

4.5 ASBESTOS: No inspection for asbestos will be carried out at the property and no report on the presence or absence of asbestos will be provided. If during the course of the Inspection asbestos or materials containing asbestos happened to be noticed then this may be noted in the general remarks section of the report. Drilling, cutting or removing sheeting or products containing asbestos is a high risk to people's health. If asbestos is noted as present within the property then Ganellen agrees to seek advice from a qualified asbestos removal expert as to the amount and importance of the asbestos present and the cost sealing or of removal.

4.6 MOULD (MILDEW) AND NON-WOOD DECAY FUNGI DISCLAIMER: No inspection or report will be made for Mould (Mildew) and non-wood decay fungi including no report on the presence or absence of Mould will be provided. However, Mould and their spores may cause health problems or allergic reactions such as asthma and dermatitis in some people. If Mould is noted, it is recommended Ganellen seek the advice from a qualified expert.

5. ESTIMATING DISCLAIMER

5.1 Any estimates provided in the Report are merely opinions of possible costs that could be encountered, based on the knowledge and experience of the architect, and are not estimates in the sense of being a calculation of the likely costs to be incurred.

The estimates are NOT a guarantee or quotation for work to be carried out. BKA accepts no liability for any estimates provided throughout the report and where estimates are provided, Ganellen agrees to obtain and rely on independent quotations for the same work.

6. THIRD PARTY DISCLAIMER

6.1 The Report will be made solely for the use and benefit of Ganellen. No liability or responsibility whatsoever, in contract or tort, including for any loss, damage, cost or expense, whatsoever, suffered or incurred by any Person other than Ganellen, is accepted to any third party who may rely on the report wholly or in part. Any third parties acting or relying on the report, in whole or in part, will do so at their own risk.

7. DISPUTE RESOLUTION

7.1 In the event of a dispute of a claim arising out of, or relating to the inspection or the Report, or any alleged negligent act, error or omission on BKA's part or on the part of the architect conducting the inspection, either party may give written notice of the dispute or claim to the other party.

8. RELEASE

8.1 Ganellen releases BKA from any and all claims, actions, proceedings, judgments, damages, losses, interest, costs and expenses of whatever nature that the Person may have at any time hereafter arising from the unauthorised provision or sale of the Report by Ganellen to a Person without BKA's express written permission.

9. INDEMNITY

9.1 Ganellen agrees to indemnify BKA in respect of any and all liability, including all claims, actions, proceedings, judgments, damages, losses, interest, costs and expenses of any nature, which may be incurred by, brought, made or recovered against BKA arising directly or indirectly from the unauthorised provision or sale of the Report by Ganelen to a Person without the BKA's express written permission.

9.2 Ganellen agrees that BKA cannot accept any liability BKA's failure to report a defect that was concealed by the owner of the building being inspected and Ganellen agrees to indemnify BKA for any failure to find such concealed defects.

9.3 If Ganellen fails to follow BKA's recommendations then Ganellen agrees and accepts that they may suffer a financial loss and indemnify BKA against all losses that Ganellen incurs resulting from Ganellen failure to act on BKA's advice.

Baker
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Appendices

Photo Register – Appendix A

Numbering

#1	Number of Building within Press Precinct (#1 to #7)	
Level/Location	/B	Basement
	/G	Ground Floor
	/1	First Floor
	/2	Second Floor
	/3	Third Floor
	/R	Roof
	/E	External
	/SN or SS	Stair north or south
	/F	Facade
-1	Photo number	

For example: **#2/2-225** — **Building 2, Level 2, Photo number 225**

For location refer to attached architectural drawings.

1.1	Basement	Photo pages	1	to	7
1.2	Ground Floor	Photo pages	8	to	11
1.3	First Floor	Photo pages	12	to	18
1.4	Second Floor	Photo pages	19	to	27
1.5	Third Floor	Photo pages	28	to	44
1.6	Roof	Photo pages	45	to	52
1.7	Façade	Photo pages	53	to	61

Plan Register – Appendix B

Basement Plan	**Page 1**
Ground Floor Plan	**Page 2**
First Floor Plan	**Page 3**
Second Floor Plan	**Page 4**
Third Floor Plan	**Page 5**
Roof Plan	**Page 6**

1 Building 1 – The Press Heritage Building

1.1 Basement – survey conducted on 19th January 2011

#1/B-1	Cracks in blockwork
#1/B-2	Cracks along concrete slab
#1/B-3	Cracks along concrete slab
#1/B-4	Cracks along concrete slab
#1/B-5	Cracks along concrete slab
#1/B-6	Cracks along concrete slab
#1/B-7	Cracks along concrete slab
#1/B-8	Cracks along concrete slab
#1/B-9	Cracks along concrete slab
#1/B-10	Cracks along concrete slab
#1/B-11	Crack to concrete column
#1/B-12	Crack along concrete beam
#1/B-13	Cracking to blockwork along steel beam
#1/B-14	Cracks along concrete slab
#1/B-15	Cracks along concrete slab
#1/B-16	Cracks along concrete slab
#1/B-17	Cracks along concrete slab
#1/B-18	Cracks along concrete slab
#1/B-19	Cracks along concrete slab
#1/B-20	Cracks along concrete slab

#1/B-21 to B-25 Additional damage to stair 2 (north), including cracking in render, paint and brickwork.

1.2 Ground Floor – survey conducted on 19th January 2011

#1/G-1	Already fixed toilet that was damaged from falling debris
#1/G-2	Already fixed ceiling that was damaged from falling debris
#1/G-3	Damaged toilet seat
#1/G-4	Water ingress through ceiling
#1/G-5	Window broken and boarded
#1/G-6	Window broken and boarded
#1/G-7	Water ingress through ceiling
#1/G-8	Water ingress through ceiling
#1/G-9	Wet carpet
#1/G-10	Damage to roof
#1/G-11	Damage to roof
#1/G-12	Damage to roof
#1/G-13	Typical additional damage to window frame paint and external façade paint and cracks to external stone work

1.3 First Floor – survey conducted on 19th January 2011

#1/1-1	Cracking in internal paint and render
#1/1-2	Cracking in internal paint and render
#1/1-3	Additional cracks in stair 2, north
#1/1-4	Cracking in internal paint and render
#1/1-5	Cracking in internal paint and render
#1/1-6	Cracking in internal paint and render
#1/1-7	Cracking in internal paint and render
#1/1-8	Additional cracks in stair 1, south
#1/1-9	Cracking in internal paint and render
#1/1-10	Cracking in internal paint and render
#1/1-11	Cracking in internal paint and render
#1/1-12	Damage to roof in light well
#1/1-13	Cracking in internal paint and render
#1/1-14	Cracking in internal paint and render
#1/1-15	Cracking in internal paint and render
#1/1-16	Cracking in internal paint and render
#1/1-17	Extreme cracking in internal paint and render
#1/1-18	Cracking in internal paint and render
#1/1-19	Cracking in internal paint and render
#1/1-20	Cracking in internal paint and render
#1/1-21	Cracking in internal paint and render
#1/1-22	Cracked window pane and typical damage to internal window frame and adjacent render and paint
#1/1-23	Boarded broken window
#1/1-24	Extended cracking in ground floor office
#1/1-25	Cracks to external brickwork
#1/1-26	Cracks in concrete beam
#1/1-27	Additional cracks in stair 1, south
#1/1-28	Additional cracks in stair 1, south

1.4 Second Floor - survey conducted on 19th January 2011

#1/2-1	Stair render completely come off and covered with fabric fro protection
#1/2-2	Architectural balustrade detail warped
#1/2-3	Stairs up to level 3 sagging, additional damage to already existing after 4th Sept
#1/2-4	Typical damage to window frames and surrounding paint and render
#1/2-5	Boarded window
#1/2-6	Cracking in internal paint and render
#1/2-7	Cracking in internal paint and render
#1/2-8	Cracking in internal paint and render
#1/2-9	External brickwork in light well cracked
#1/2-10	Cracking in internal paint and render
#1/2-11	Cracking in internal paint and render
#1/2-12	Extreme damage to external brickwork
#1/2-13	Cracks in render/concrete?
#1/2-14	External brickwork cracked
#1/2-15	External brickwork cracked
#1/2-16	Cracking in internal paint and render
#1/2-17	Cracking in internal paint and render
#1/2-18	Cracking in internal paint and render
#1/2-19	Cracking in internal paint and render, ceiling, wall
#1/2-20	Cracking in internal paint and render
#1/2-21	Cracking in internal paint and render
#1/2-22	Cracking in internal paint and render
#1/2-23	Cracking in internal paint and render
#1/2-24	Cracking in internal paint and render
#1/2-25	Suspended Ceiling detached
#1/2-26	Cracking in internal paint and render
#1/2-27	Internal lining damaged for structural inspection
#1/2-28	Cracking in internal paint and render
#1/2-29	Cracking in internal paint and render
#1/2-30	Cracking in internal paint and render
#1/2-31	Cracking in internal paint and render
#1/2-32	Additional damage to stair 2 (south)
#1/2-33	Additional damage to stair 2 (south)
#1/2-34	Additional damage to stair 2 (south)

1.5 Third Floor – survey conducted on 20th January 2011

#1/3-1	Water ingress into level 3 office, damage for inspection to suspended ceiling
#1/3-2	Water ingress into level 3 office, damage for inspection to suspended ceiling
#1/3-3	Stair render completely come off and covered with fabric fro protection
#1/3-4	Stair render completely come off and covered with fabric fro protection
#1/3-5	Stair render completely come off and covered with fabric fro protection
#1/3-6	Extreme cracking in internal paint and render
#1/3-7	Stair render completely come off and covered with fabric fro protection
#1/3-8	Stair render completely come off and covered with fabric fro protection
#1/3-9	Stair render completely come off and covered with fabric fro protection
#1/3-10	Stair render completely come off and covered with fabric fro protection
#1/3-11	Cracks to lintel around sky light
#1/3-12	Cracks to lintel around sky light
#1/3-13	Cracking in internal paint and render
#1/3-14	Cracking in internal paint and render
#1/3-15	Cracking in internal paint and render
#1/3-16	Cracking in internal paint and render
#1/3-17	Cracking in internal paint and render
#1/3-18	Cracking in internal paint and render
#1/3-19	Cracks to ceiling
#1/3-20	Cracks to ceiling
#1/3-21	Cracking in internal paint and render
#1/3-22	Cracks to safe room door frame
#1/3-23	Cracking in internal paint and render
#1/3-24	Broken windows to south façade boarded
#1/3-25	Broken windows to south façade boarded
#1/3-26	Cracks to ceiling
#1/3-27	Boarded window, typical damage to window frames and adjacent wall
#1/3-28	Cracks to ceiling
#1/3-29	Extreme cracking in internal paint and render
#1/3-30	Cracking in internal paint and render
#1/3-31	Cracking in internal paint and wallpaper
#1/3-32	Cracking in internal paint and wallpaper
#1/3-33	Extreme cracking in internal paint and render
#1/3-34	Extreme cracking in internal paint and render
#1/3-35	External brickwork cracked
#1/3-36	External brickwork cracked
#1/3-37	External brickwork cracked around window
#1/3-38	External brickwork cracked
#1/3-39	Typical damage to window frame paint
#1/3-40	Skirting board cracked, carpet warped
#1/3-41	Cracking in internal paint and render
#1/3-42	Cracking in internal paint and render
#1/3-43	Windows broken and boarded
#1/3-44	Cornice cracked
#1/3-45	Cracking in internal paint and render
#1/3-46	Cracking in internal paint and render
#1/3-47	Cracking in internal paint and render
#1/3-48	Cracking in internal paint and render
#1/3-49	Windows broken and boarded
#1/3-50	Concrete cracked along edge wall ceiling, extended from last report
#1/3-51	Concrete cracked along edge wall ceiling, extended from last report
#1/3-52	Concrete cracked along edge wall ceiling, extended from last report
#1/3-53	External strapping of façade
#1/3-54	Window pane cracked
#1/3-55	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-56	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-57	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-58	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-59	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-60	Extended damage and cracking to brickwork and render in stair 2, south

Third floor, building 1 continued

#1/3-61	Extended damage and cracking to brickwork and render in stair 2, south
#1/3-62	Cracking in internal paint and render
#1/3-63	Cracking in internal paint and render
#1/3-64	Cracking in internal paint and render
#1/3-65	Cracking in internal paint and render
#1/3-66	Cracking in internal paint and render

1.6 Roof – survey conducted on 20th January 2011

#1/R-1	Cracked brickwork to turret
#1/R-2	Cracked brickwork to turret
#1/R-3	Cracked brickwork to turret
#1/R-4	Cracked brickwork to turret
#1/R-5	Parapet cracked
#1/R-6	Parapet cracked
#1/R-7	Membrane faulty
#1/R-8	Parapet cracked
#1/R-9	Skylight glass cracked
#1/R-10	Skylight glass cracked
#1/R-11	Cracks to parapet stone, render and steel
#1/R-12	Cracks between brick wall and corrugated iron wall
#1/R-13	Membrane faulty
#1/R-14	Flashing connection broken
#1/R-15	Parapet cracked
#1/R-16	Parapet cracked
#1/R-17	Brickwork cracked
#1/R-18	Membrane faulty
#1/R-19	Membrane faulty
#1/R-20	Membrane faulty
#1/R-21	Parapet brickwork cracked
#1/R-22	Parapet brickwork cracked
#1/R-23	Parapet brickwork cracked
#1/R-24	Membrane faulty
#1/R-25	Membrane faulty
#1/R-26	Parapet brickwork cracked
#1/R-27	Brickwork cracked in pigeon loft
#1/R-28	Brickwork cracked in pigeon loft
#1/R-29	Brickwork cracked in pigeon loft

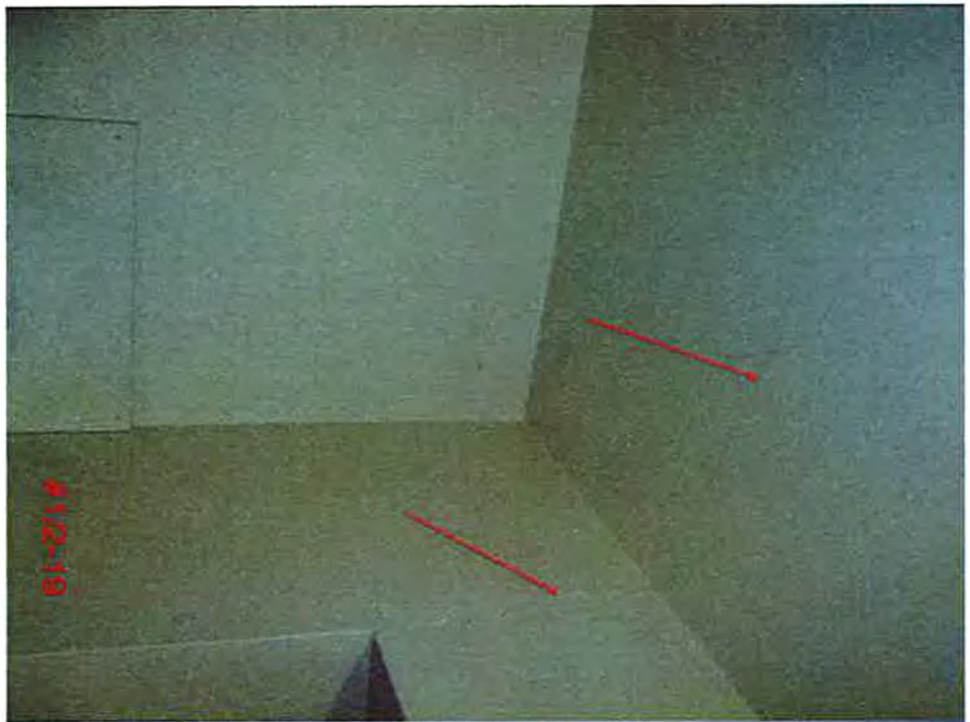
At the date of the survey water ingress into the building through the roof was reported on by the tenant and their representatives in areas mentioned in above list. Due to the extended damage to flashings and membrane as shown in the pictures it can't be ruled out that more damage that will result in water getting into the building has occurred.

1.7 Façade - survey conducted on 20th January 2011

#1/F-1	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-2	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-3	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-4	Strapping and boarded windows to south facade
#1/F-5	Strapping and boarded windows to south facade
#1/F-6	Boarded single window to south façade
#1/F-7	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-8	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-9	Cracks in window arches, typically grown bigger after Boxing Day, broken window
#1/F-10	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-11	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-12	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-13	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-14	Typical damage to edges of windows, cracks to paint and render or stone
#1/F-15	Cracks in window arches, typically grown bigger after Boxing Day
#1/F-16	Damage to stone at bottom of turret, roof level
#1/F-17	Damage to stone at bottom of turret, roof level
#1/F-18	Damage to stone and paint work to bottom of south-west corner
#1/F-19	Damage to stone at bottom of turret, roof level
#1/F-20	Damage to stone at bottom of turret, roof level
#1/F-21 to F-32	Pictures 21 to 32 showing all details of damage to South façade which was additionally damaged during the Boxing Day aftershock.
#1/F-33	Crack in paint work near Press Lane entry
#1/F-34	Cracked brickwork to light well, east

Please refer to appendix, plans and photos See ground floor plan for location reference (Page 2).

The south façade of the building was exceptionally more damaged during the aftershock on Boxing Day 2010. We have included photos of all sections of the façade to document the damage and be able to assess the additional damage after the 4th September 2010 earthquake.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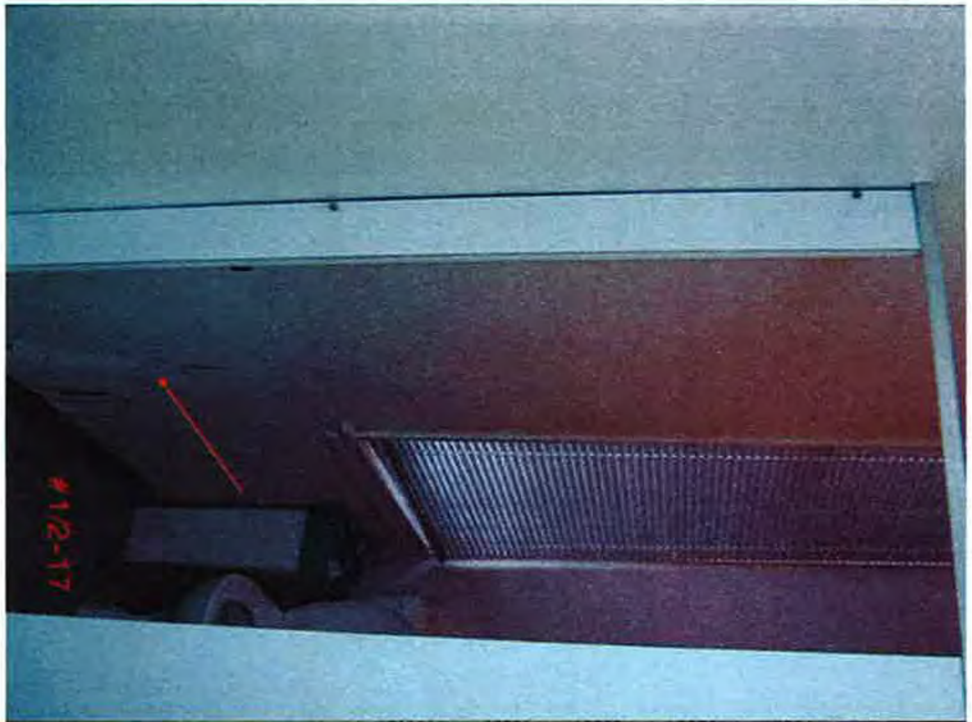
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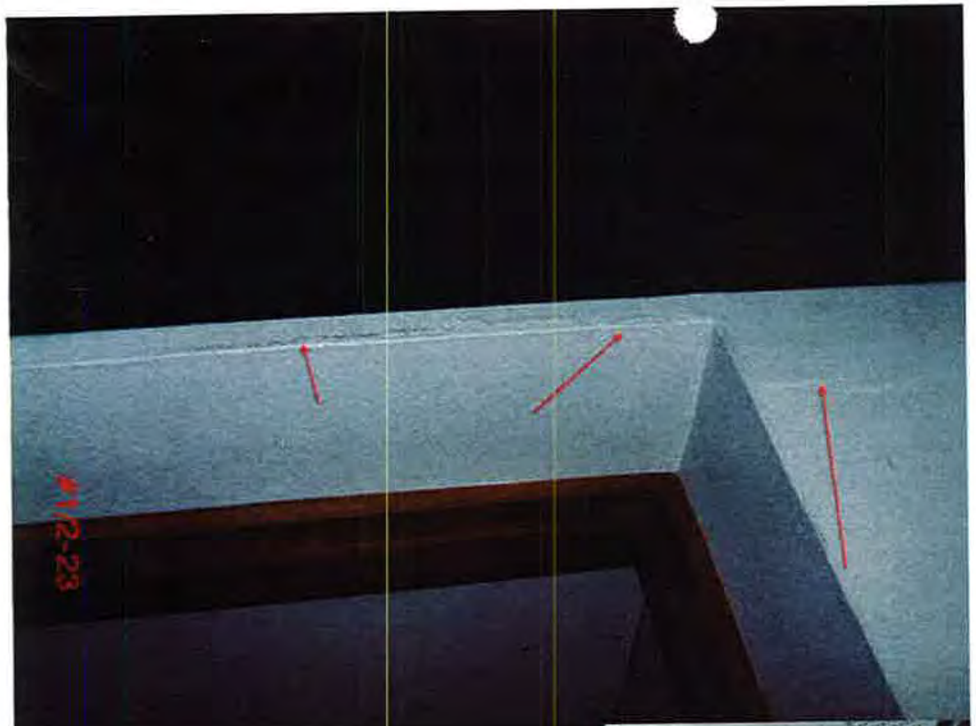

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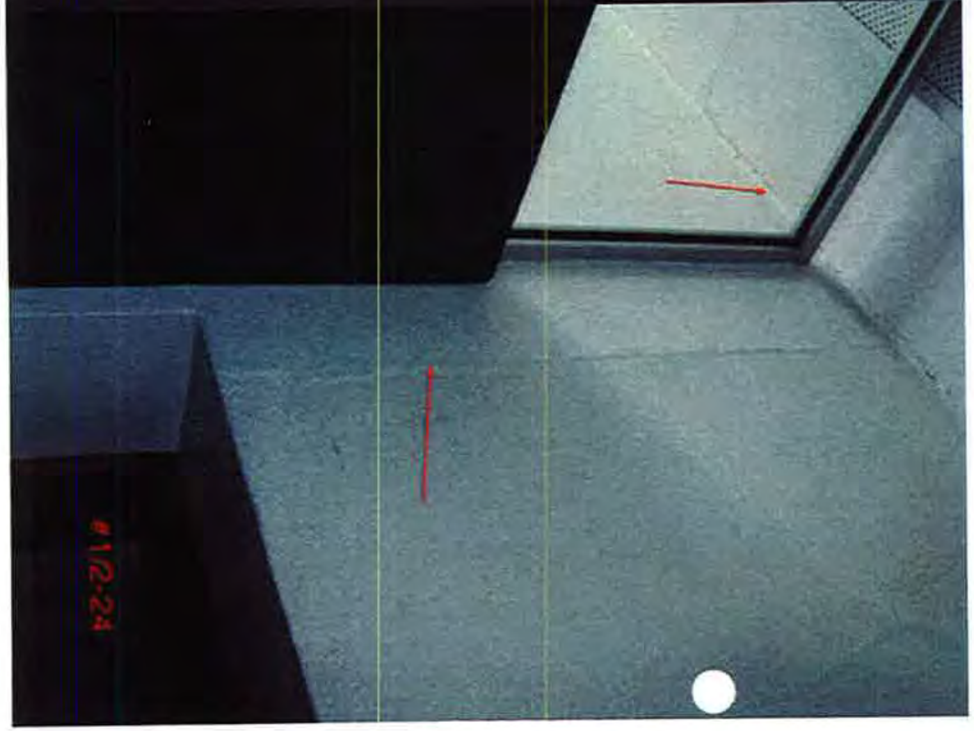

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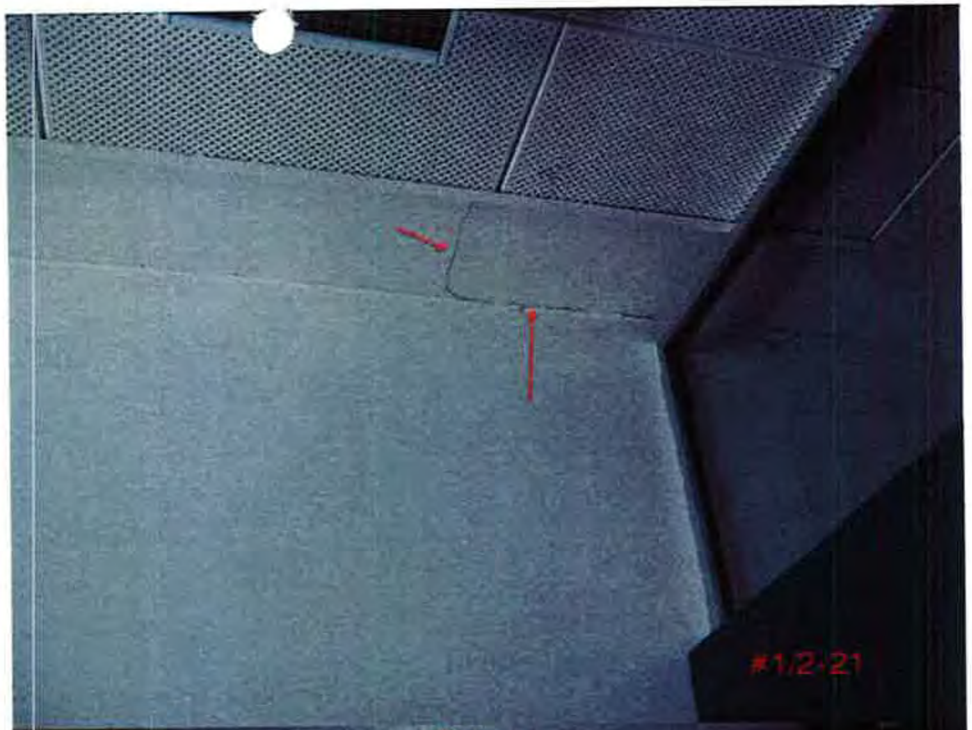

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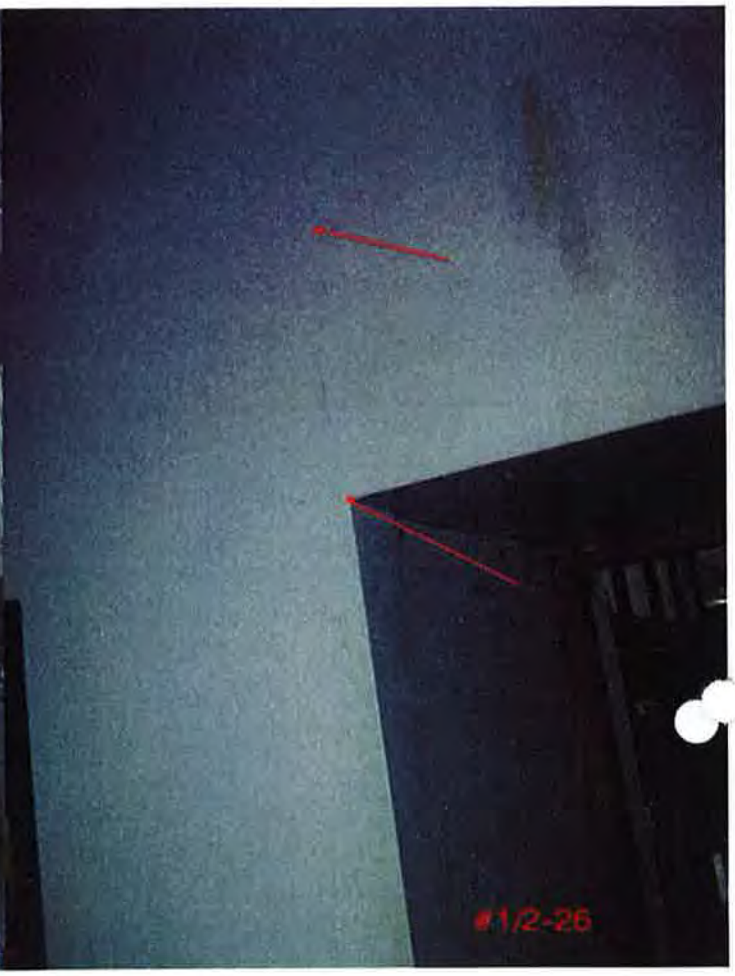
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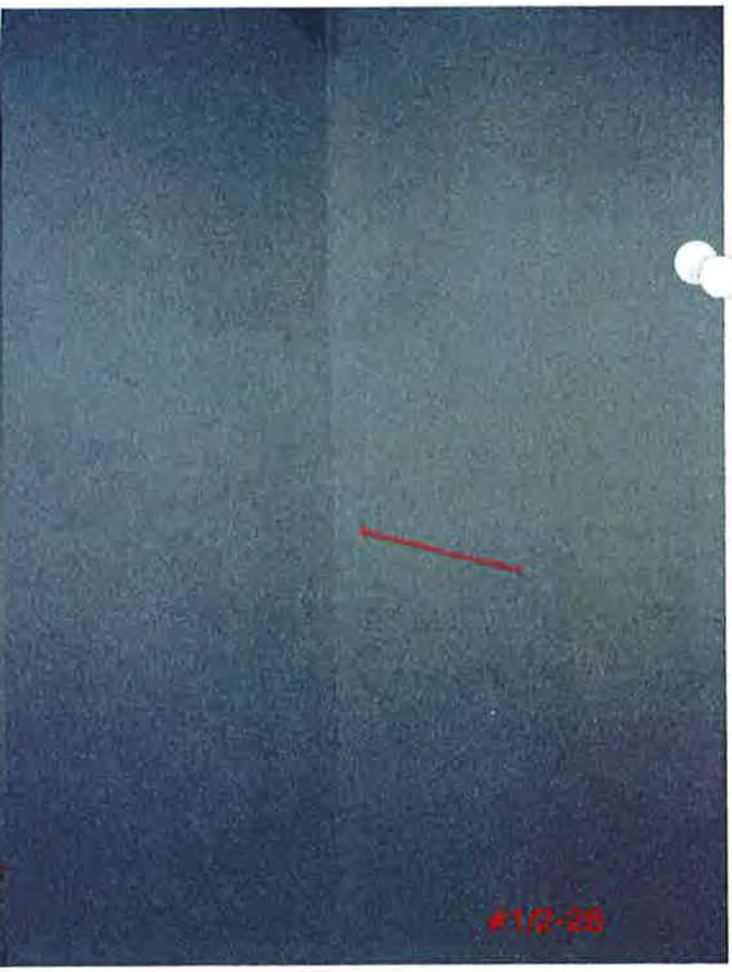
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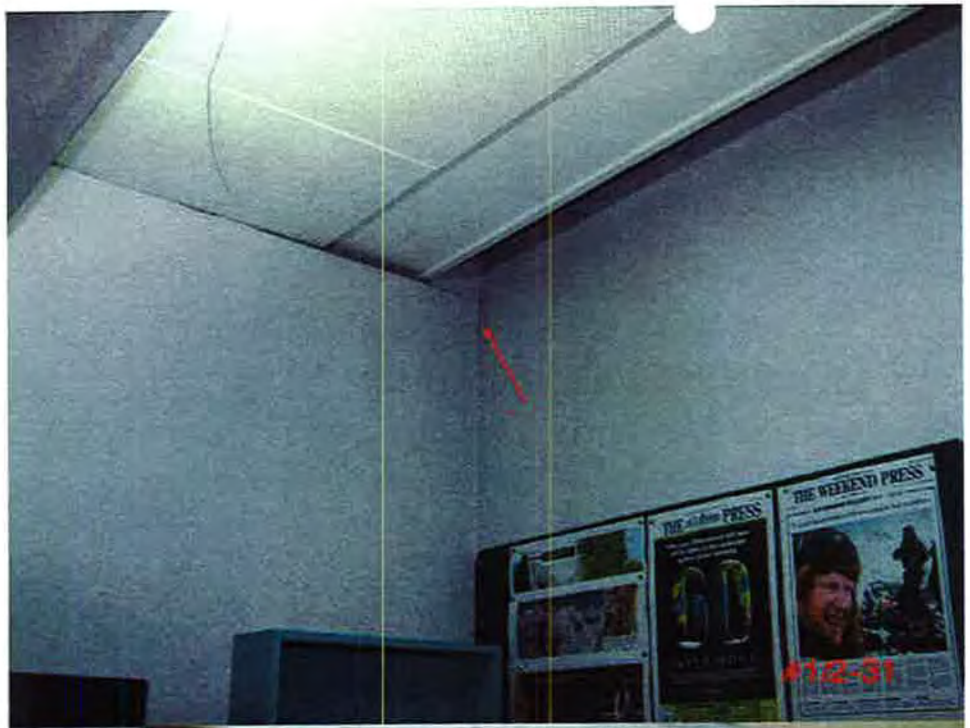

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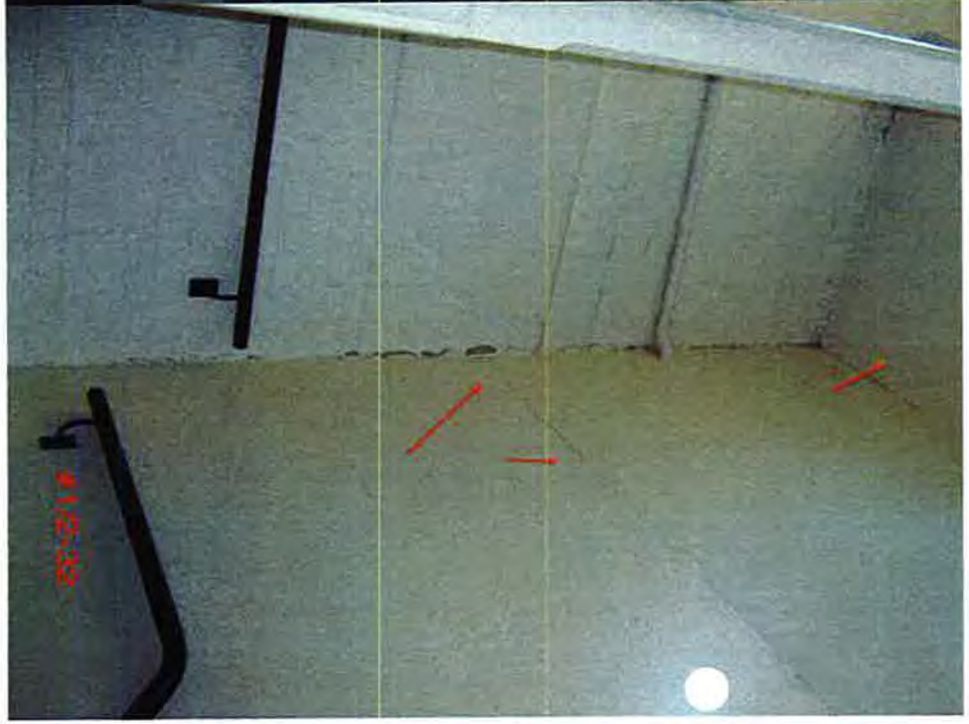

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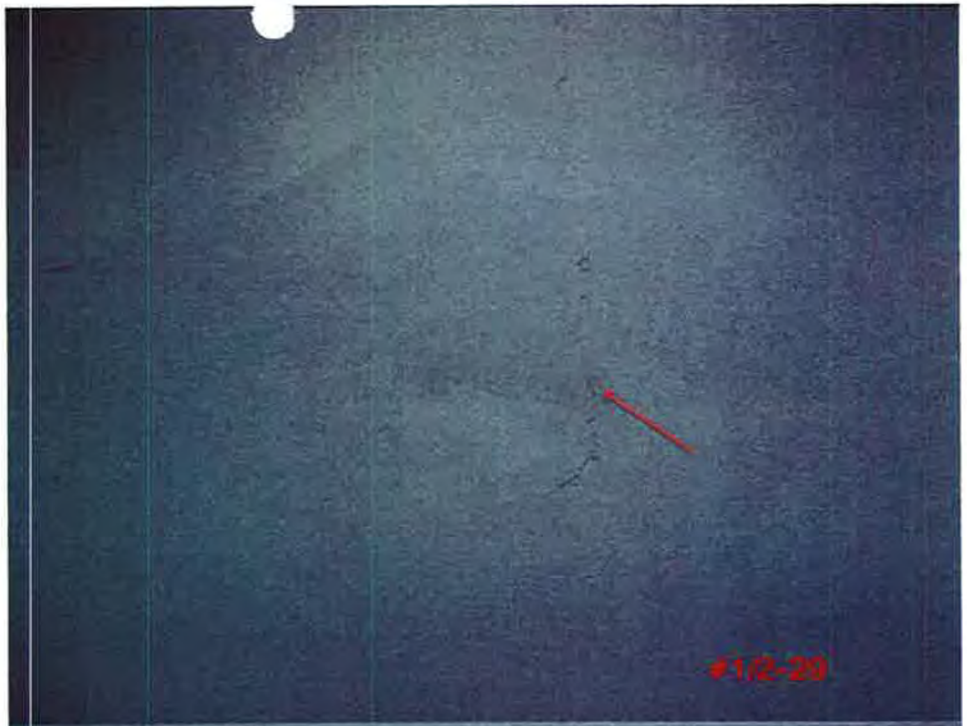

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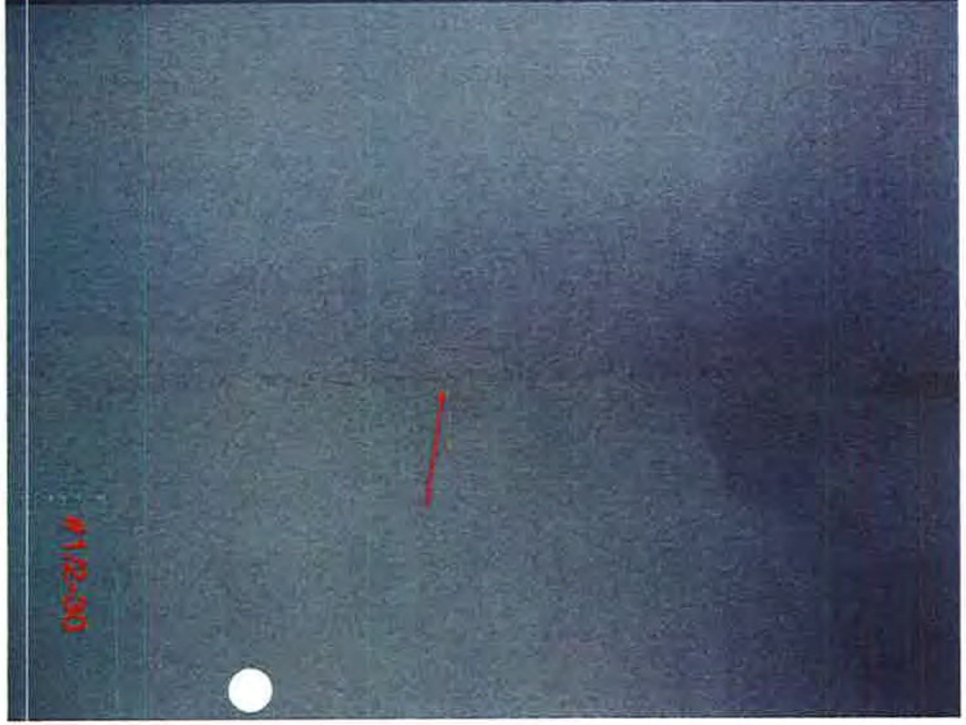

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#1/3-2


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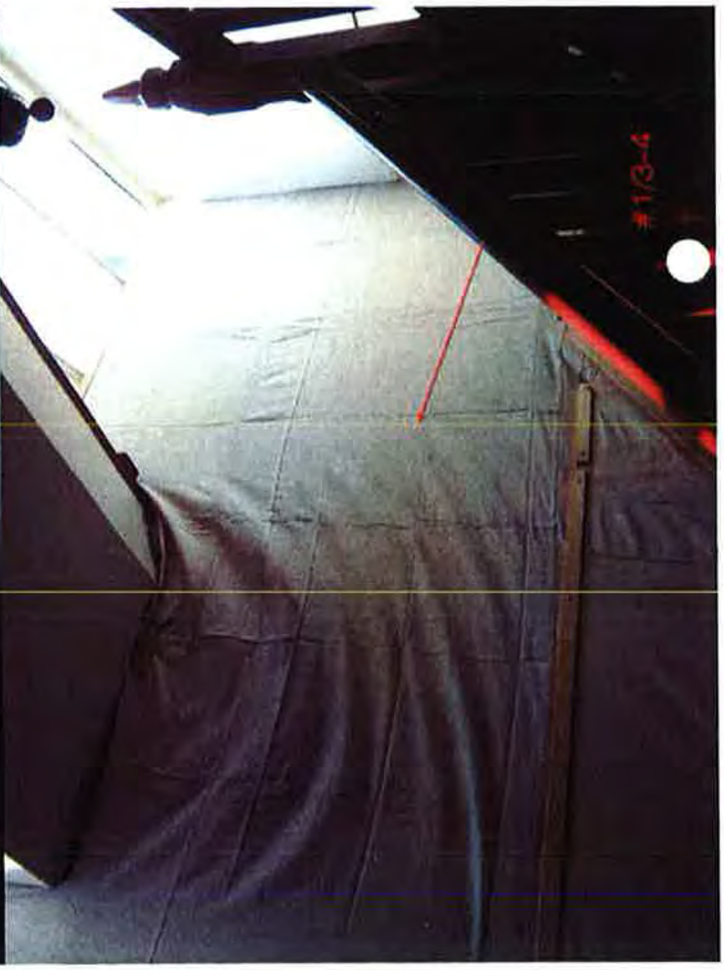
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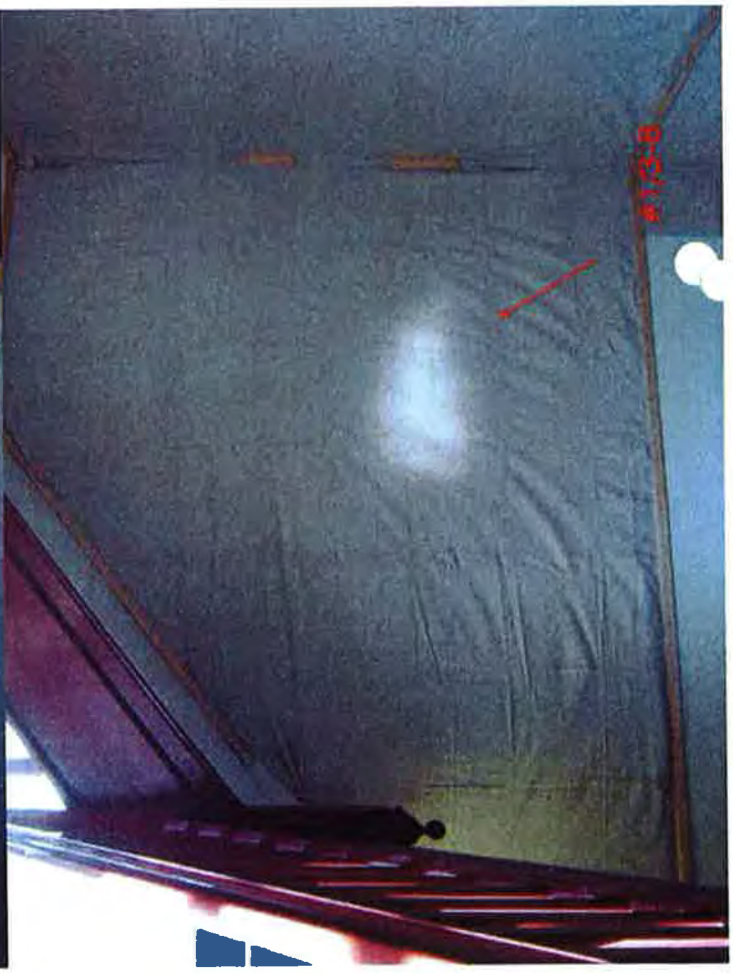
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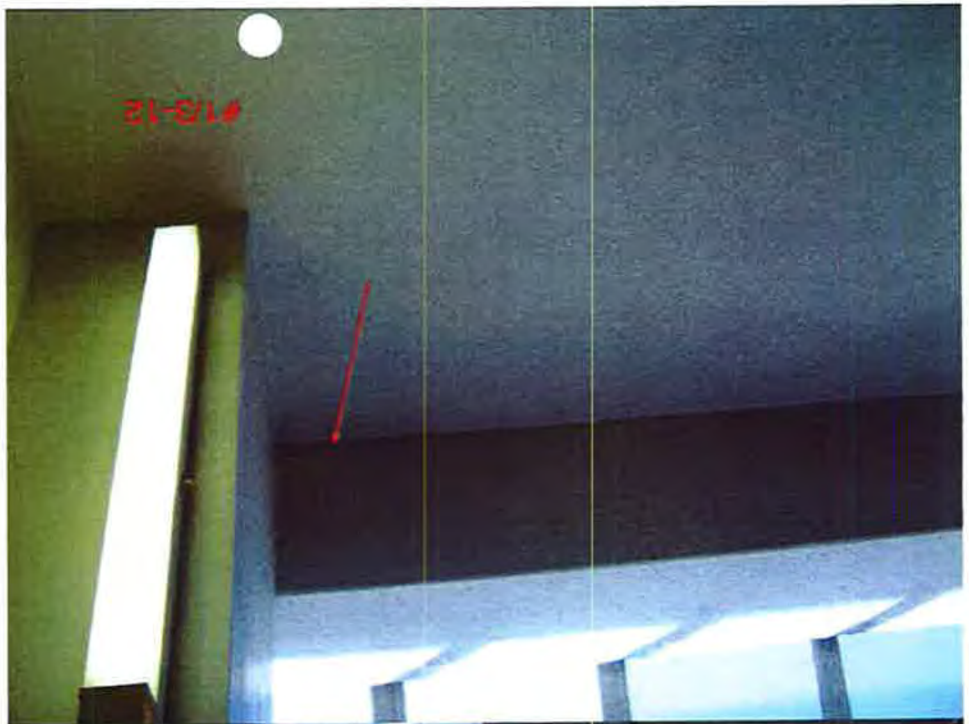
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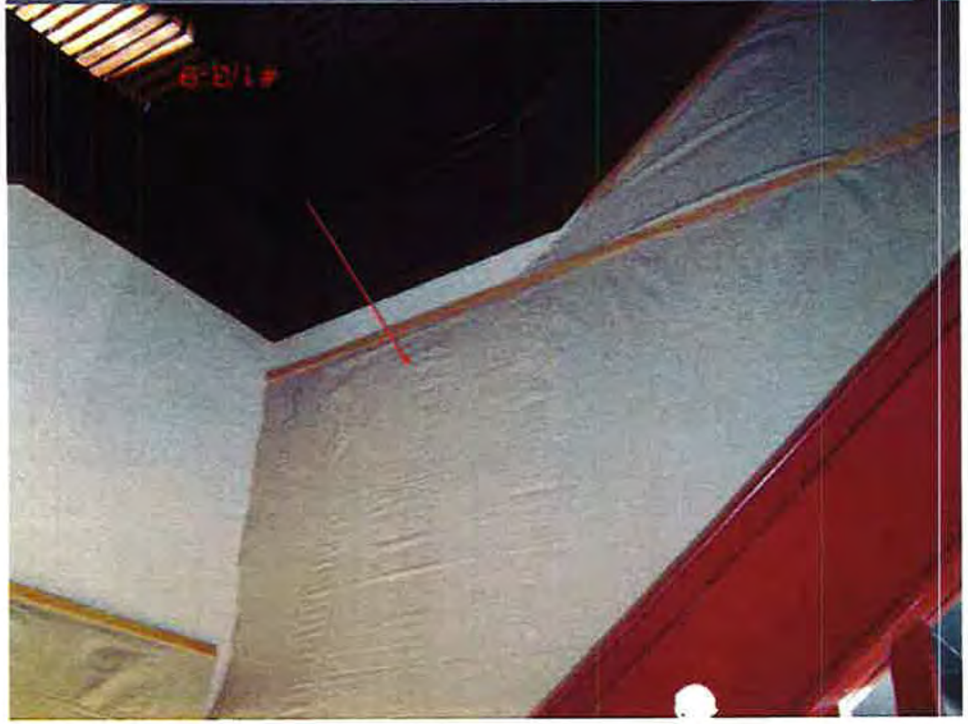
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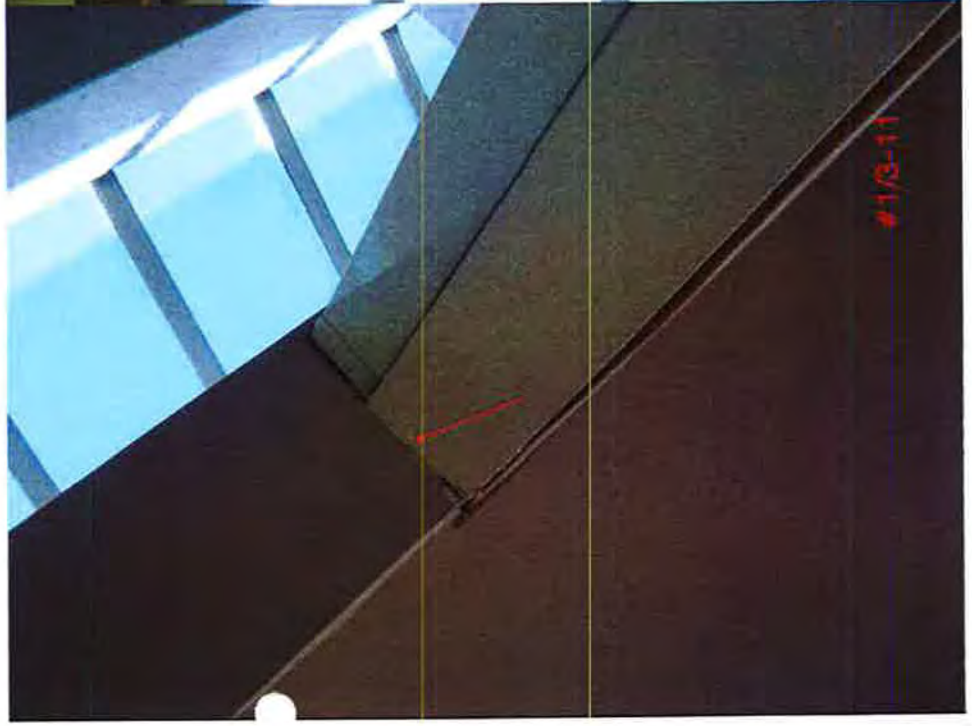
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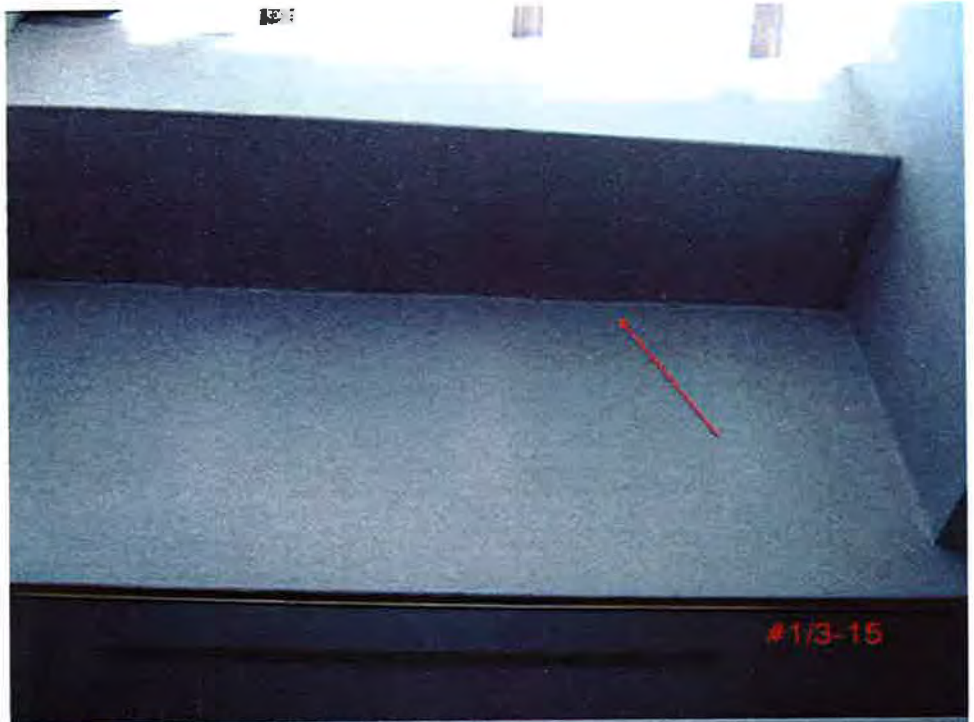
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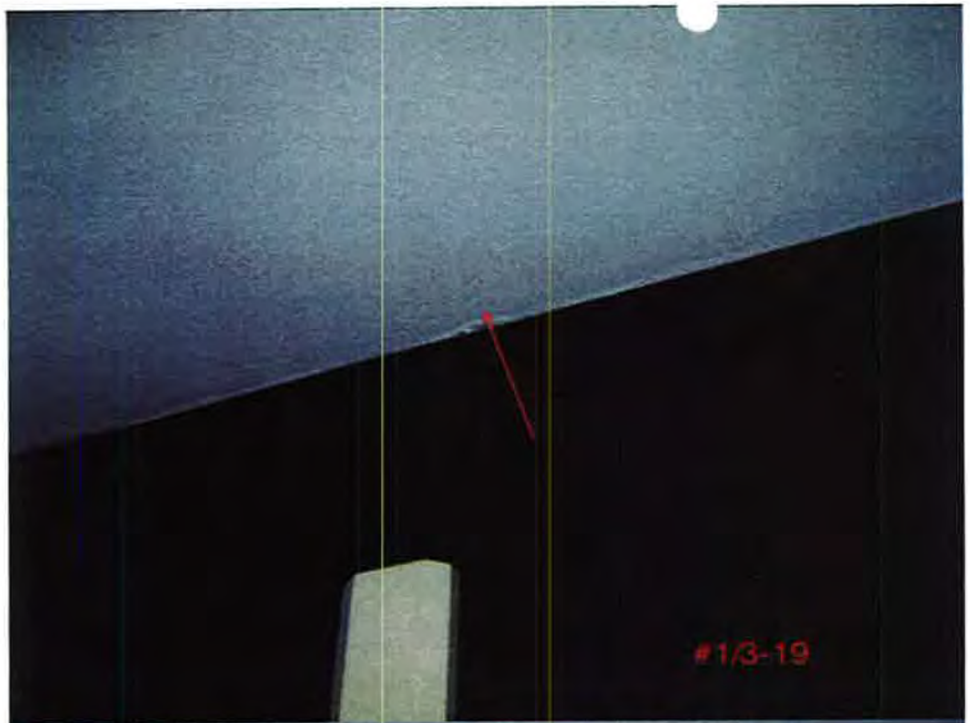

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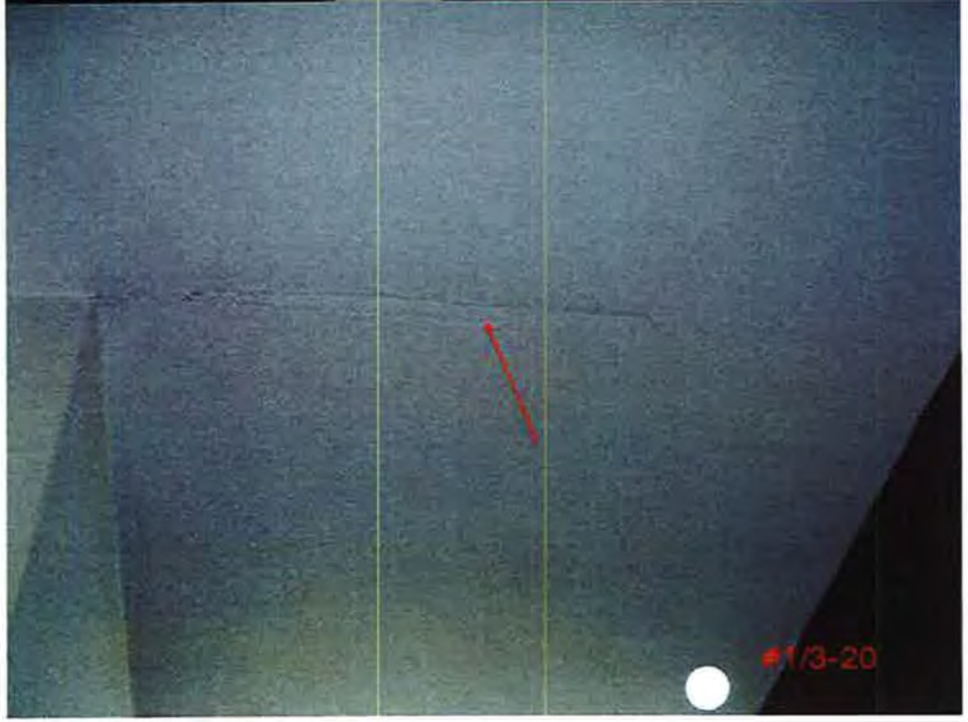

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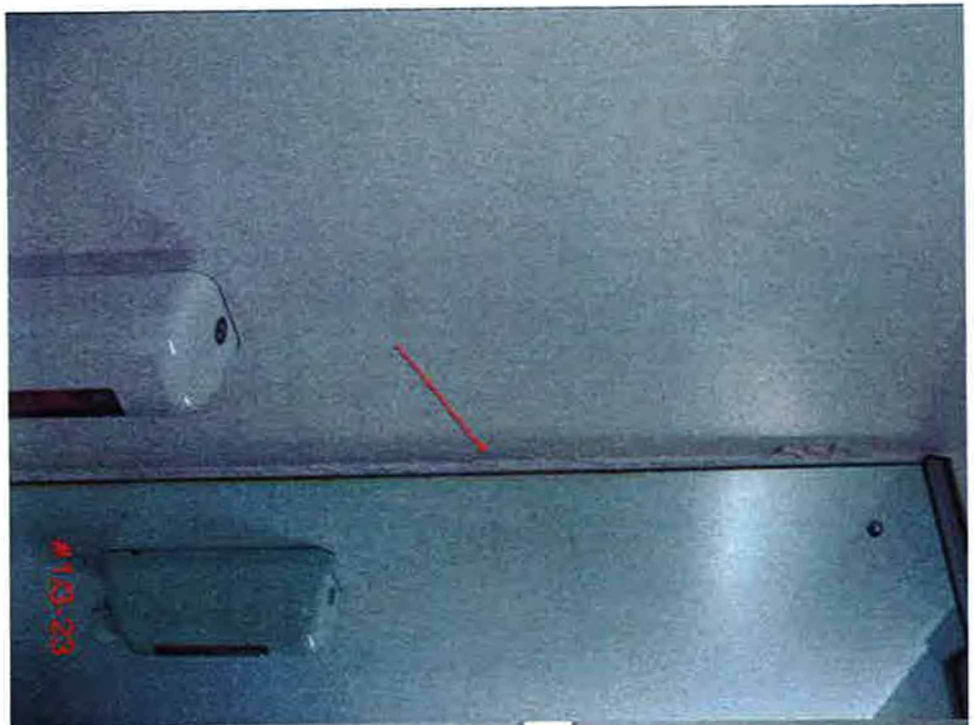
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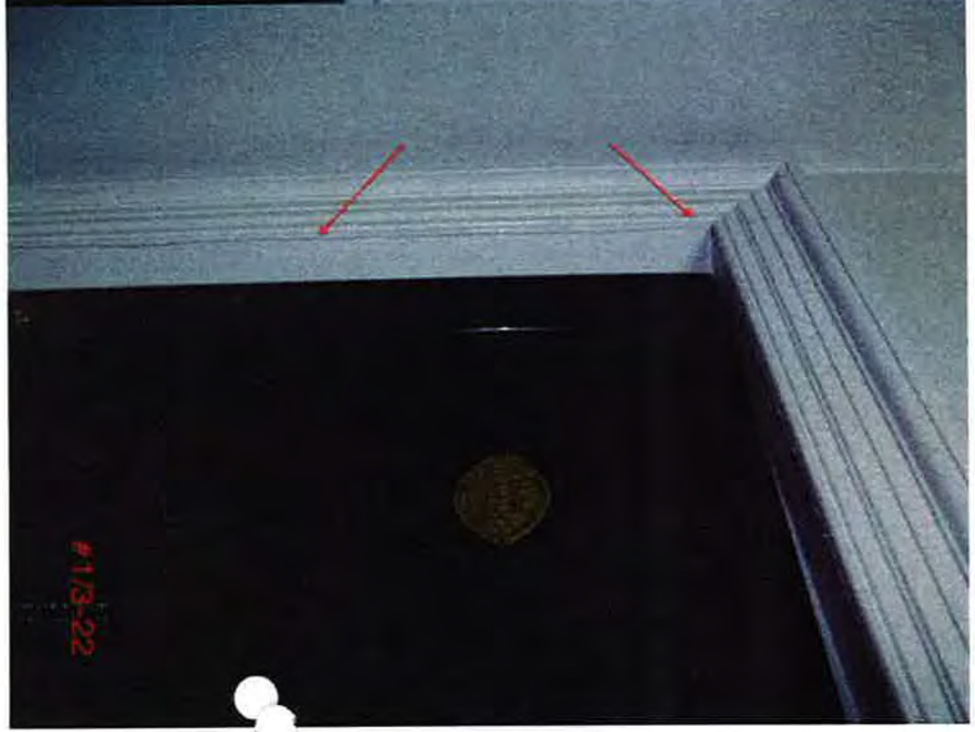
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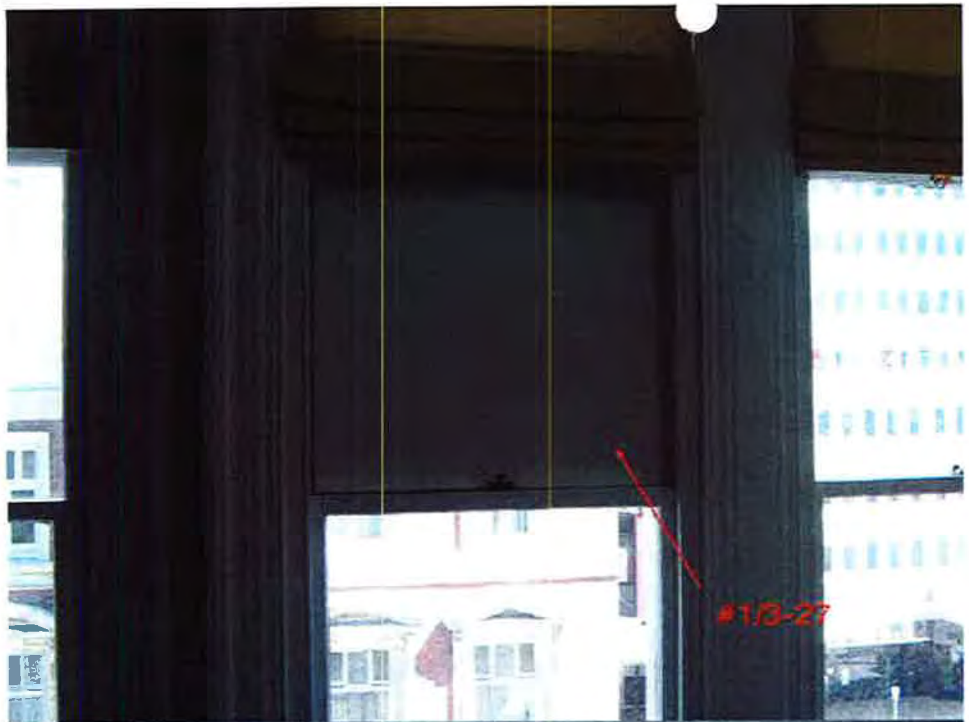

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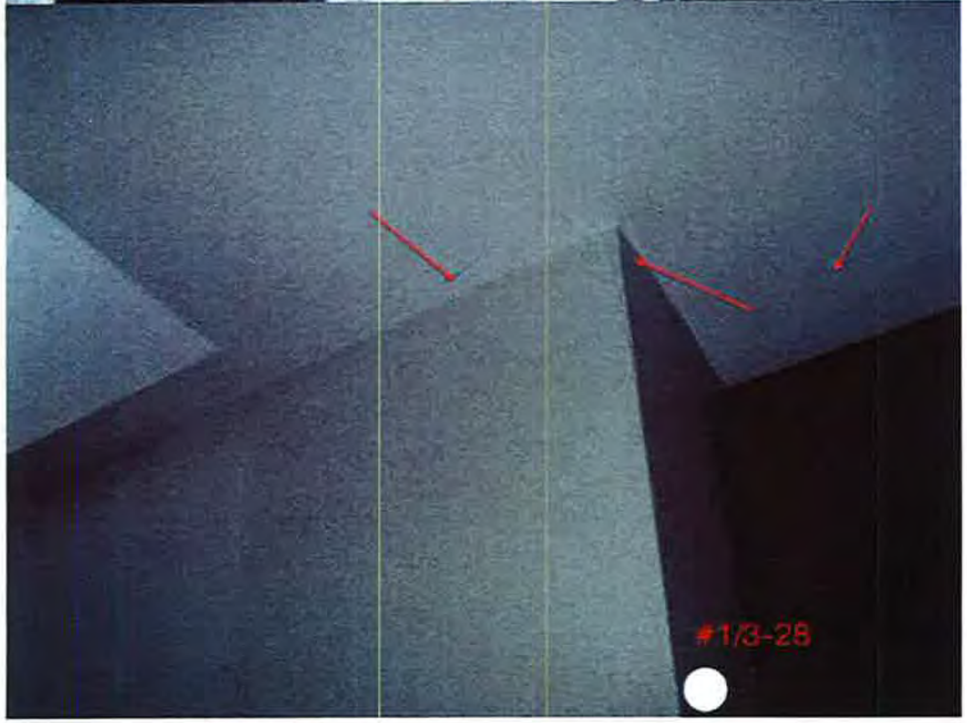

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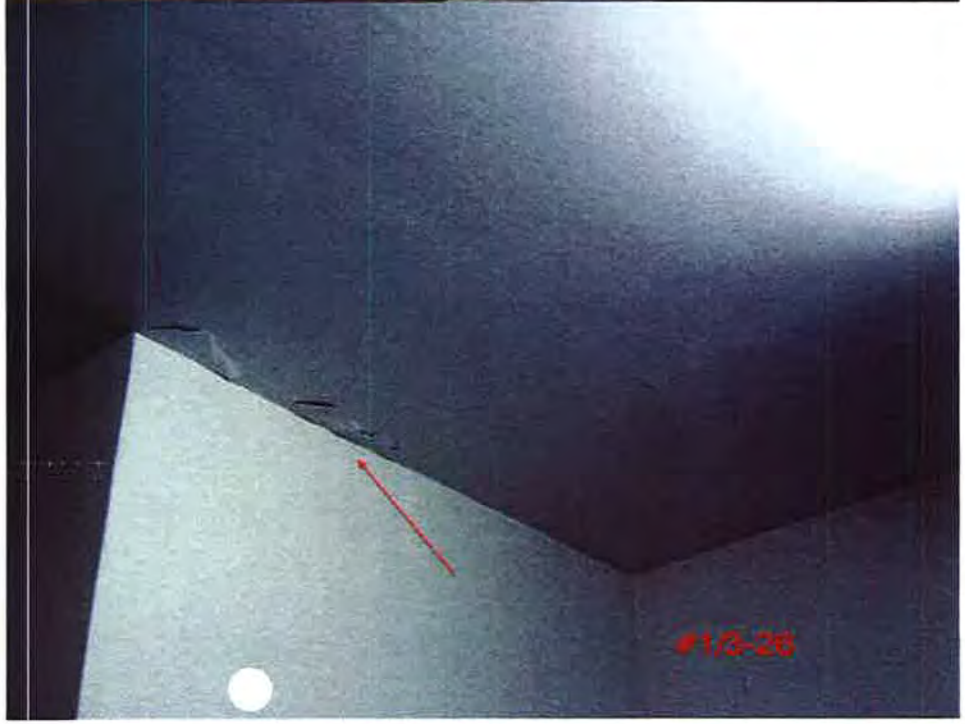

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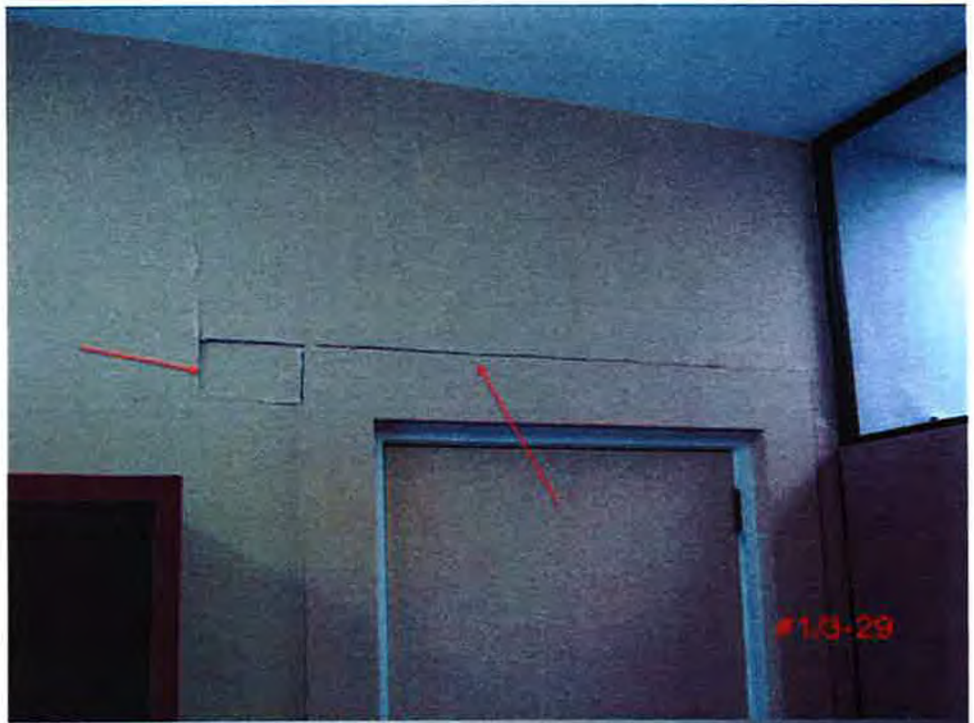

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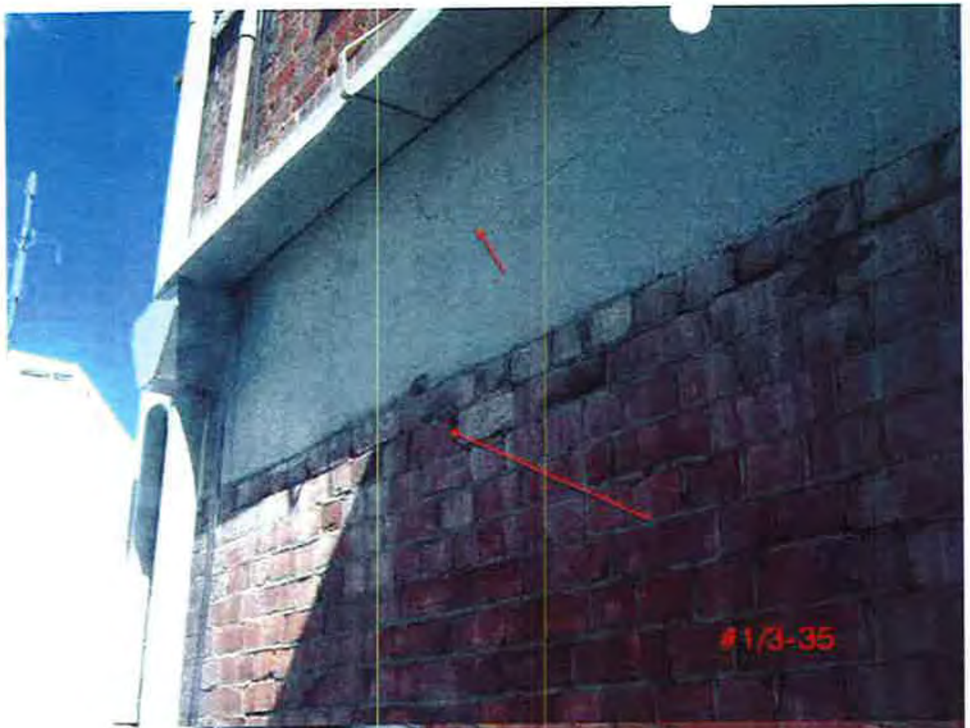

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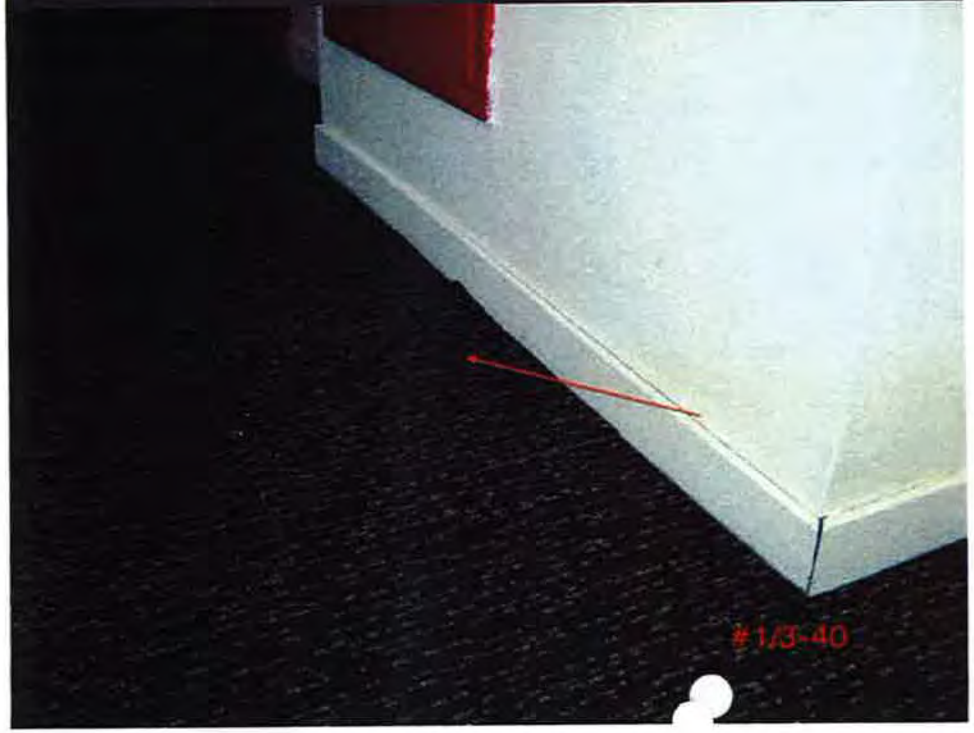

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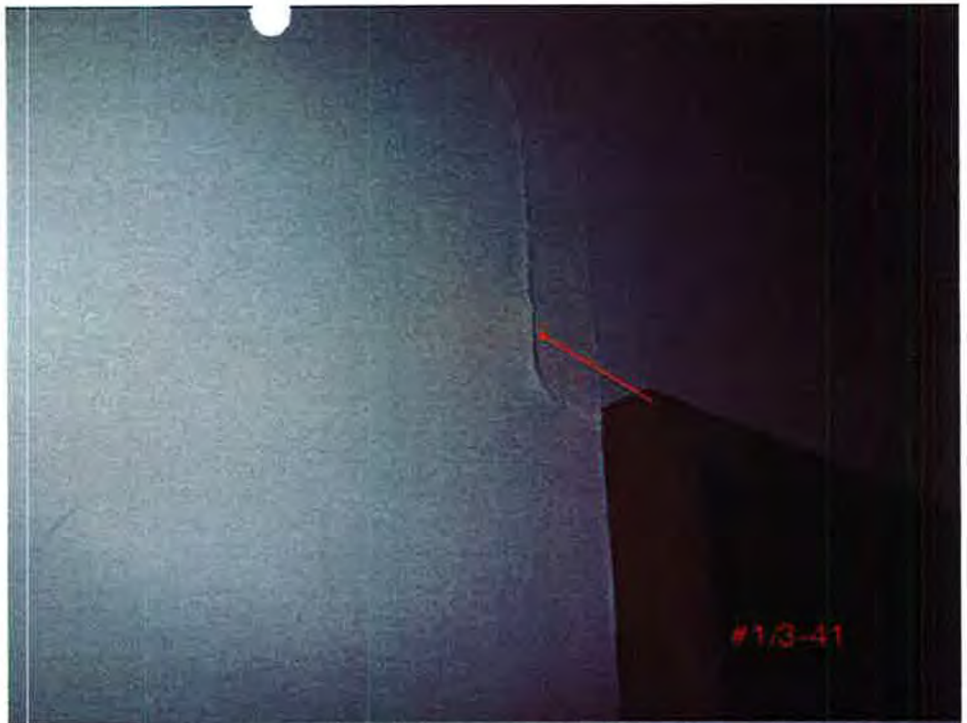
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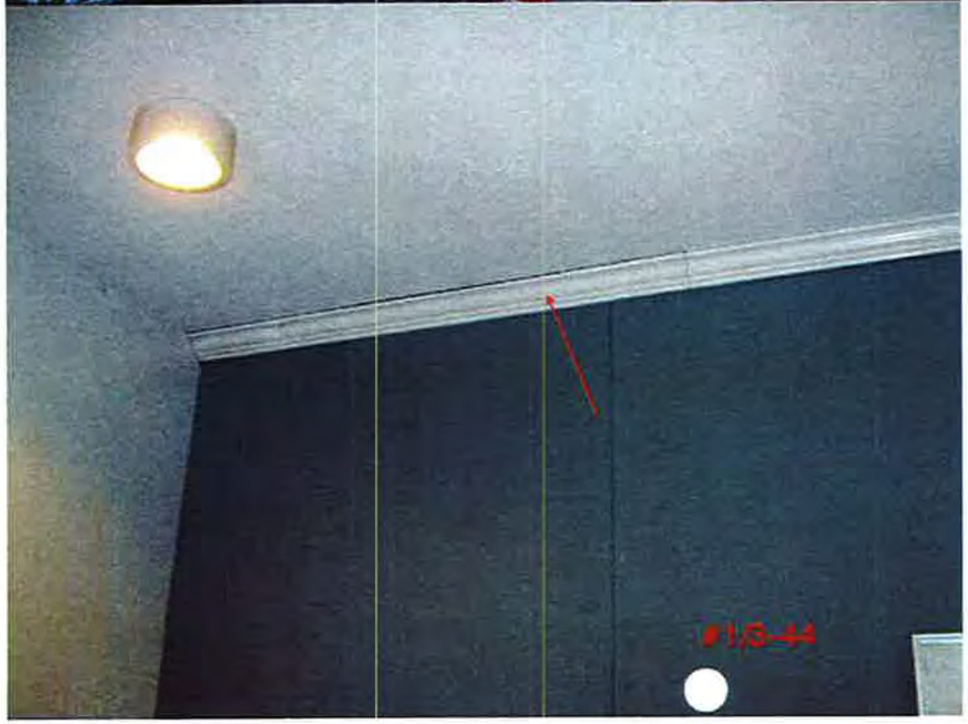
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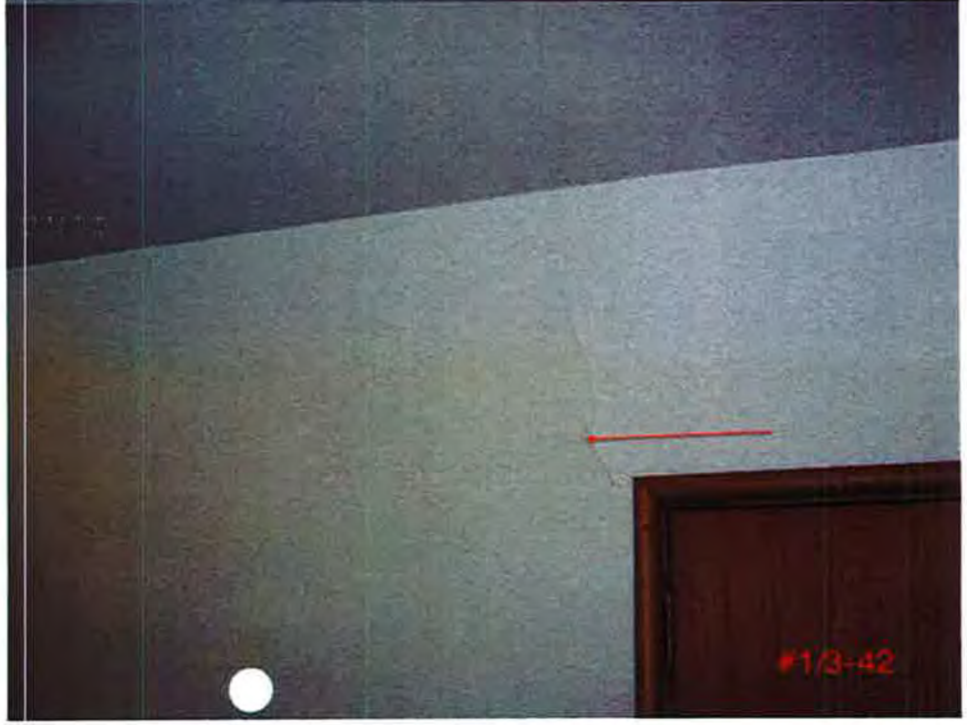
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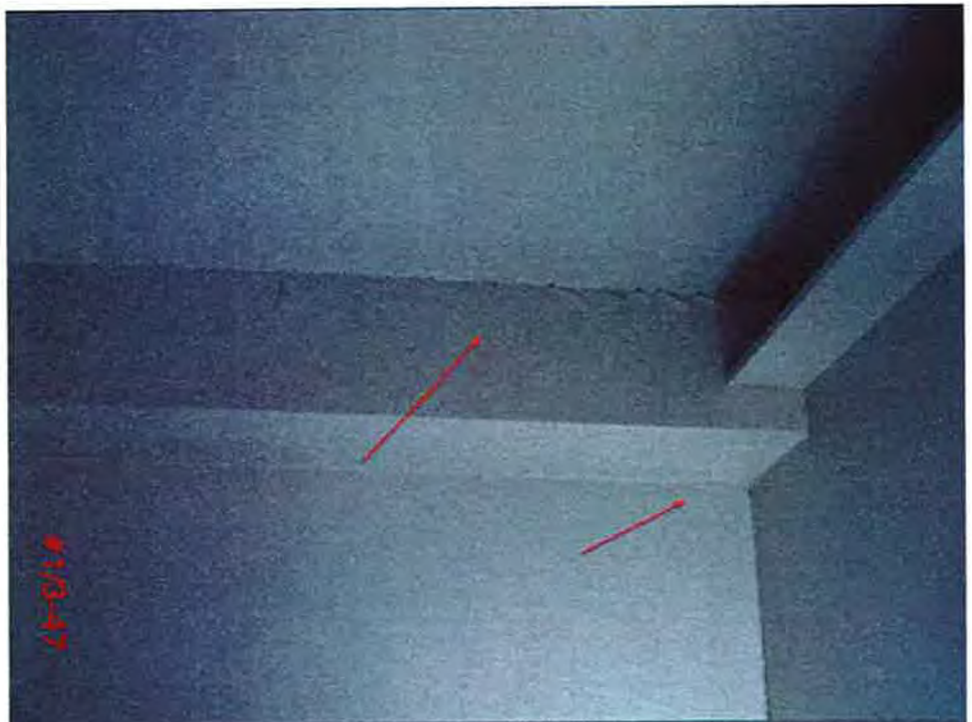
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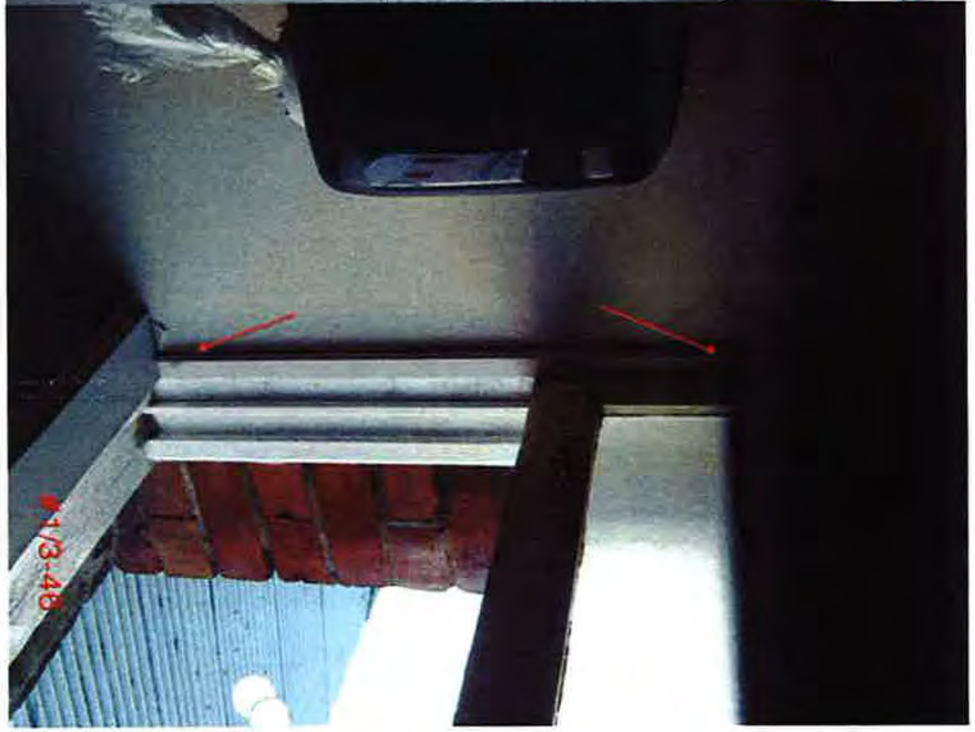
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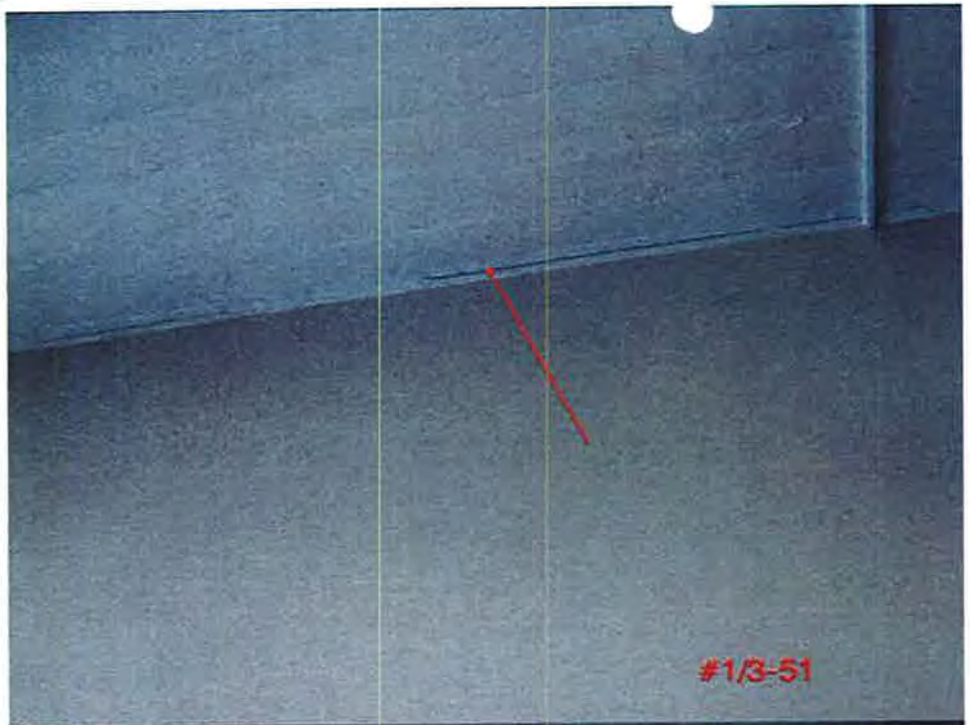

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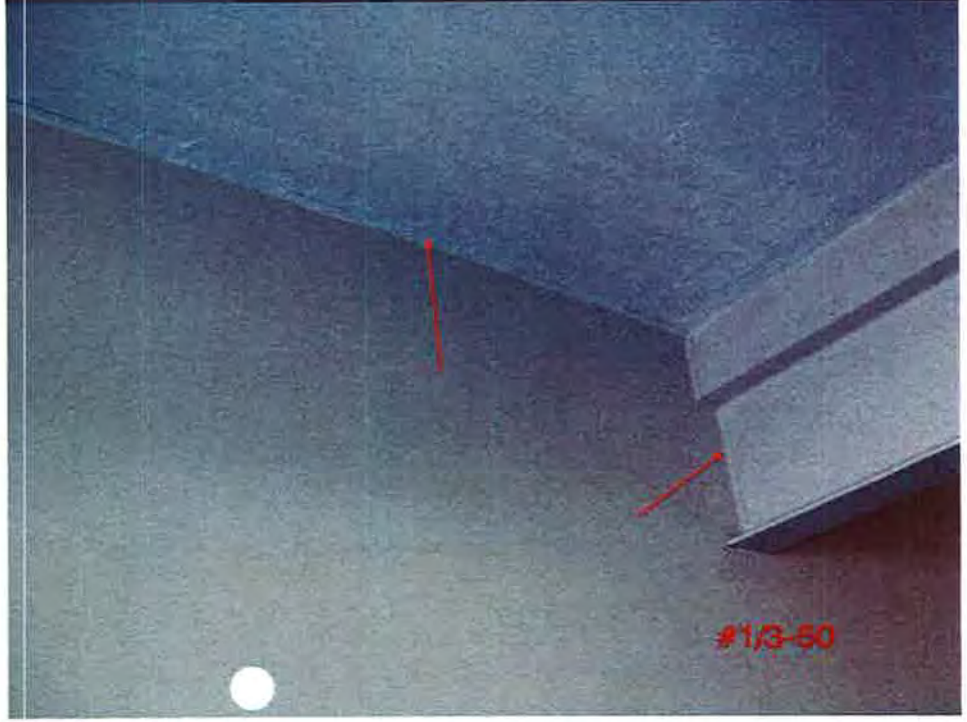

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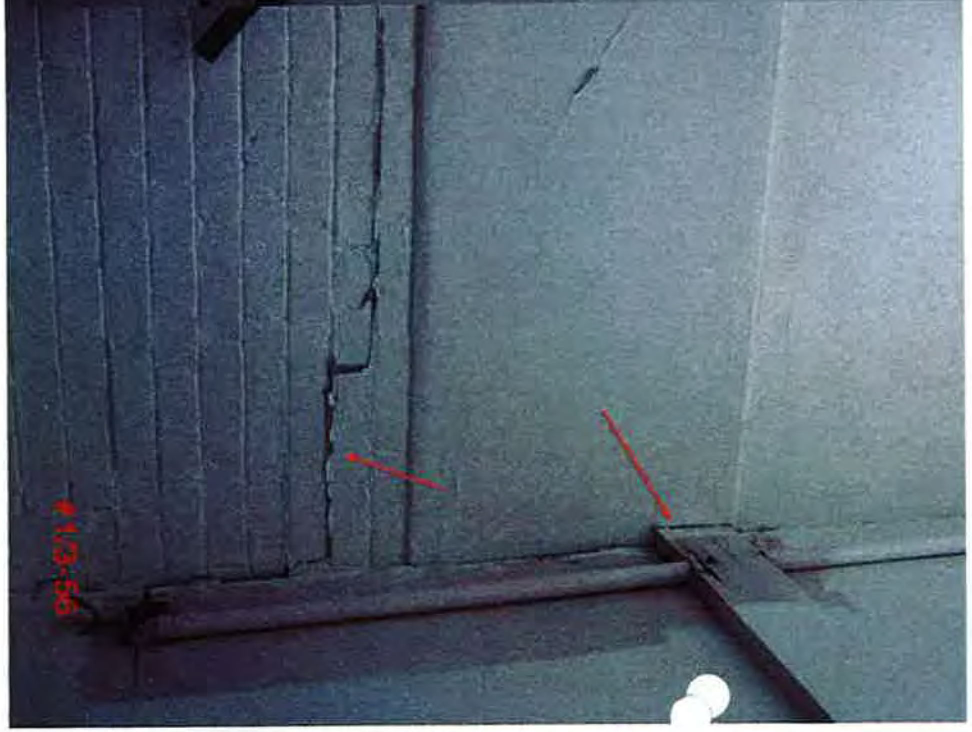
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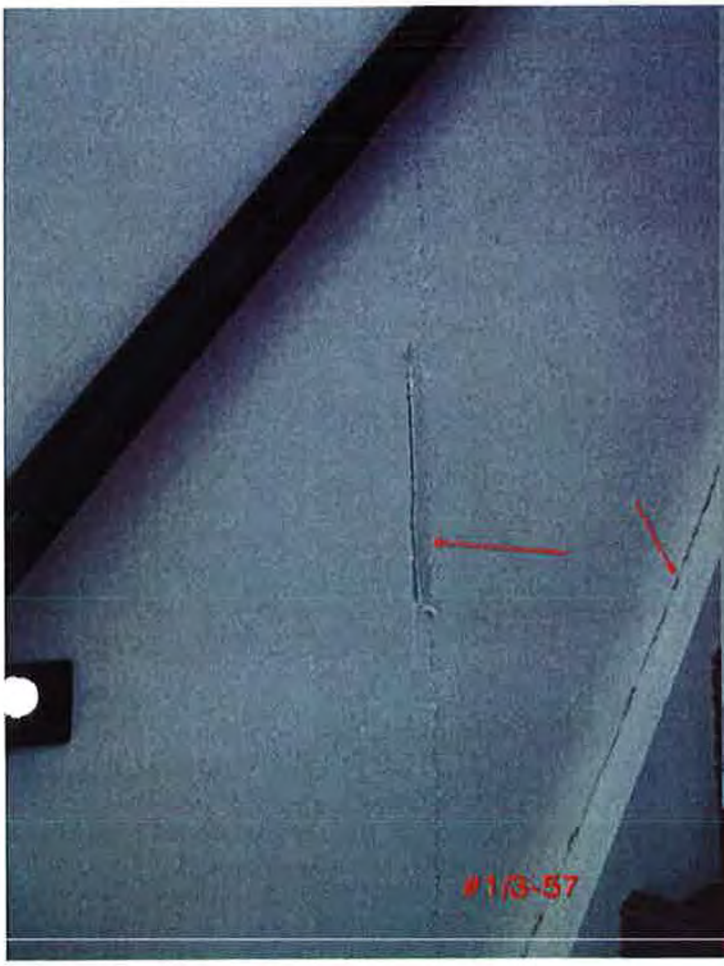
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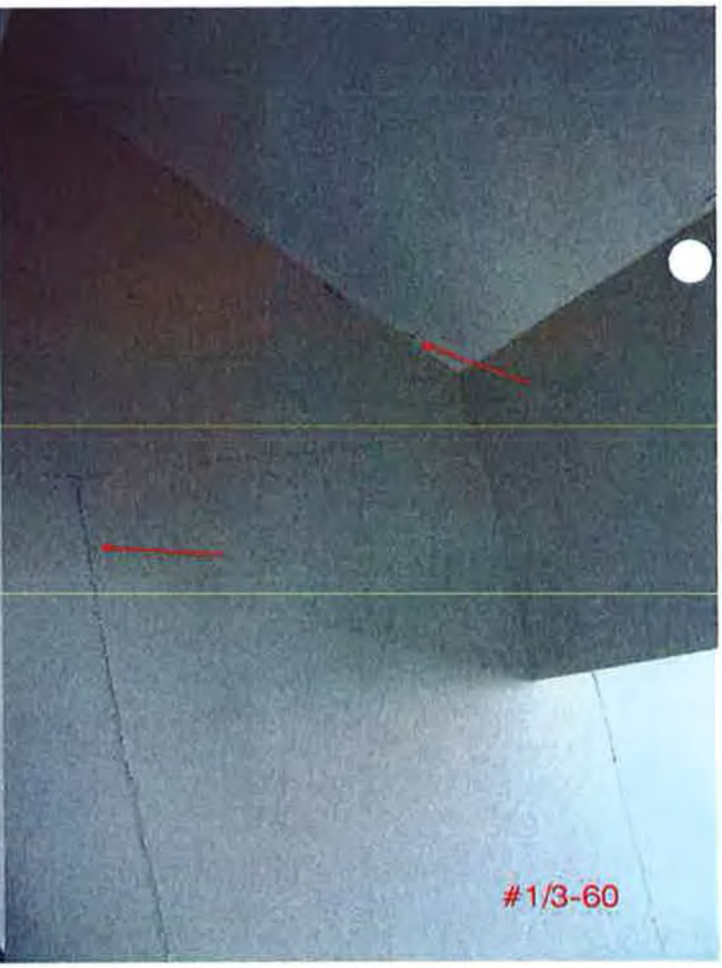
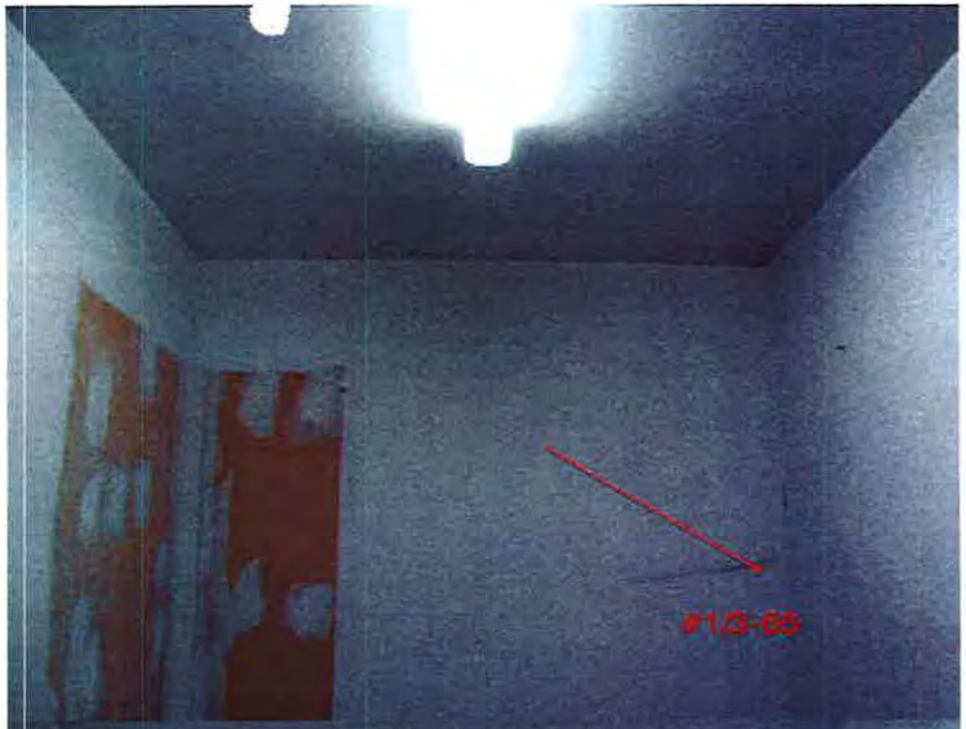

#1/3-60


FIRE
#1/3-63


#1/3-61


Eat your colours every day
Vegetables. Quick, tasty, healthy.
#1/3-64


FIRST AID
FIRE EXIT
CAUTION MIND THE STEP
#1/3-62



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#1/3-66

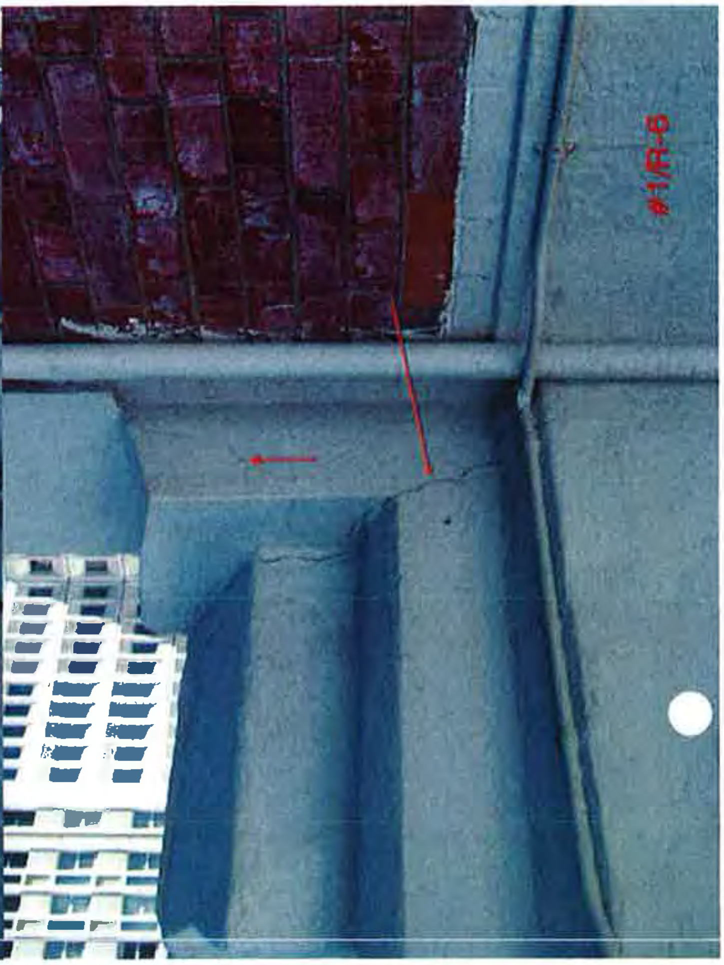

#1/R-3


WARN
DANG
RESTRICTED
UNAUTHOR
PERSONN
#1/R-1


#1/R-4


#1/R-2


#1/R-5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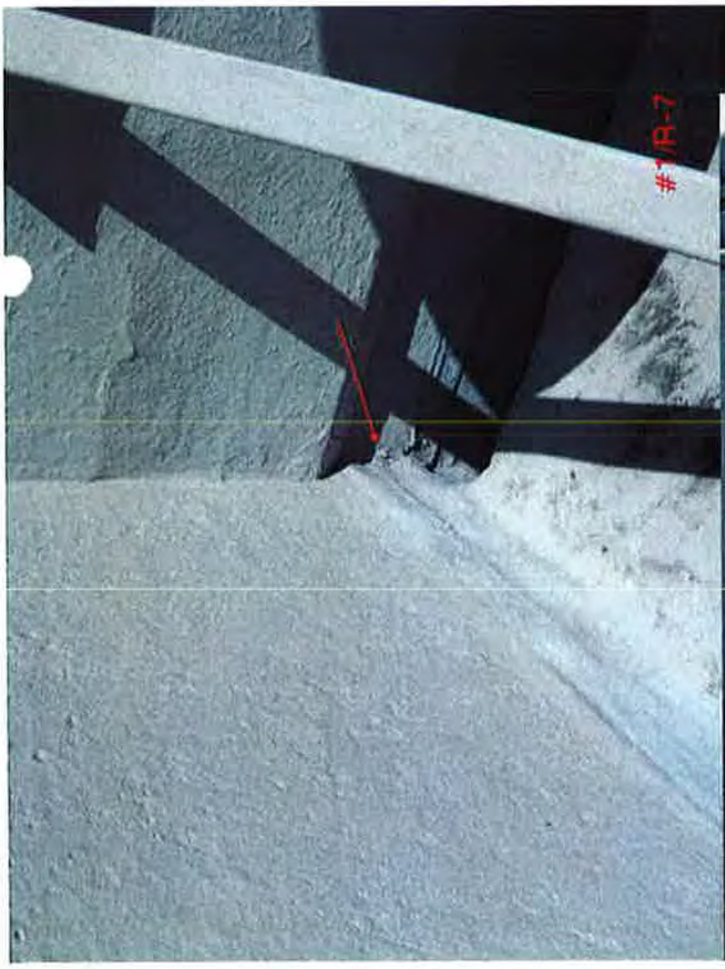
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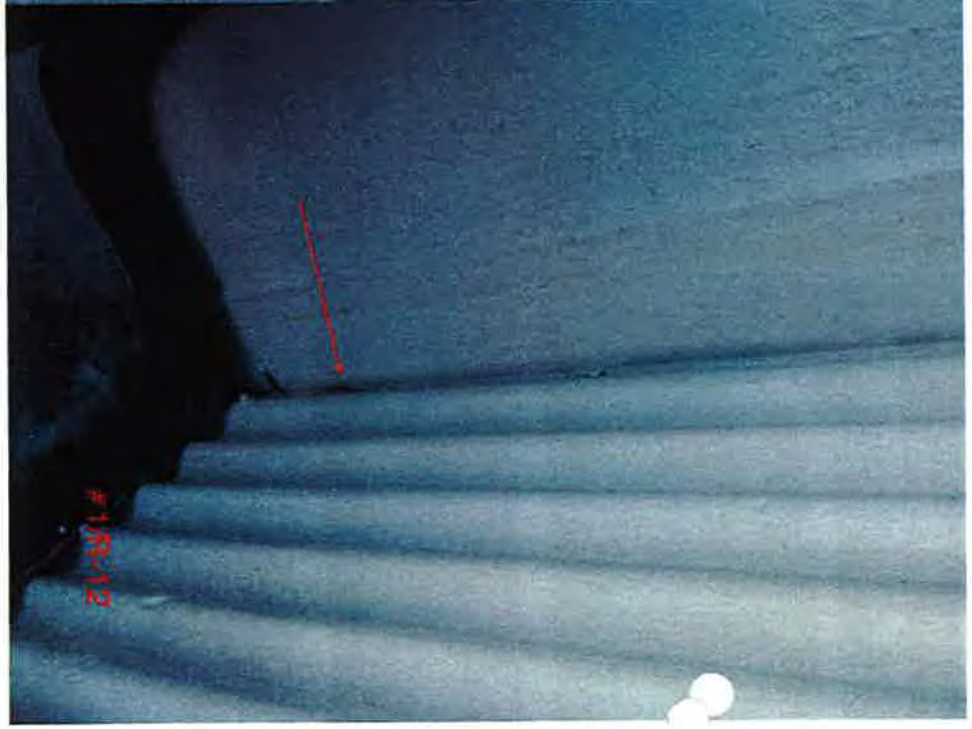
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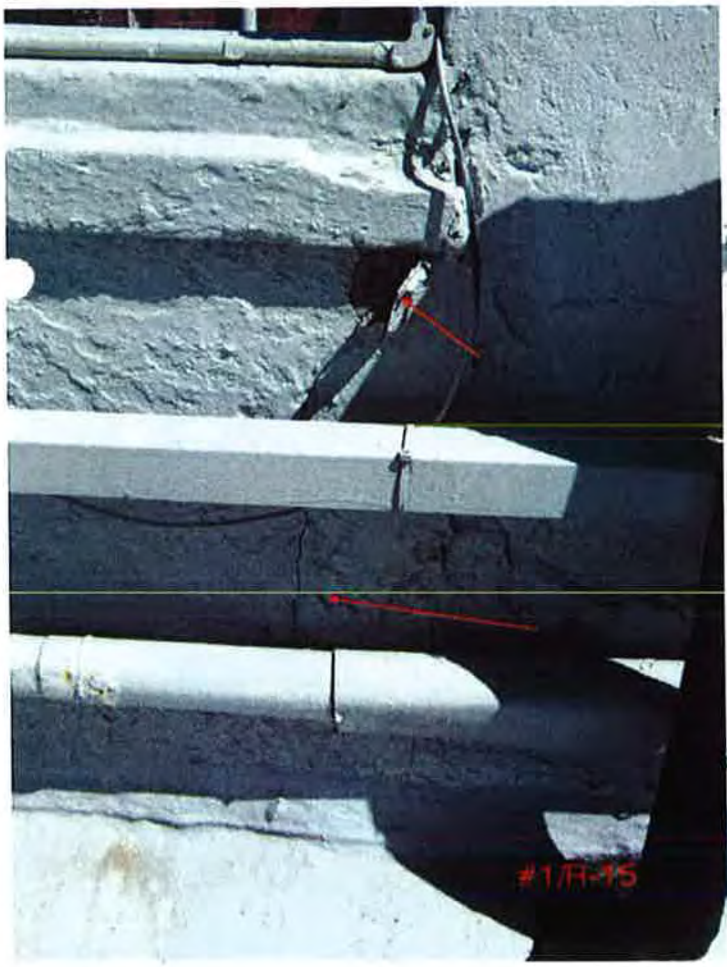

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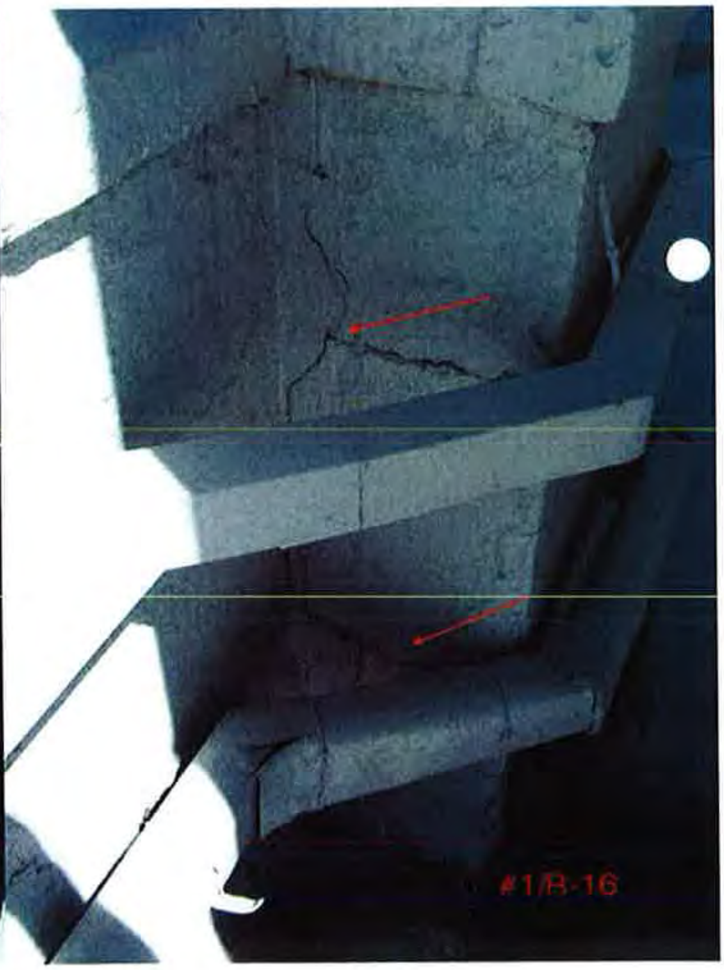

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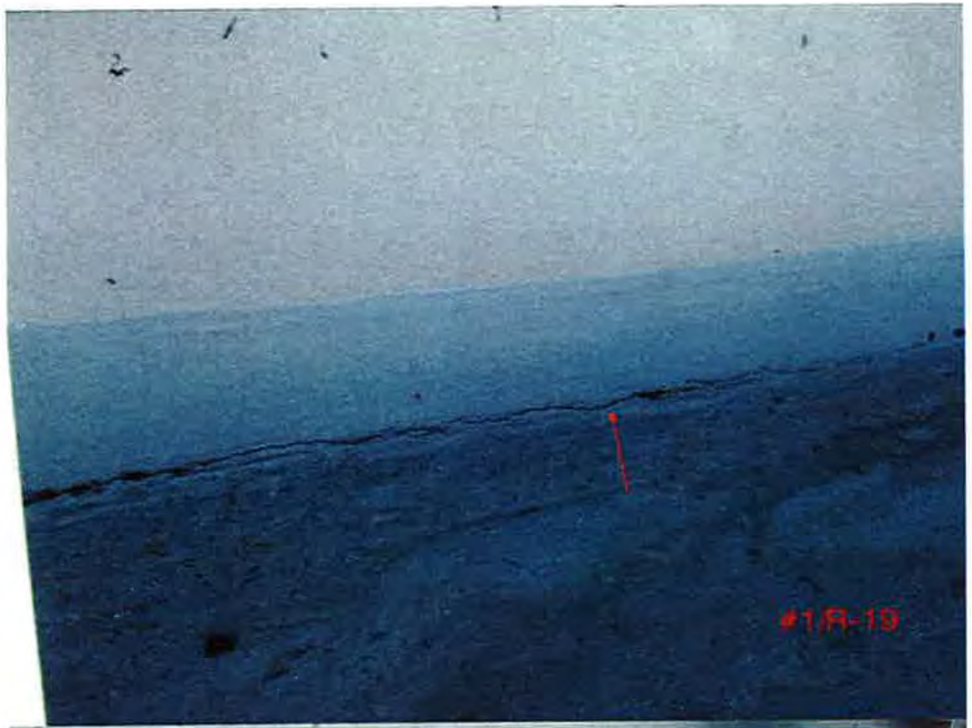

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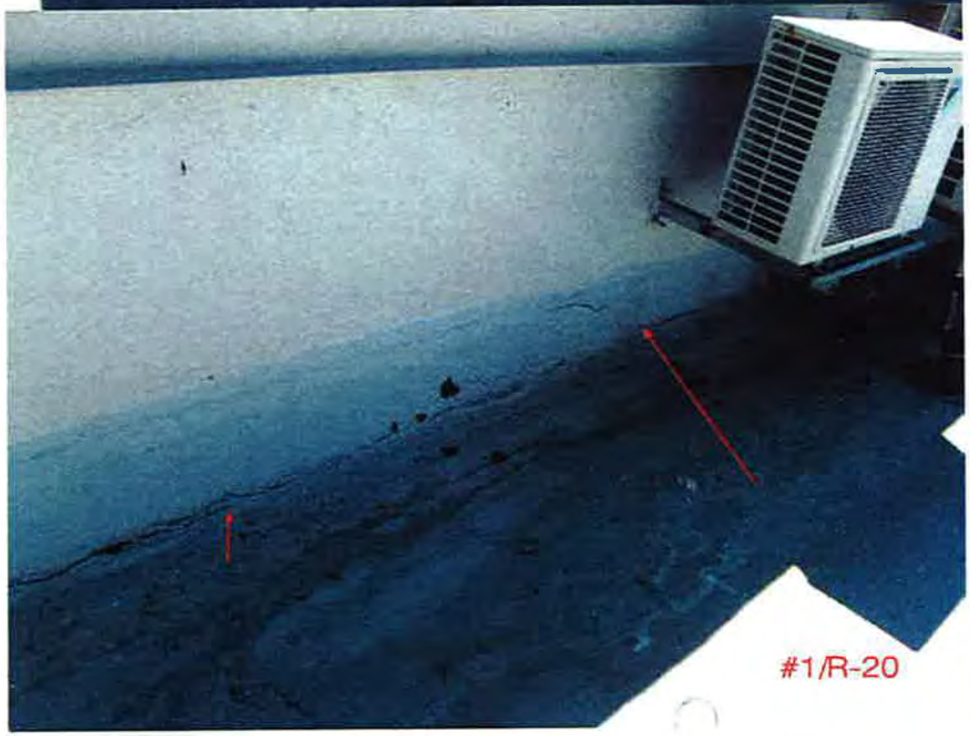

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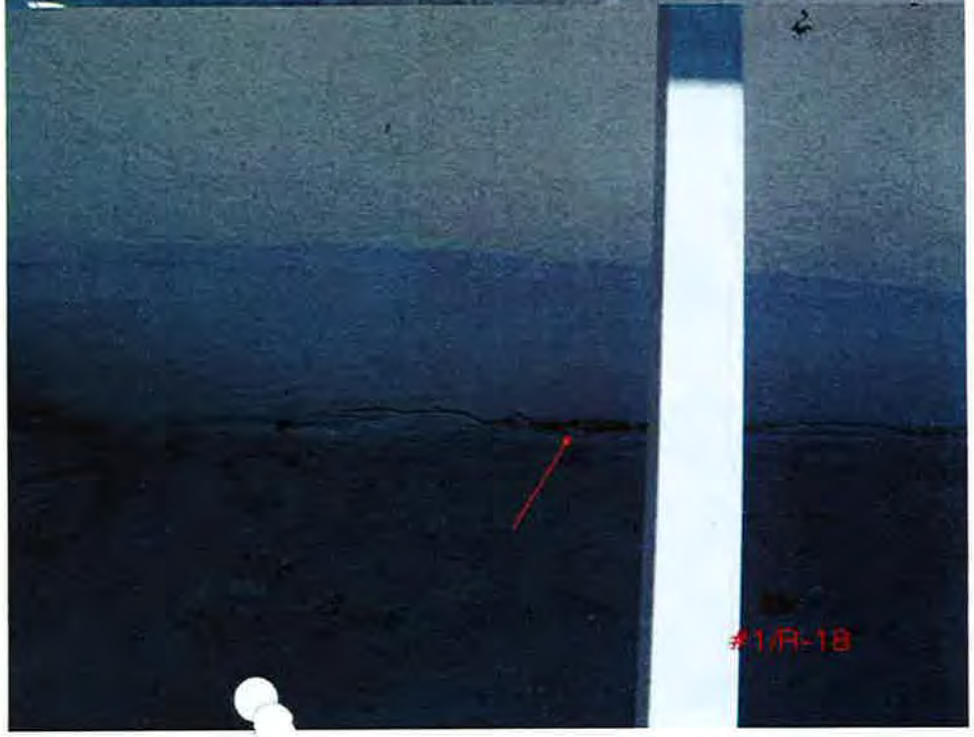

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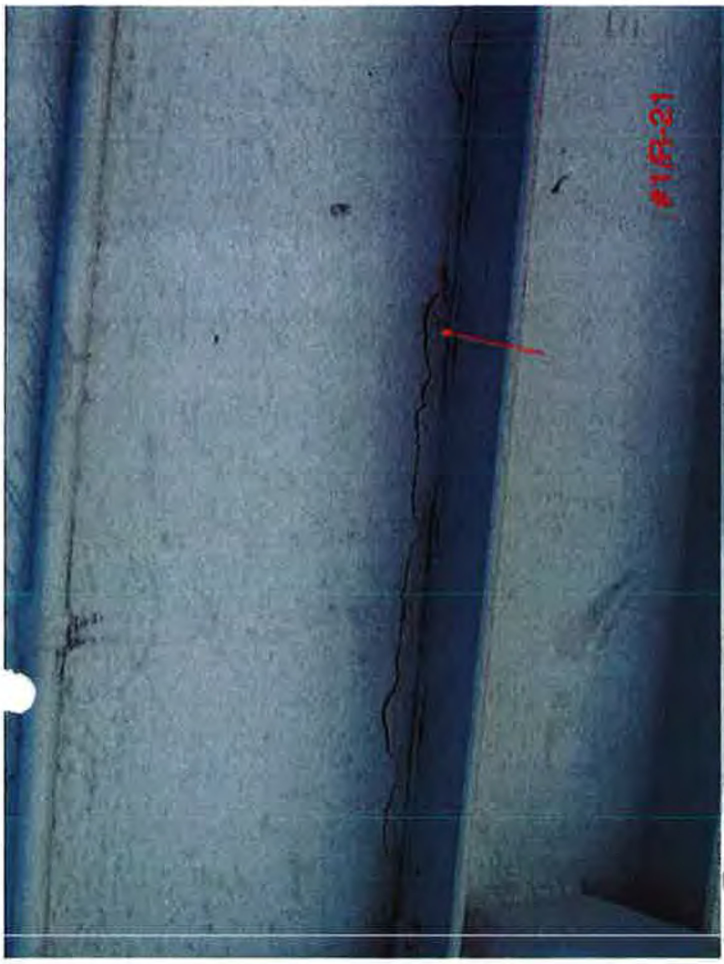
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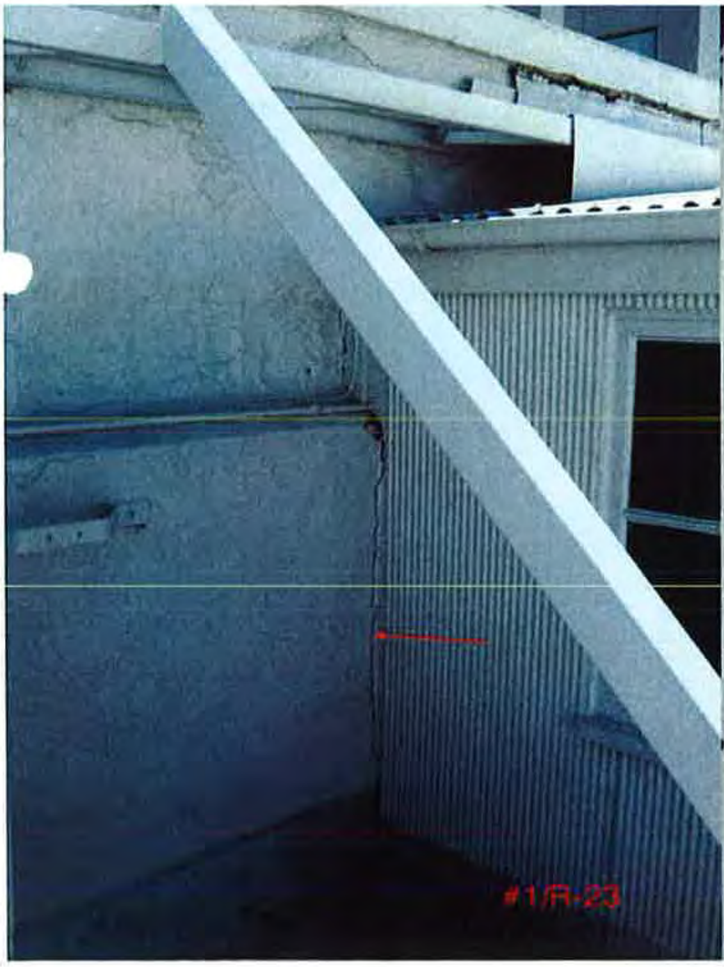
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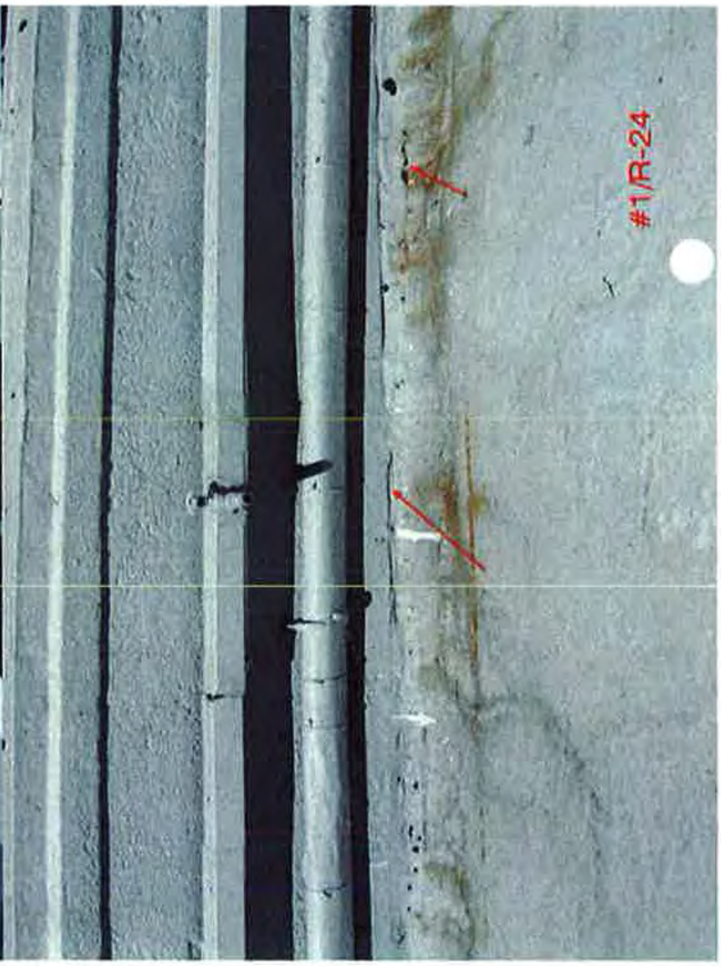
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#1/F-3

#1/F-1

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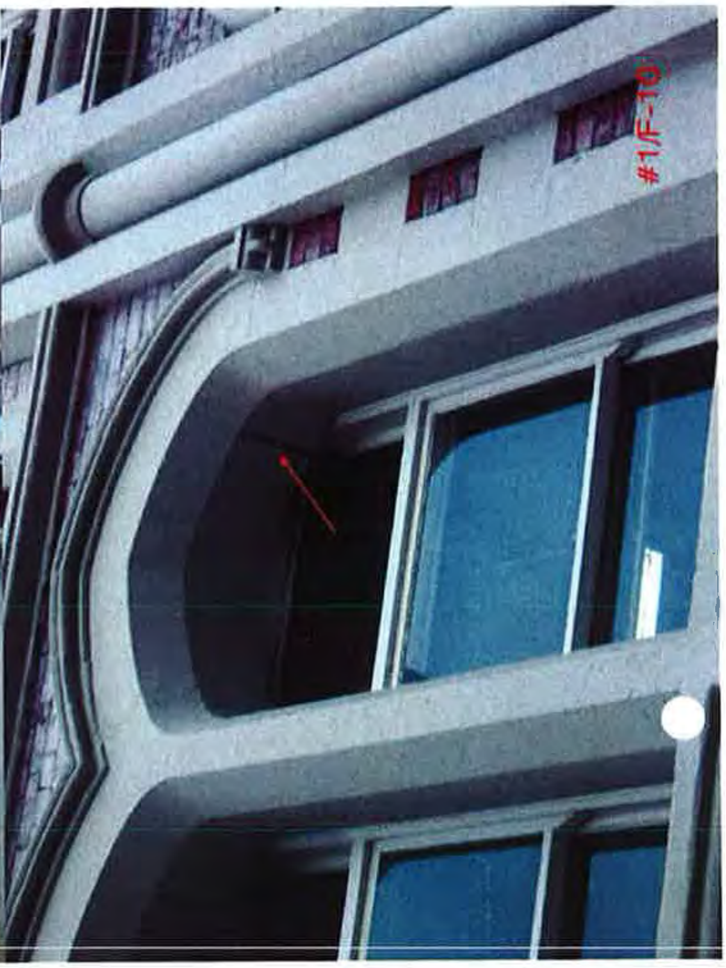
#1/F-9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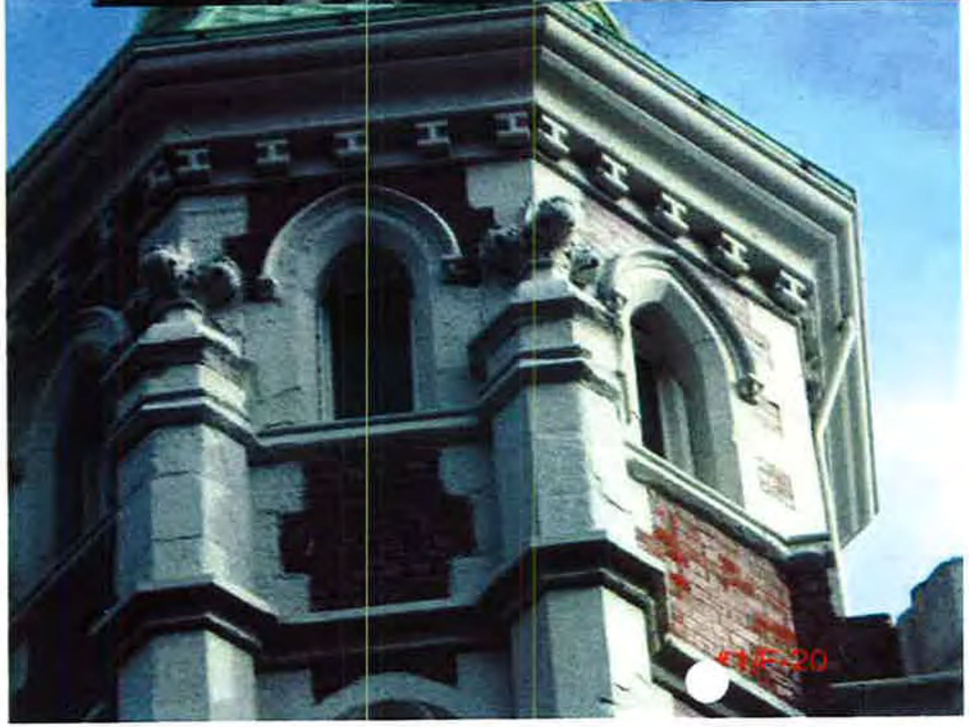

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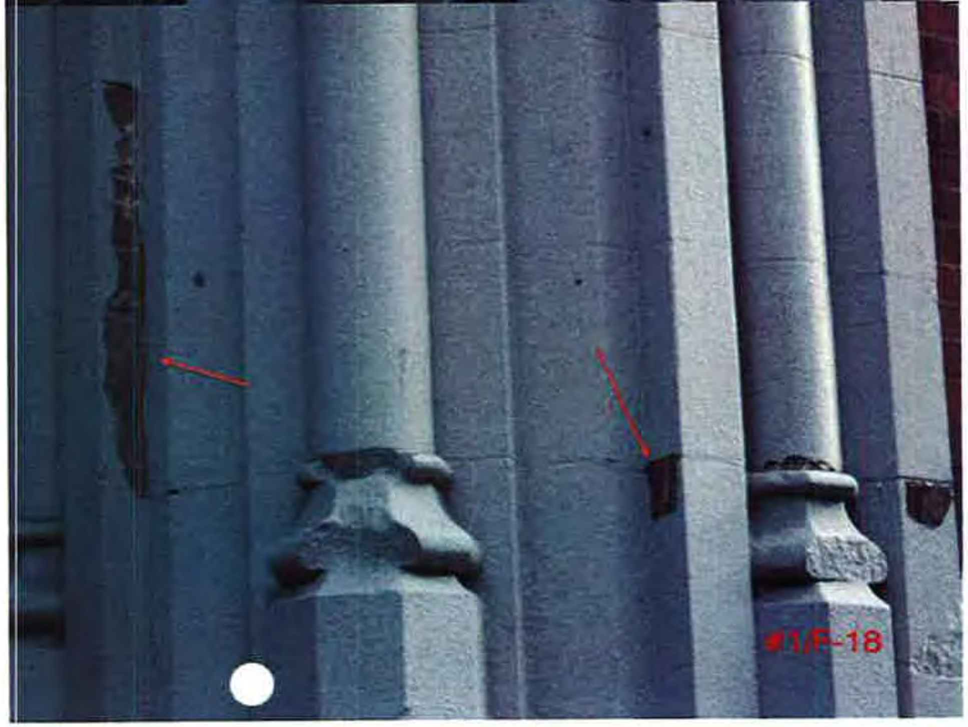

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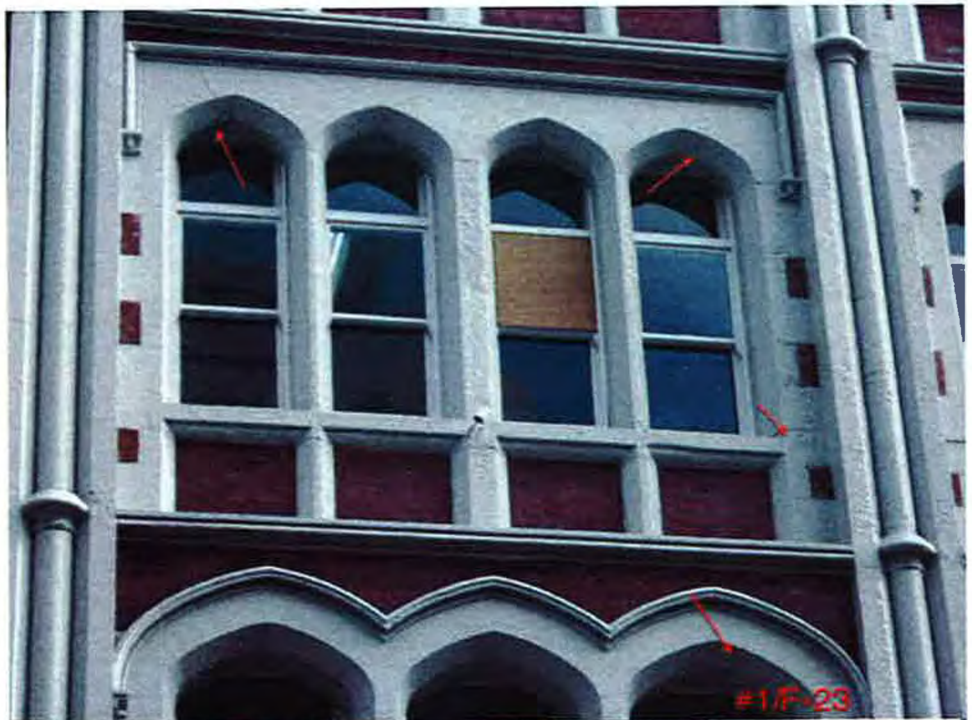
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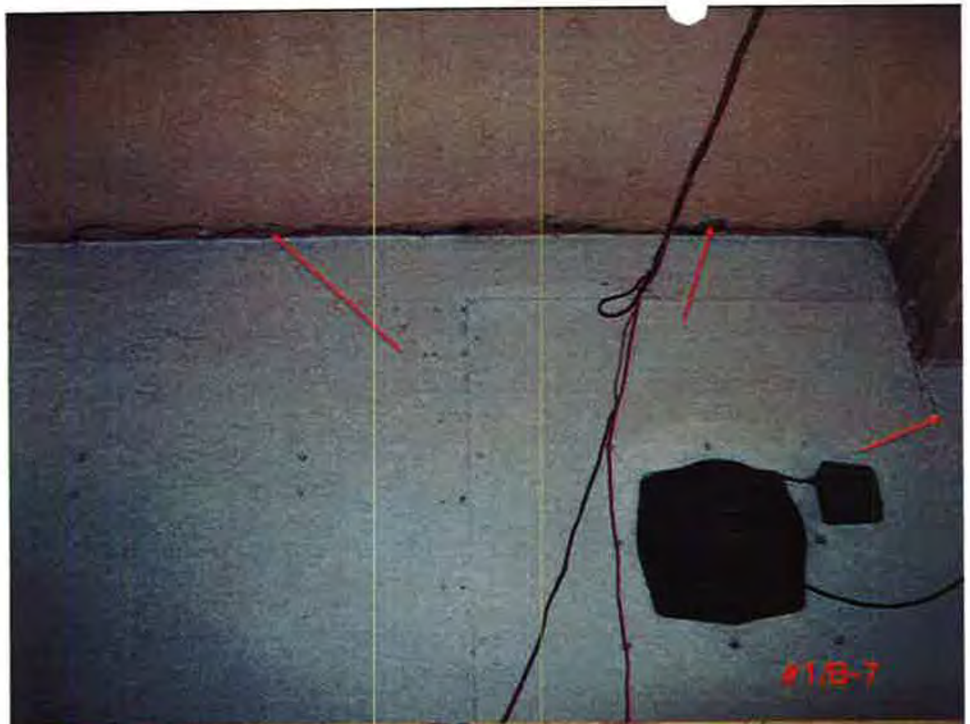

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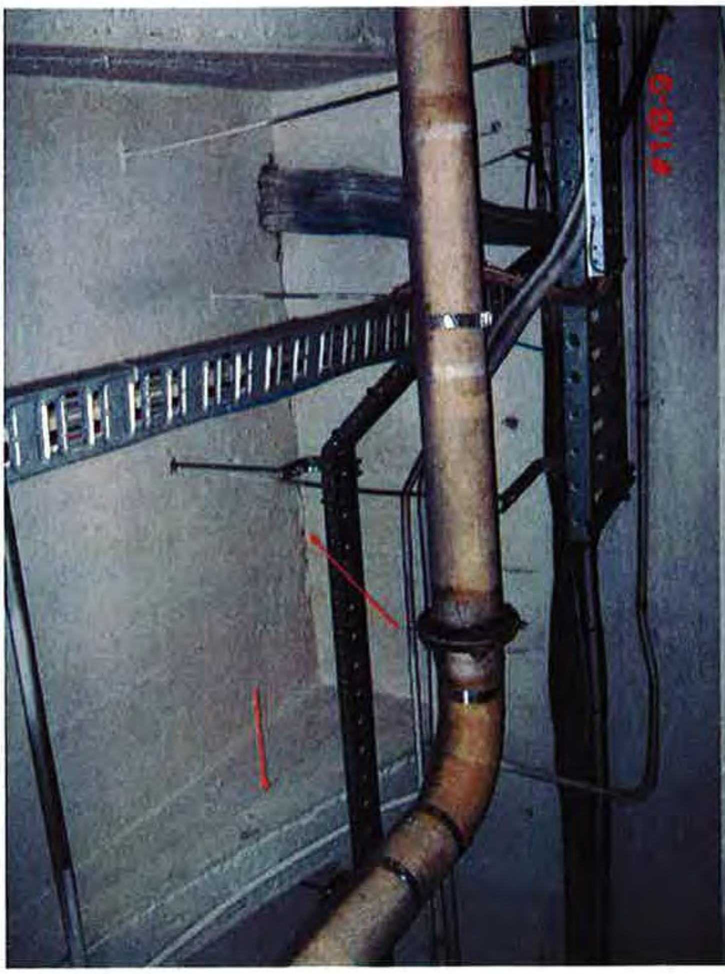
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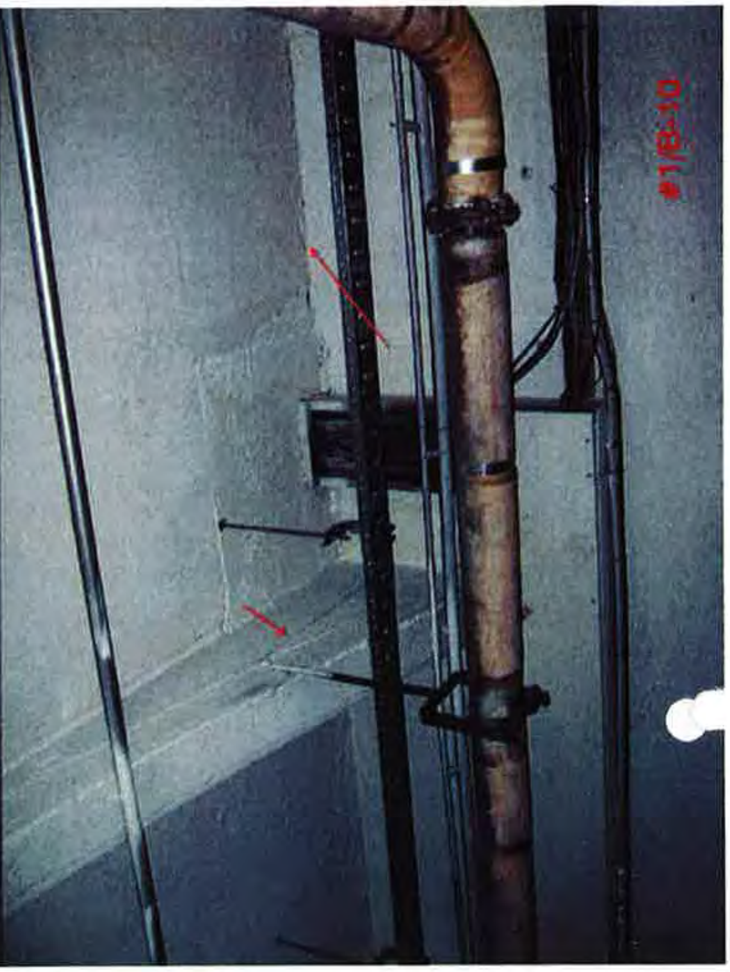
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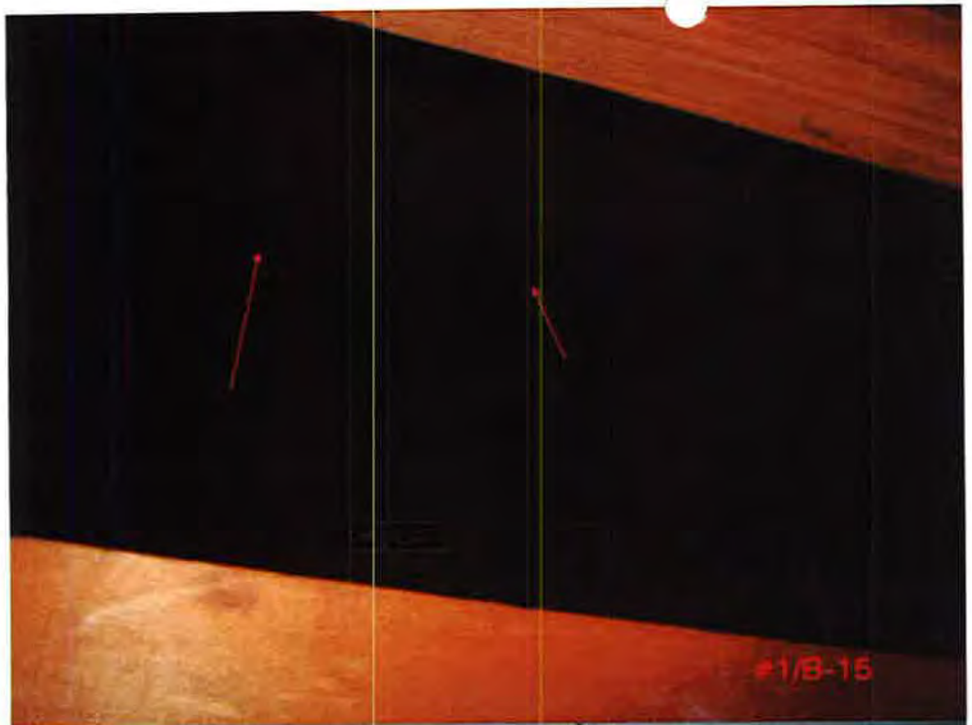

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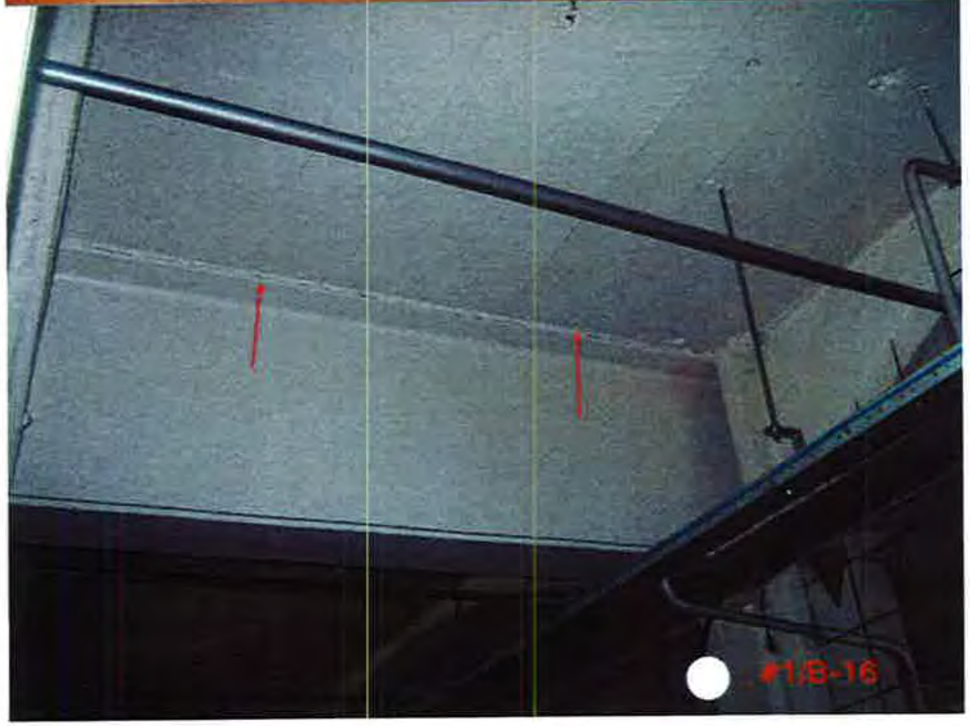

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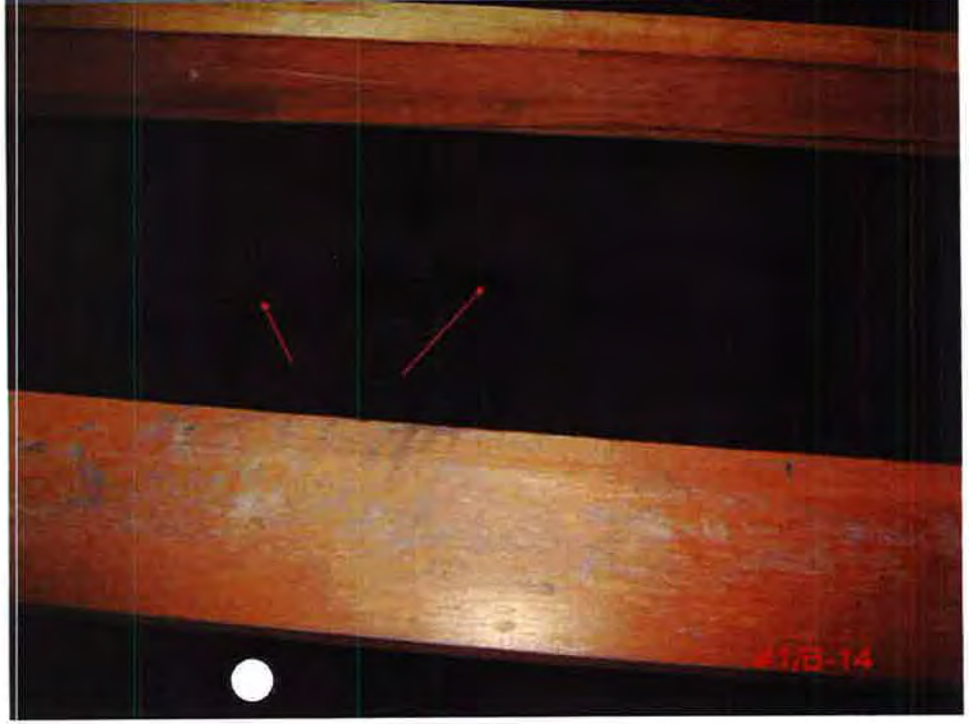

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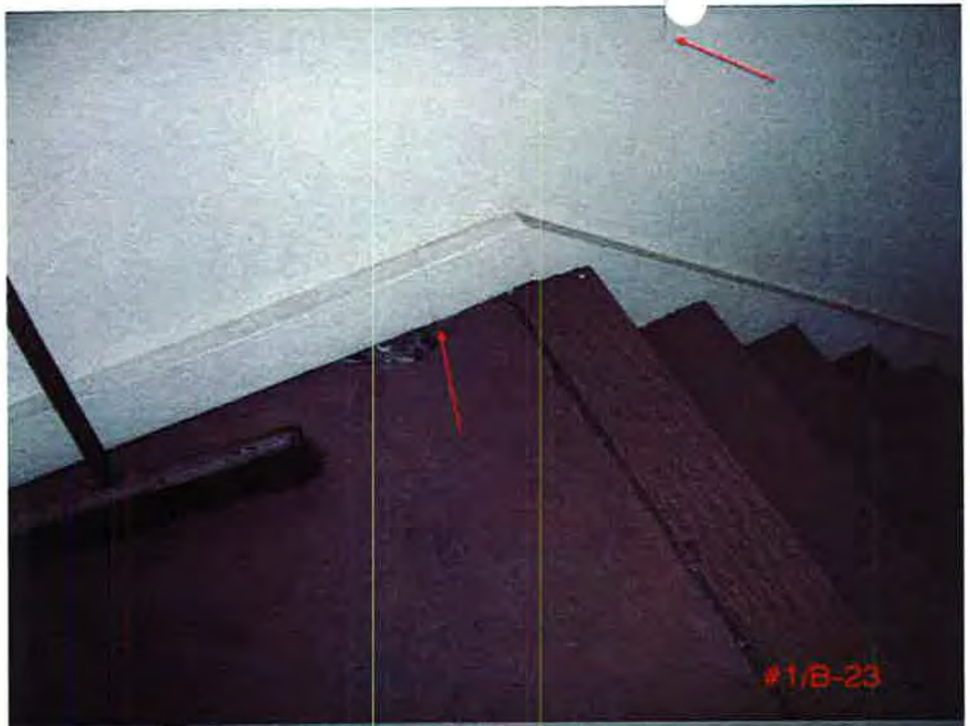
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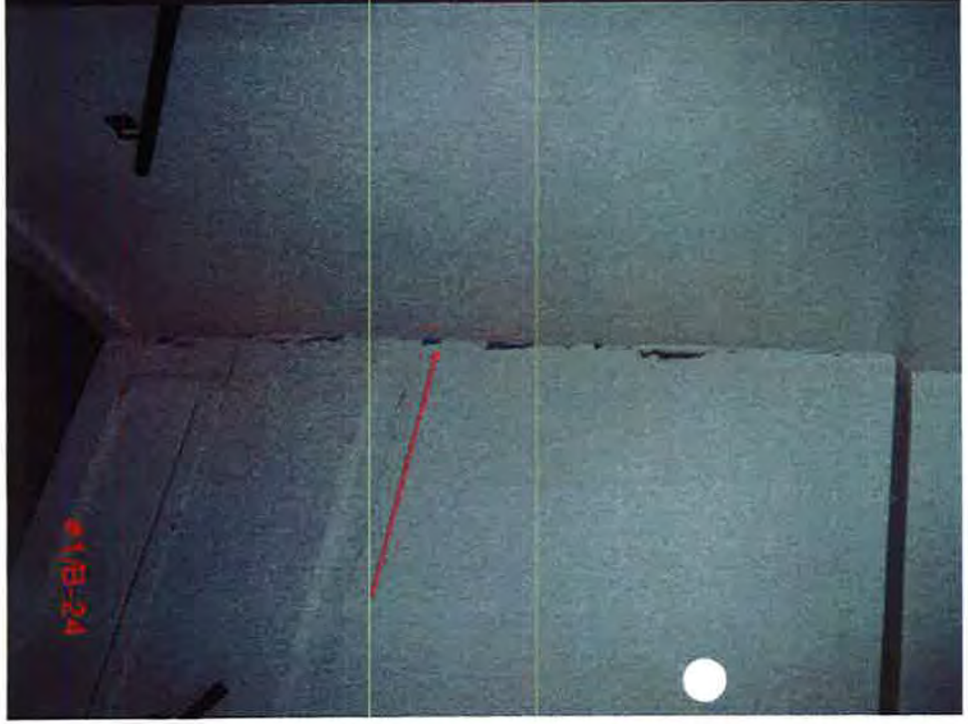
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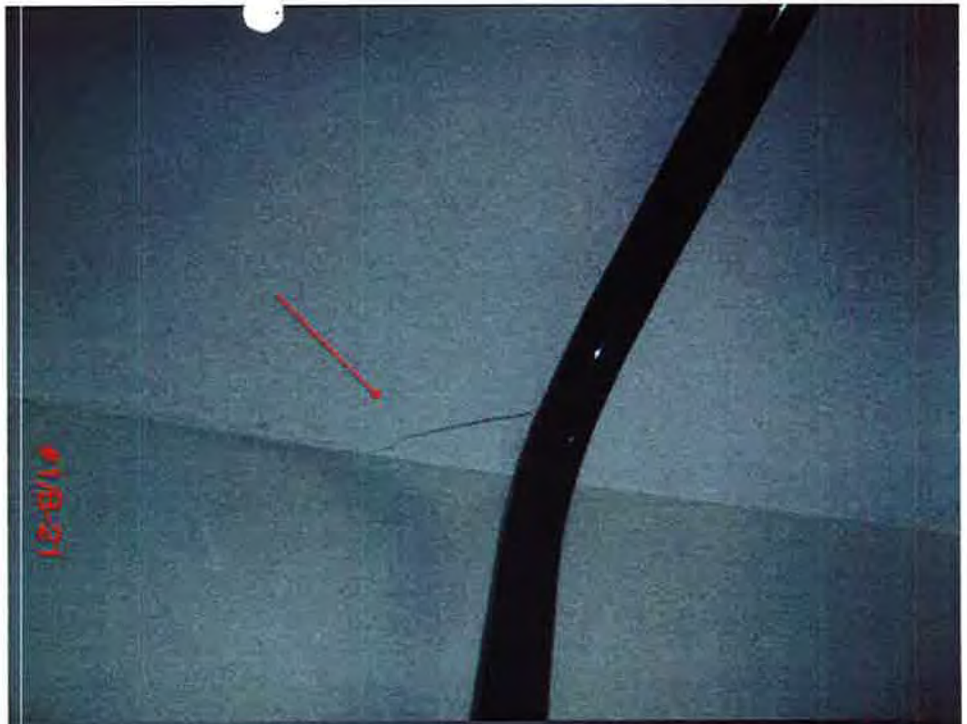
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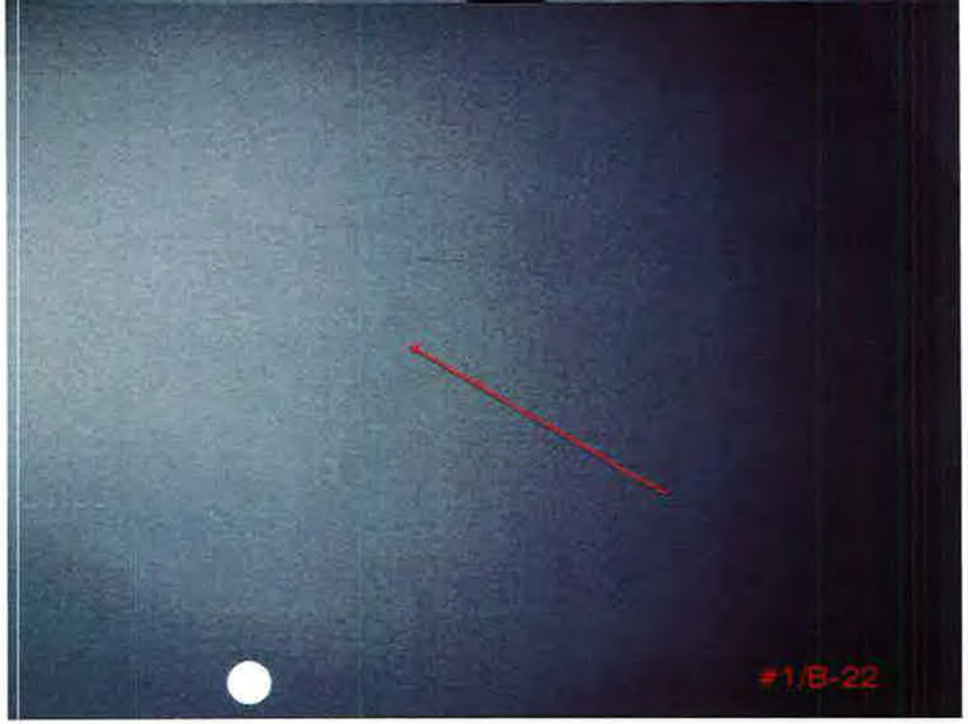
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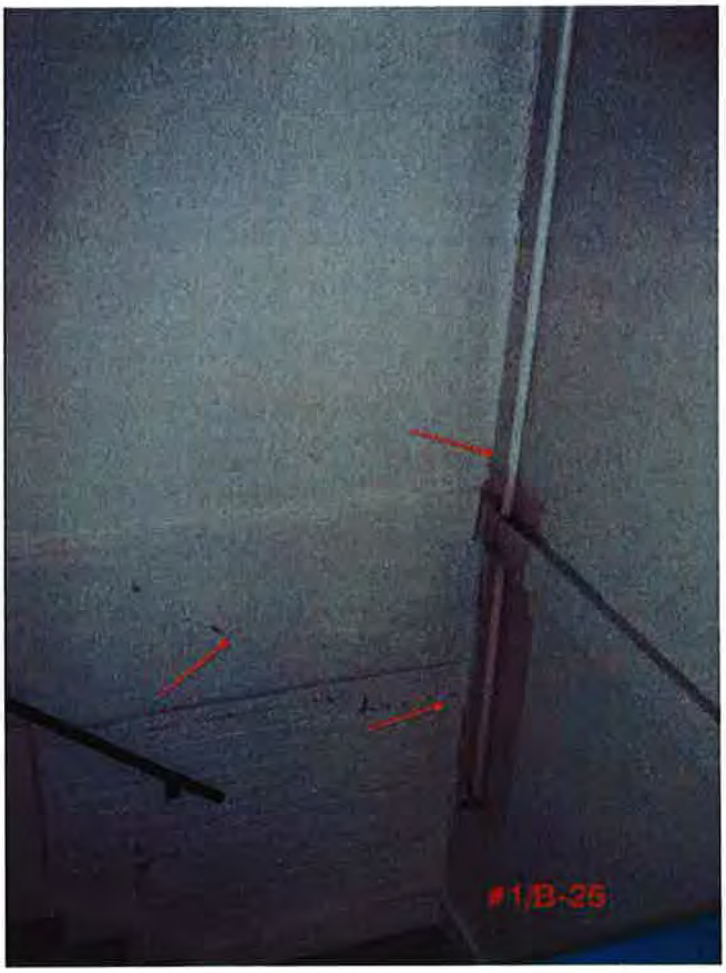
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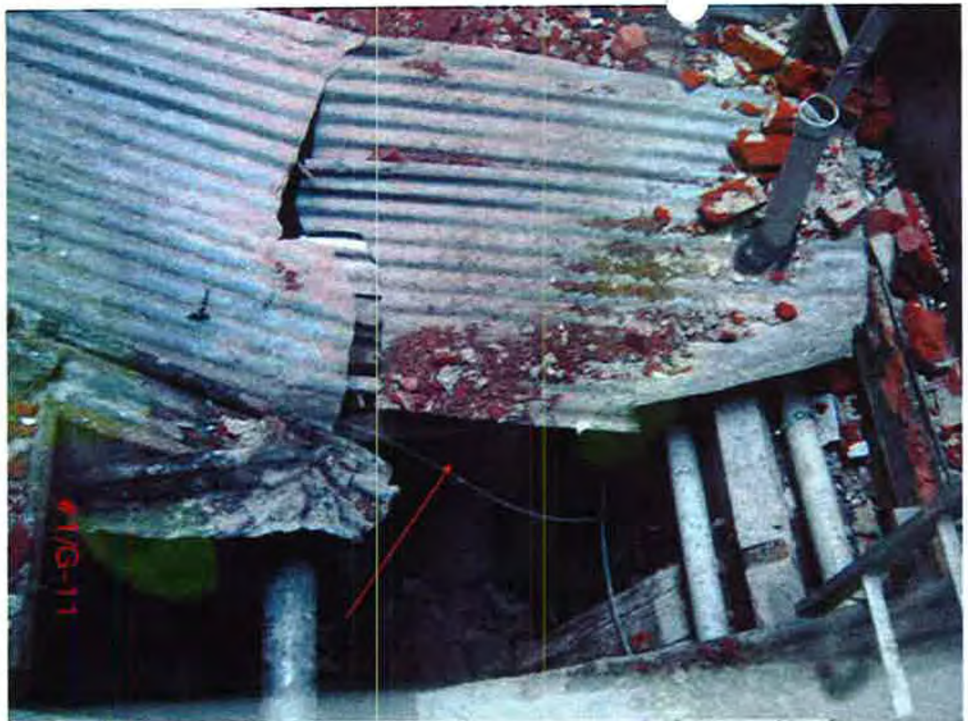

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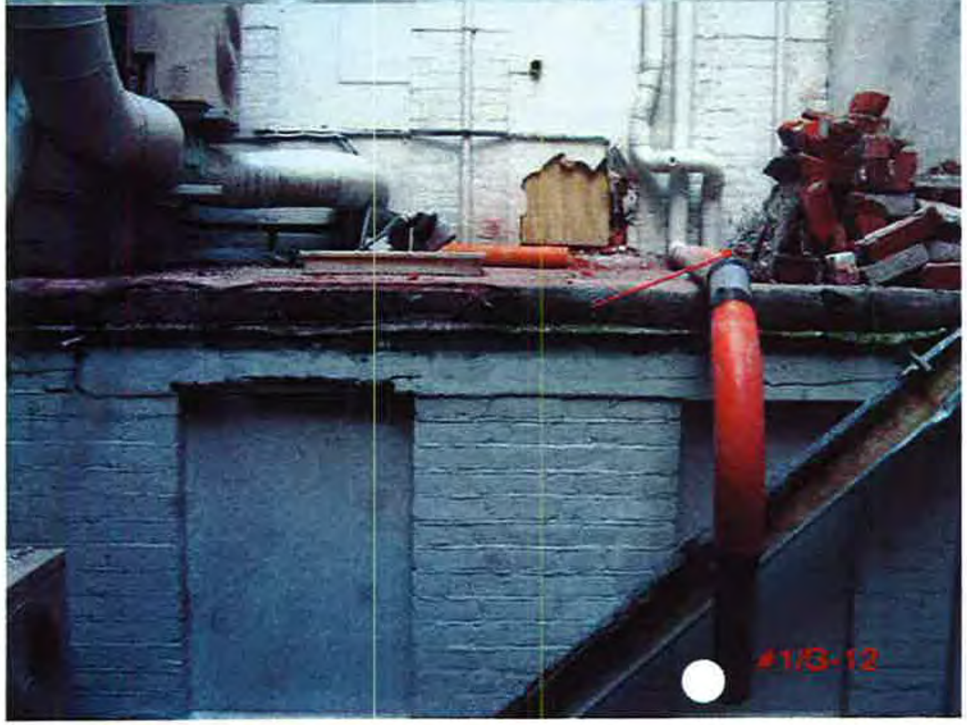

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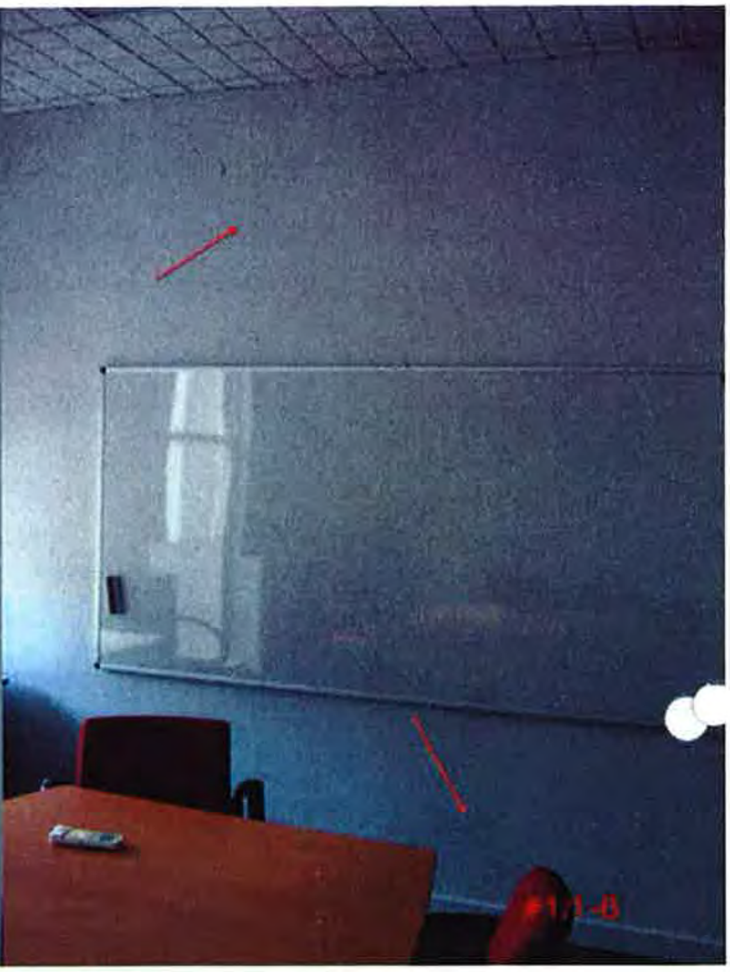
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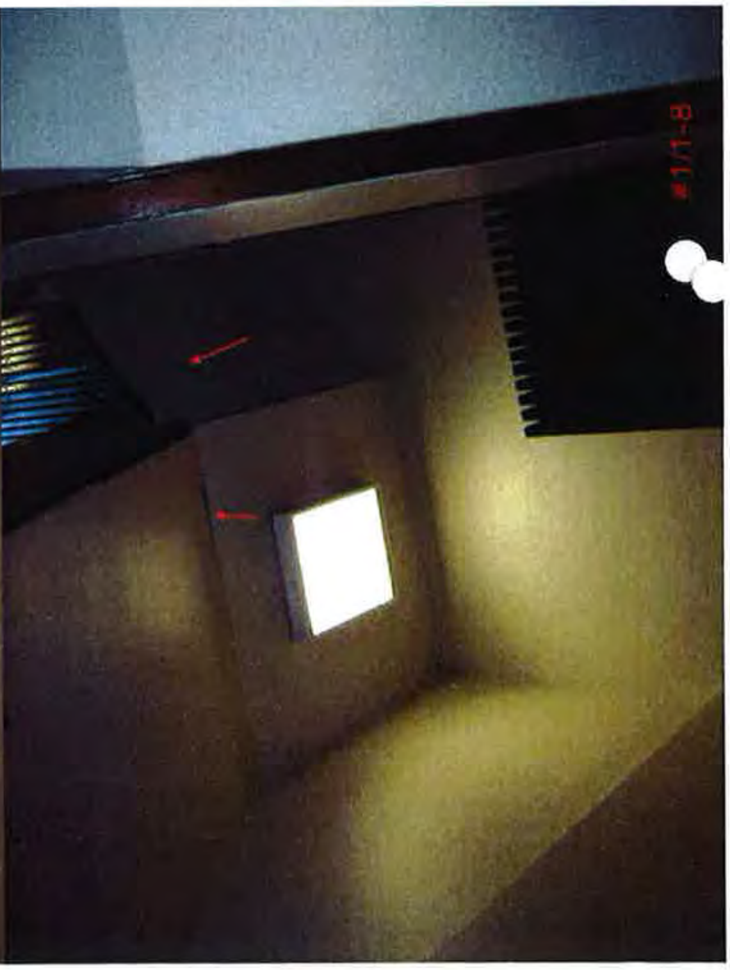
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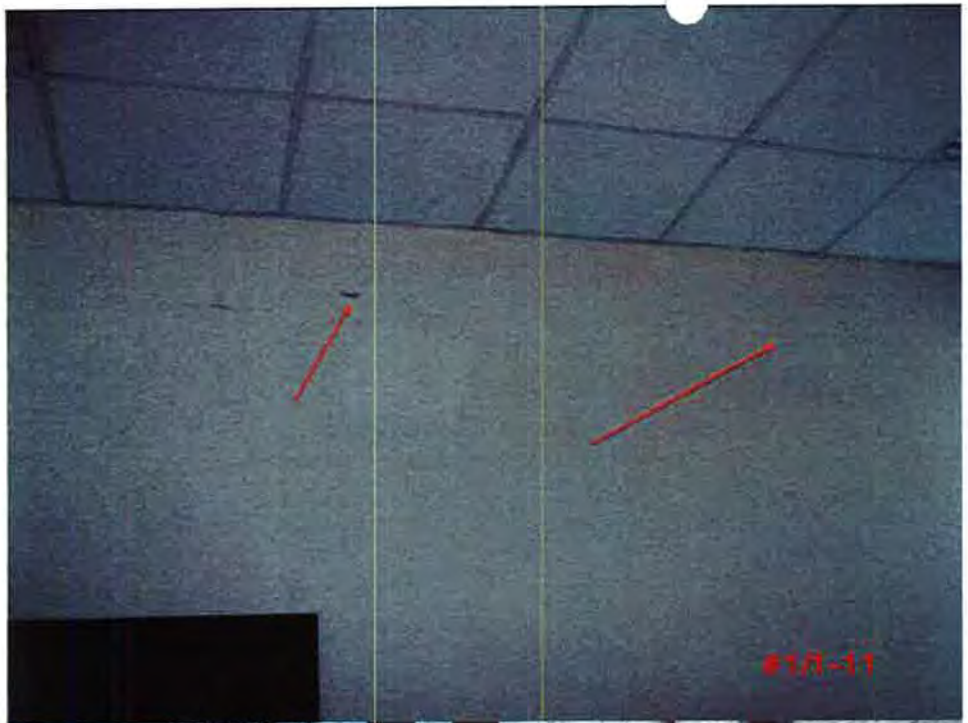
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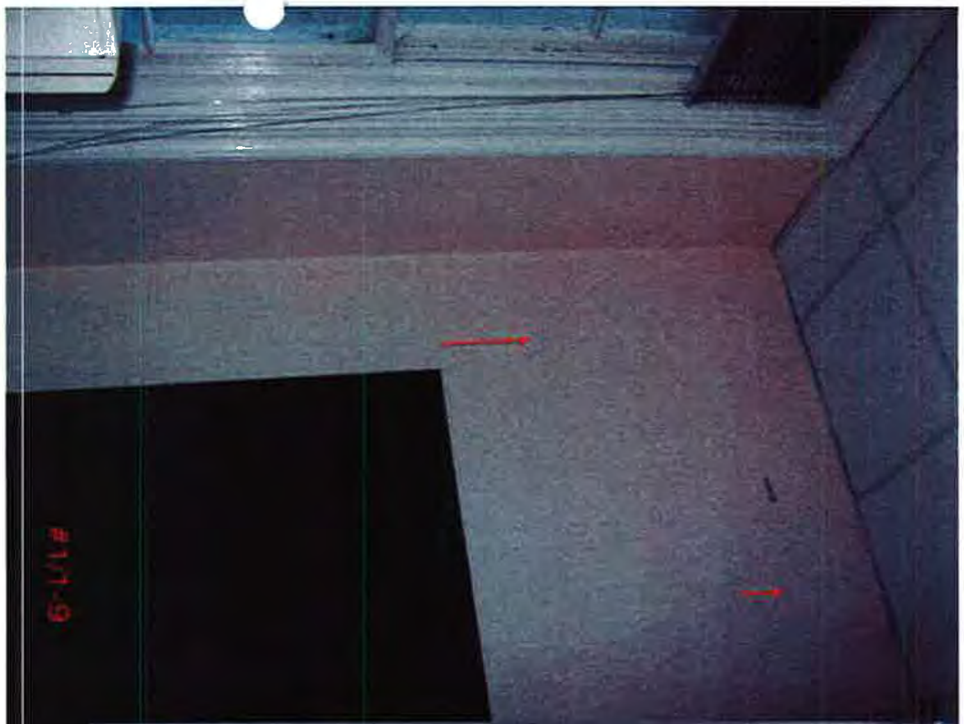
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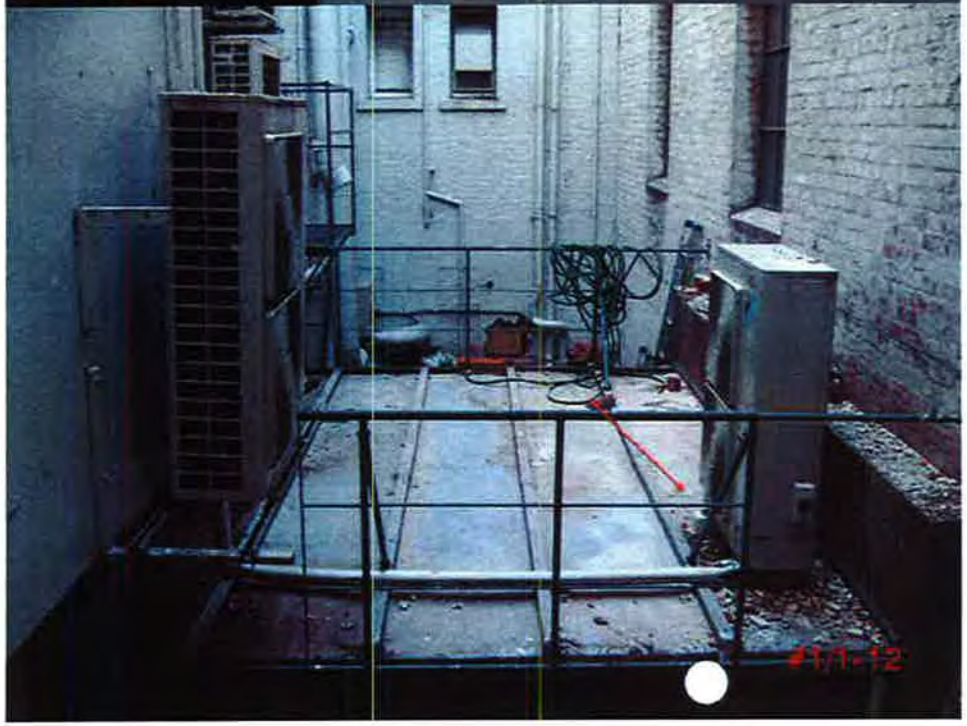
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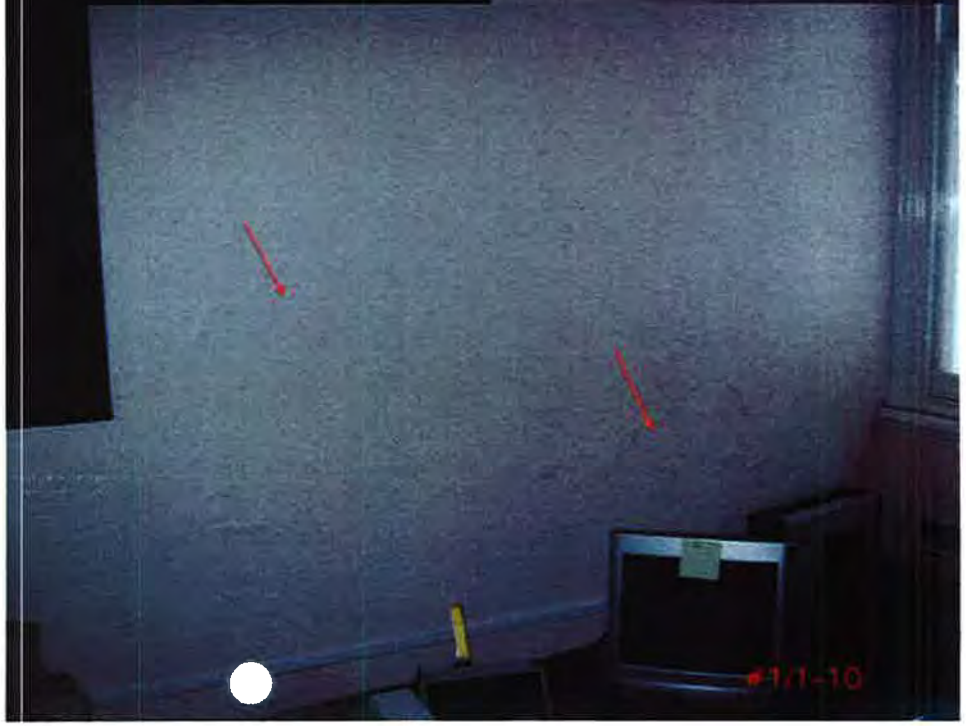
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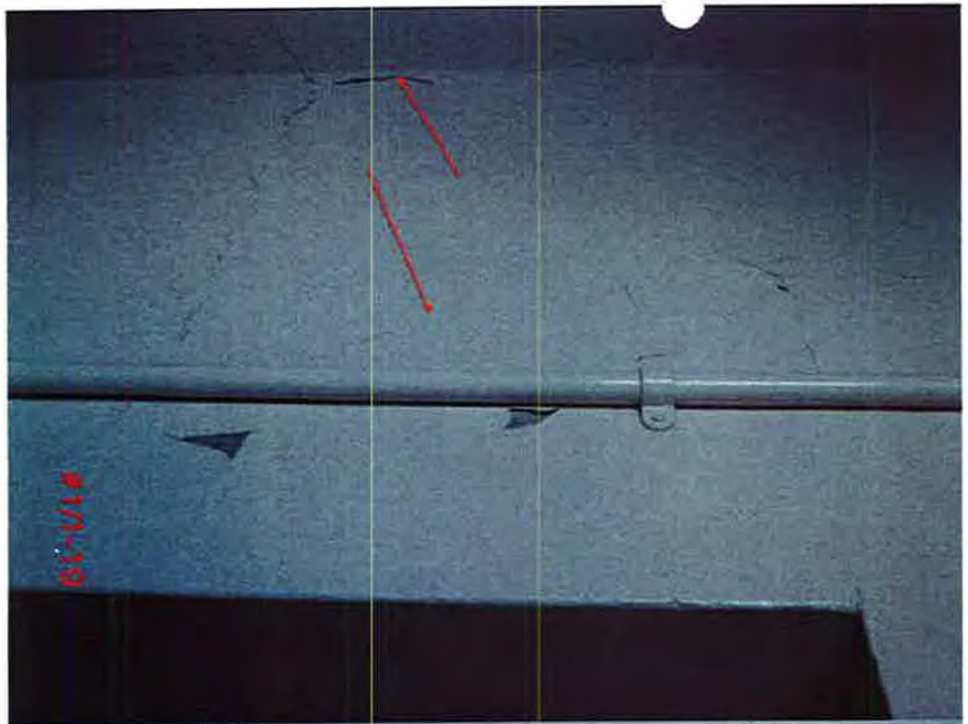
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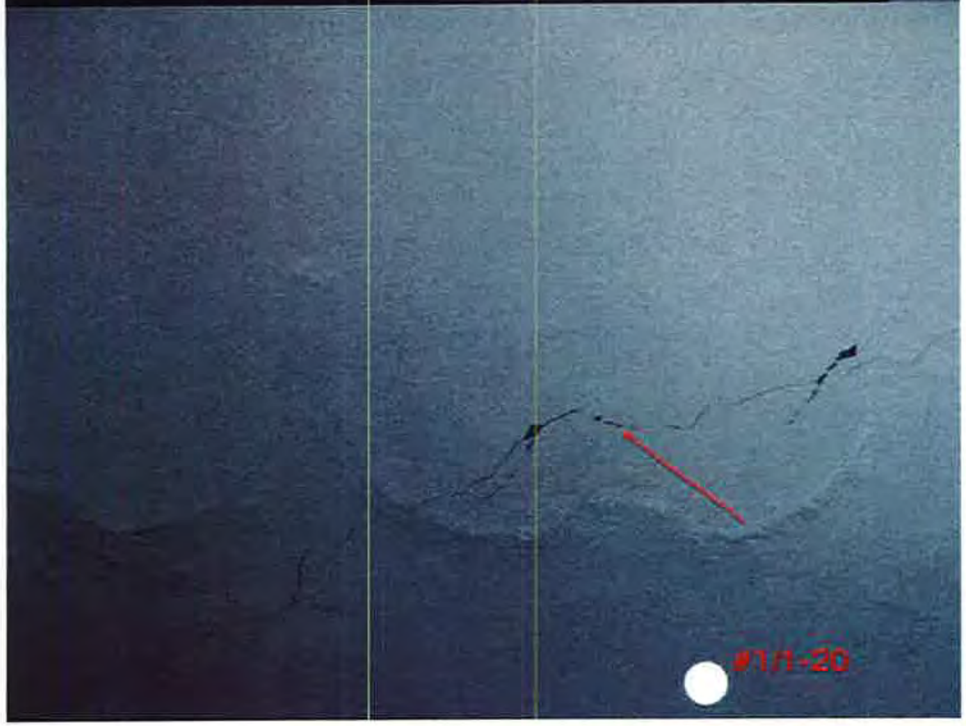
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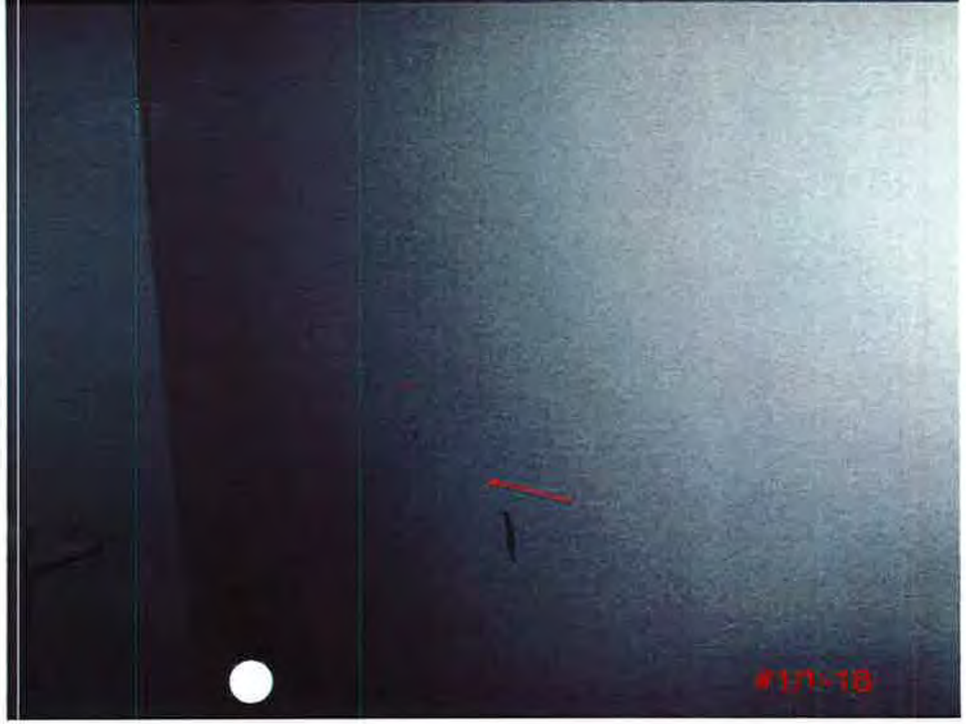
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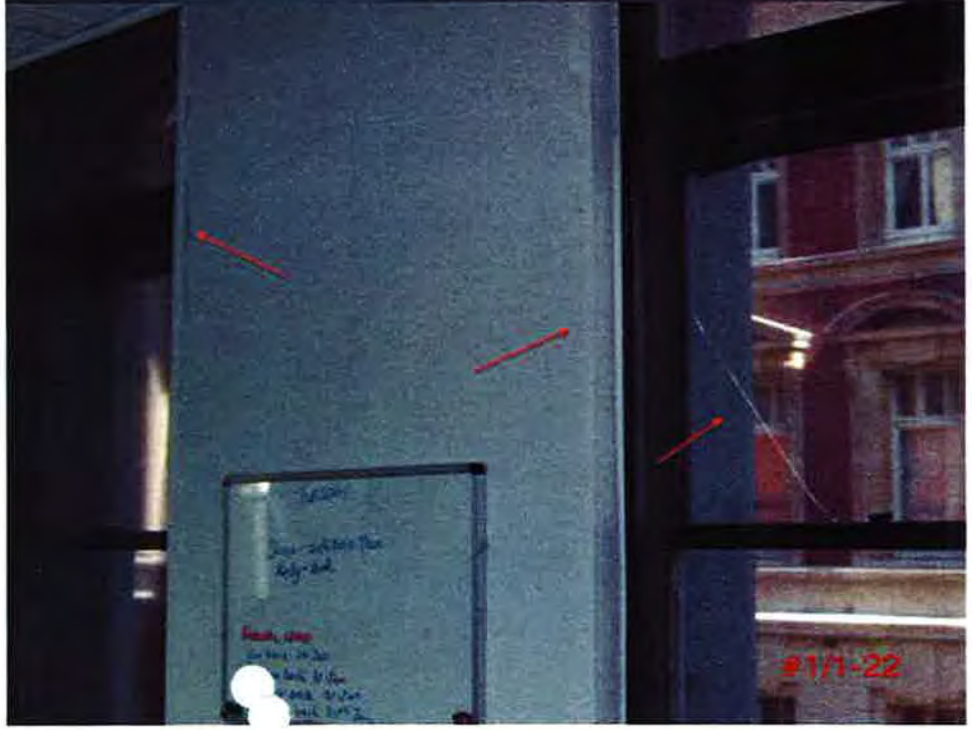
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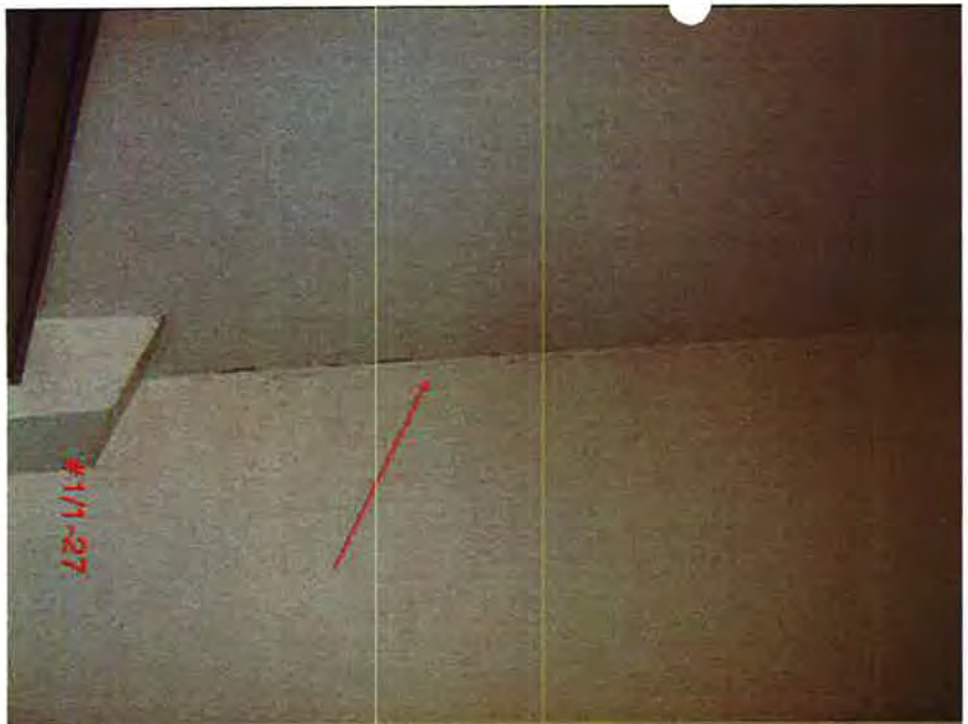
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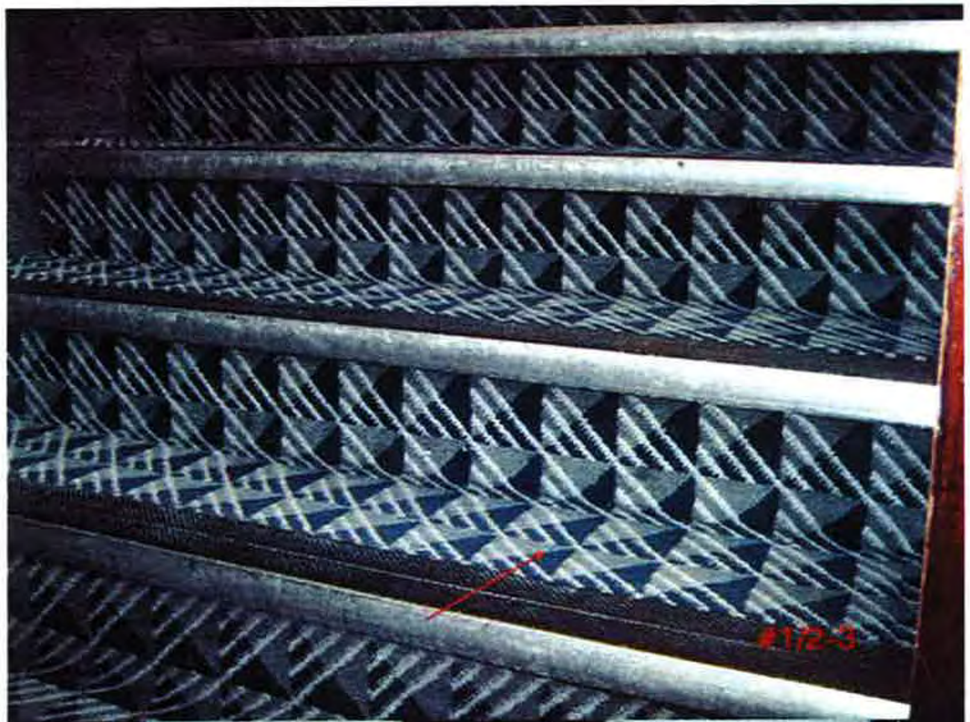
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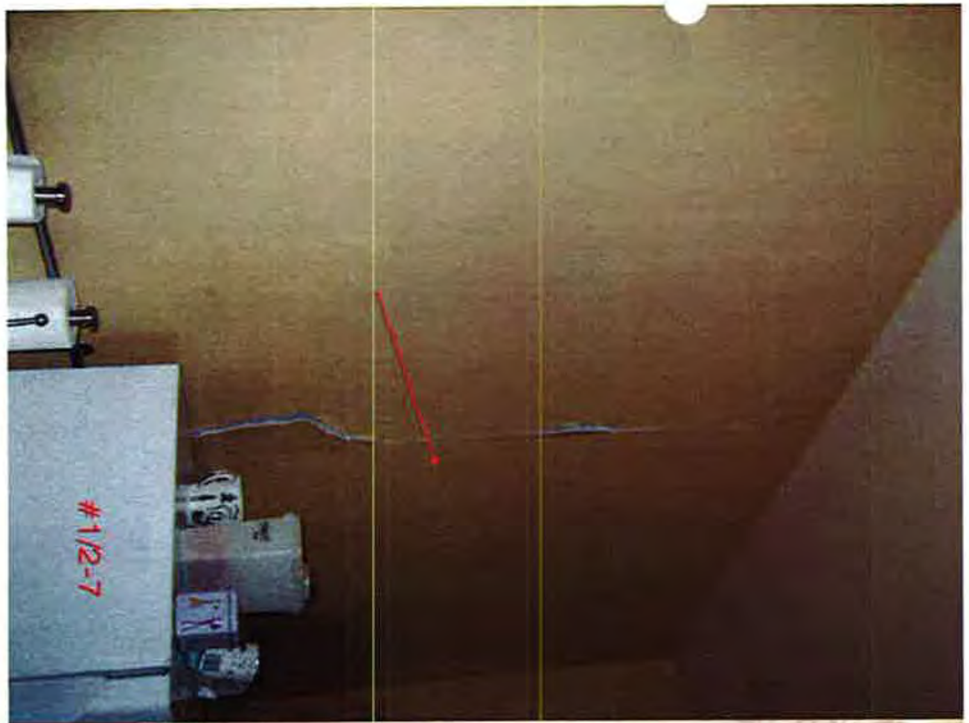
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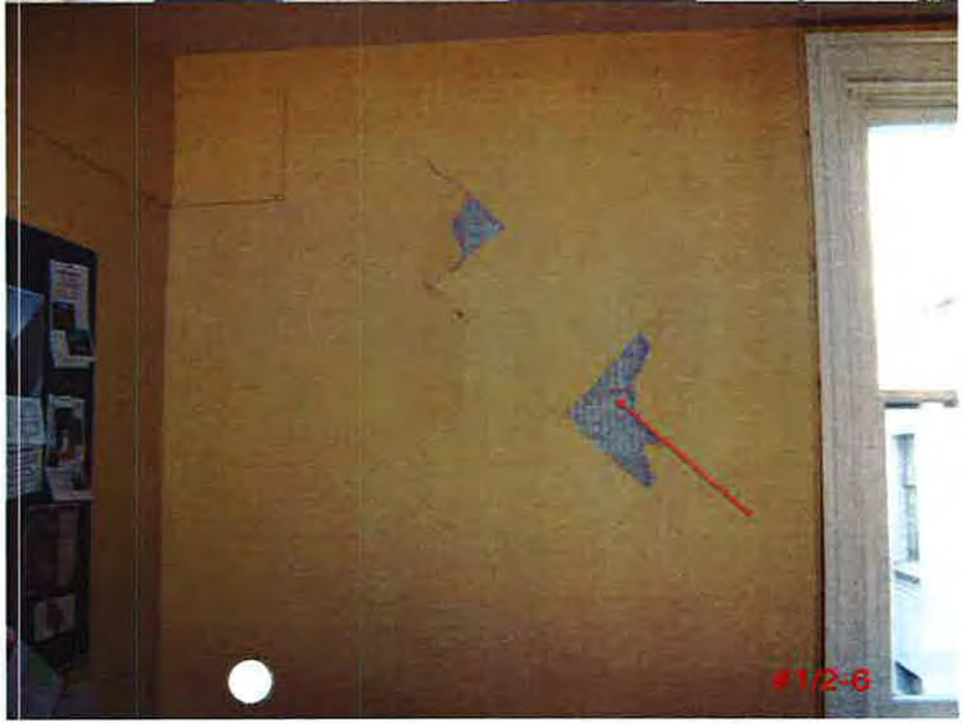
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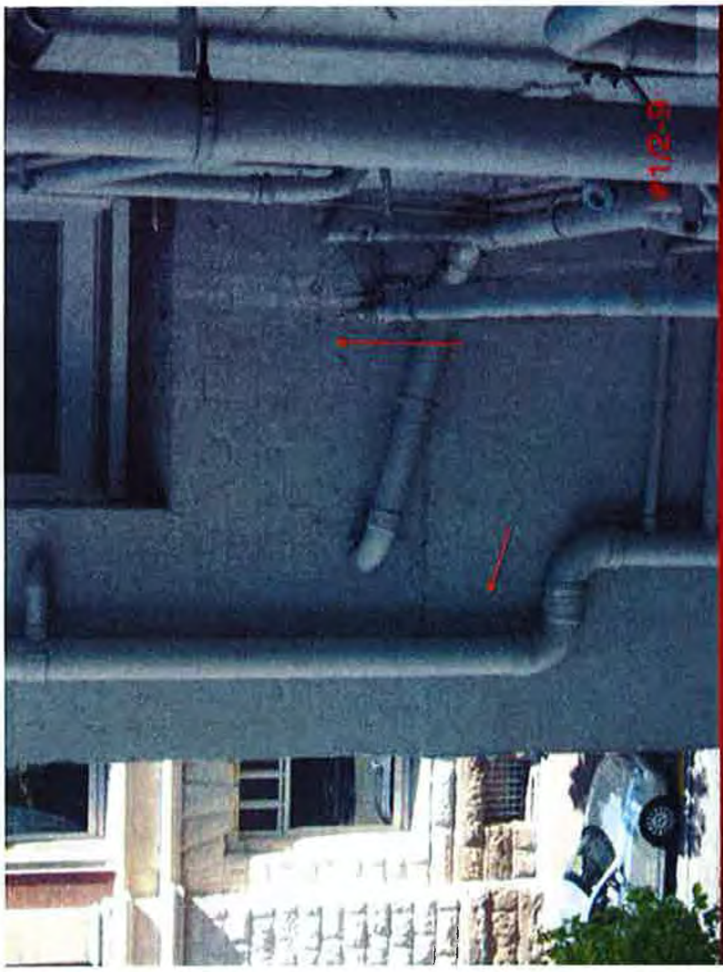
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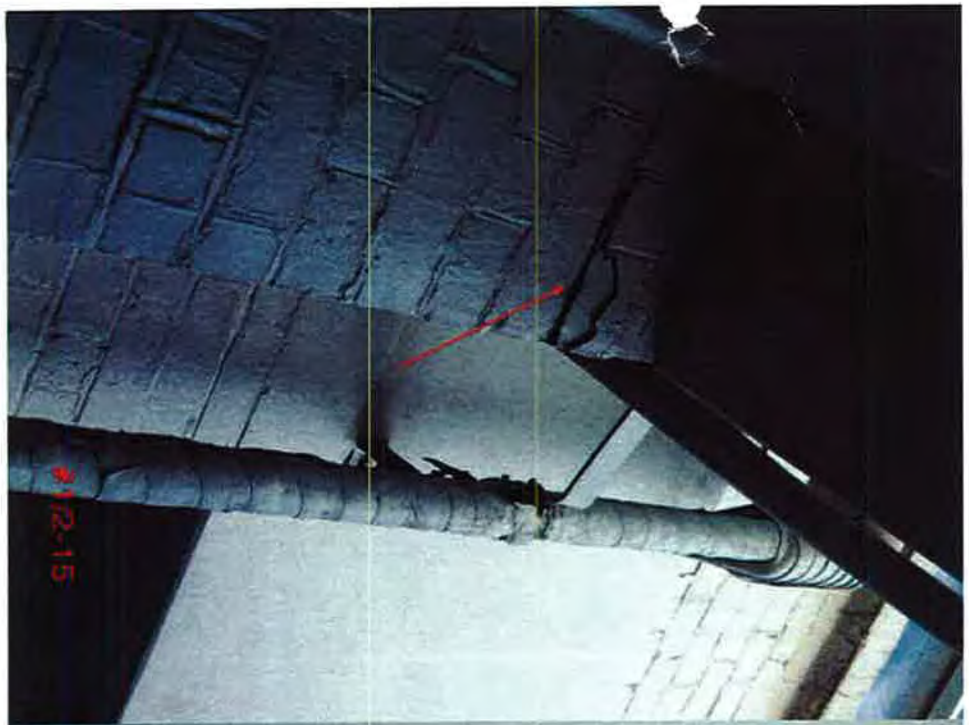
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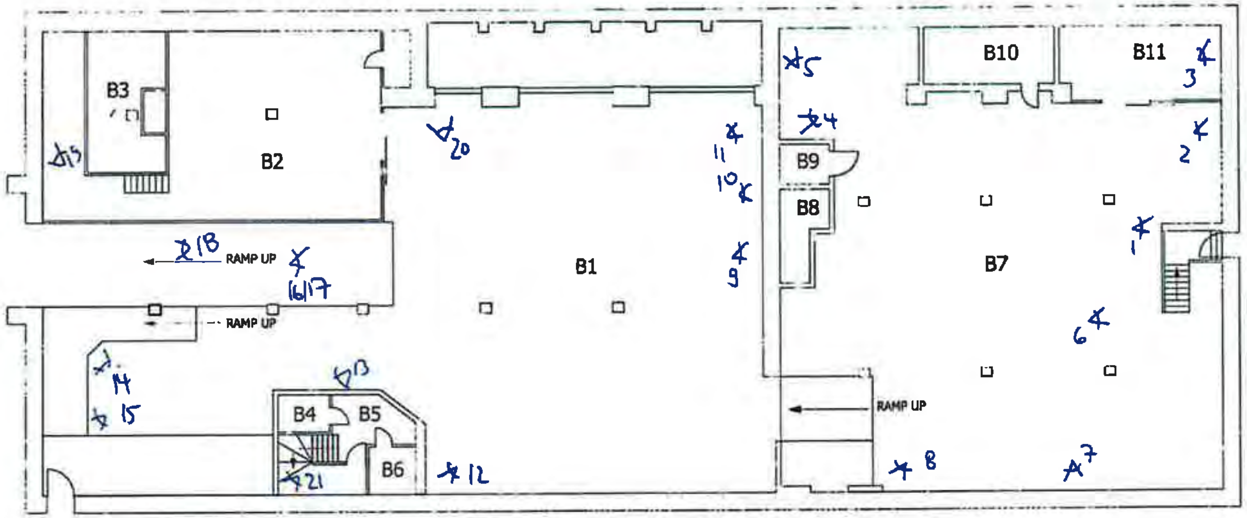

Views ✱22 to ✱25

- ADDITIONAL DAMAGE BASEMENT STAIR NORTH

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LEGEND
✱ VIEW DIRECTION

Project Title
The Christchurch Press Complex

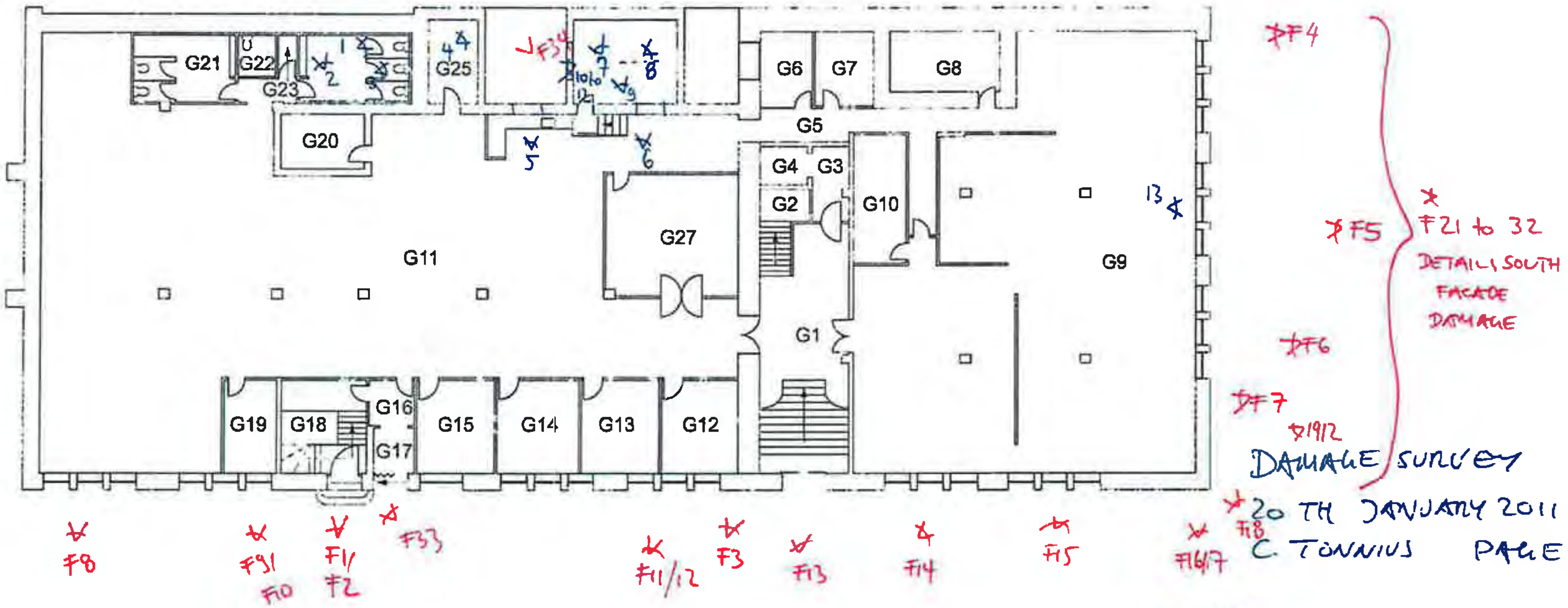
BUILDING ONE

Cathedral Square
Christchurch

Drawing Title
EXISTING BASEMENT FLOOR PLAN

Scale
Scale 1:200 @ A3

Issue SKETCH
Date
C.A.D file
Project No.
Sheet No.
SK 1.0
Rev



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✗ VIEW DIRECTION

... F EXTERNAL PHOTOS IN RED

Project Title
The Christchurch Press Complex

BUILDING ONE

Cathedral Square
Christchurch

Drawing Title
EXISTING GROUND FLOOR PLAN

Scale
Scale 1:200 @ A3

Drawn by
Date

Checked
Date

Issue SKETCH

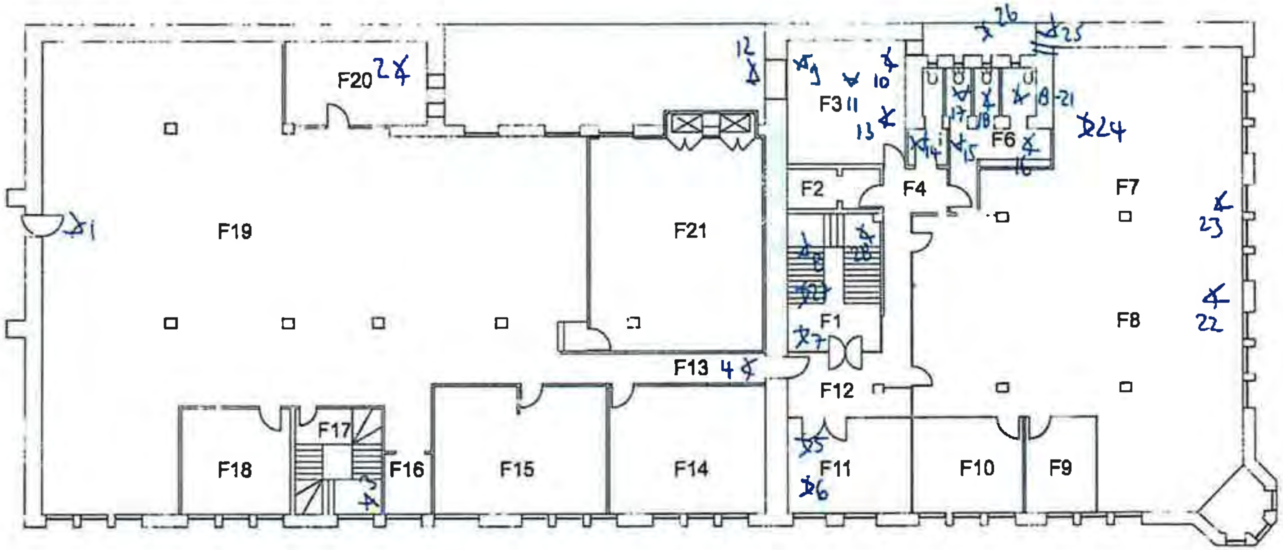
Date

C.A.D file

Project No.

Sheet No.
SK 1.1

Rev



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20TH JANUARY 2011
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LEGEND
⚹ VIEW DIRECTION

Project Title
The Christchurch Press Complex

BUILDING ONE

Cathedral Square
Christchurch

Drawing Title
EXISTING FIRST FLOOR PLAN

Scale
Scale 1:200 @ A3

Drawn by
Date

Checked
Date

Issue SKETCH

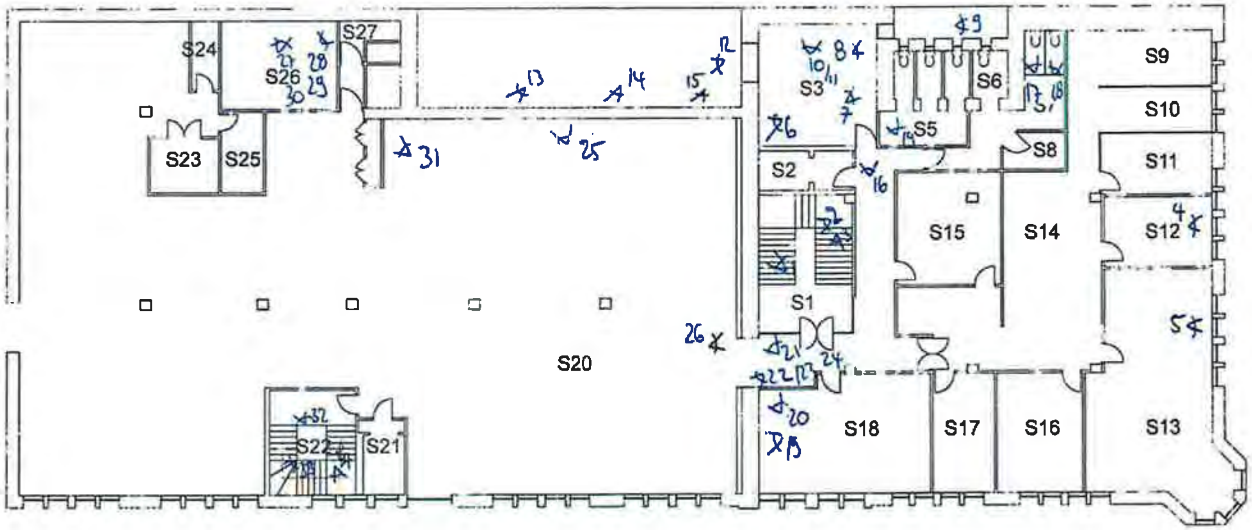
Date

C.A.D file

Project No.

Sheet No.
SK 1.2

Rev



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20TH JANUARY 2011
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LEGEND
✗ VIEW DIRECTION

Project Title
The Christchurch Press Complex

BUILDING ONE

Cathedral Square
Christchurch

Drawing Title
EXISTING SECOND FLOOR PLAN
Scale
Scale 1:200 @ A3
Drawn by
Date
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Date

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Project No.
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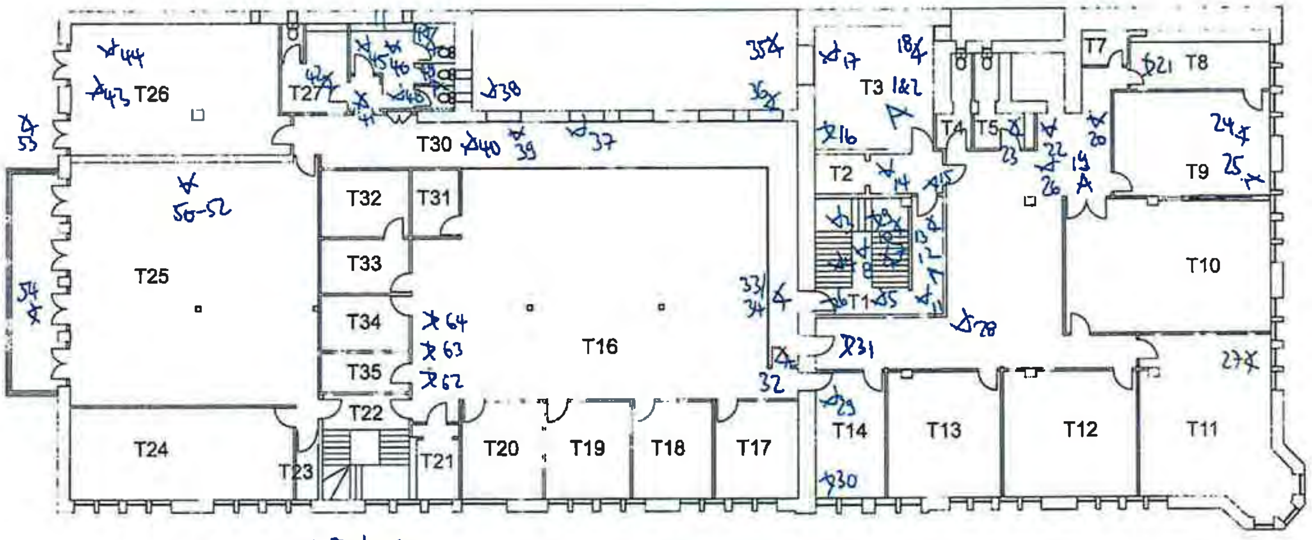

55 to 61
ADDITIONAL DAMAGE
IN NORTH STAIR
LEVEL 3

DAMAGE SURVEY
20TH JANUARY 2011
C-TONNIUS PAGE 5OF6

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LEGEND

✗ VIEW DIRECTION

Project Title
The Christchurch Press
Complex

BUILDING ONE

Cathedral Square
Christchurch

Drawing Title
EXISTING THIRD
FLOOR PLAN

Scale
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Drawn by
Date

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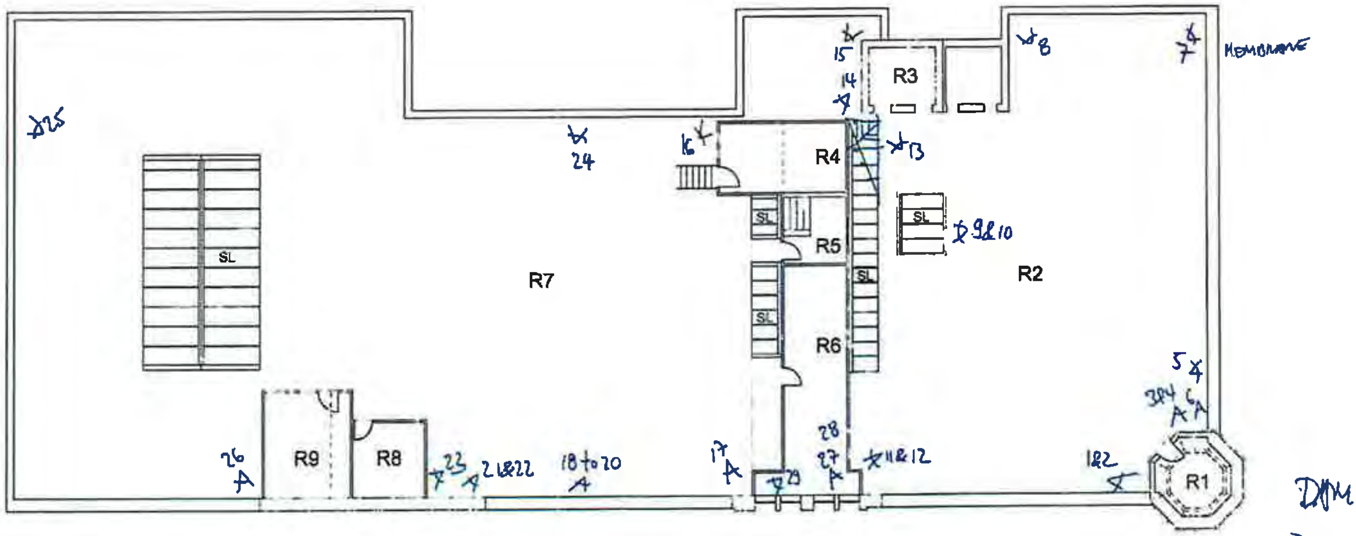

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LEGEND
✗ VIEW DIRECTION

Project Title
The Christchurch Press Complex
BUILDING ONE
Cathedral Square
Christchurch

Drawing Title
EXISTING ROOF PLAN
Scale
Scale 1:200 @ A3
Drawn by
Date
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Date

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Project No.
Sheet No.
SK 1.5
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HolmesConsultingGroup

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MEMORANDUM

To: Matt Bonis

Company: Planit RW Batty & Associates Limited

From: John Hare

Project No: 105849 Date: 3 February 2011

Subject: Press Co. - RC Support Information

Hi Matt

You will have seen the drawings that we sent through late on Friday, which are our concept for the structural works. We are working on the report that goes with that, but subject to some fine-tuning, a summary is as follows:

EXISTING BUILDING

We have completed a full assessment of the building in its condition prior to the Darfield Earthquake of September 4 2010, and the Boxing Day earthquake. The general conclusion of this is that the building was not earthquake prone prior to the earthquake. Assessed capacities are approximately 40-45% Full Code Load (FCL) for the east-west actions and 50% FCL for north-south actions.

The Darfield earthquake (M7.1) was primarily a north-south orientated earthquake, with amplification in the longer period range. The Boxing Day aftershock (M4.4), although significantly smaller in magnitude, was relatively close at approximately 3.6km. Further it was primarily east-west in orientation and a short duration, short-period movement. This was significantly more damaging to this building in particular. It is further surmised form the damage recorded (primarily to the south wall pier elements at all levels and to the central stair walls and north walls at the third floor) that there was some pounding from the Worcester Towers building to the east.

Temporary shoring has been installed to the worst affected areas of the building in order to provide a measure of security for safe occupation, and for the safety of pedestrians externally. This work will need to be retrospectively consented, but in the longer term will be removed as the building is repaired and reinstated.

Although a formal assessment has not been completed, it is clear that the building's residual strength following these earthquakes is less than 33% FCL.

PROPOSED REPAIR AND REINSTATEMENT WORK

Our structural concept for the repair and reinstatement of the building is shown on our sketches Ssk-001 to 003 and outline specification. In general terms, this work is as follows:

1. South wall. Several piers were severely damaged in the Boxing Day aftershock and have been shored with timber and nylon strops. These piers require extensive repair prior to compensatory strengthening to fully reinstate them.

   Strip linings and repair damaged piers with Helifix anchors (crossing cracks) and cementitious grout to cracks. Line entire wall with 150mm reinforced concrete skin wall. Reline. Option of using Fibre Reinforced Polymer (FRP) was considered, but would not offer the required stiffness increase on this face. Centre-coring the columns from above was also and option, but with the variable materials (stone and brick) it is felt that this may not be practically achievable over this height.

   Some of the decorative stonework to the exterior of the building has been damaged. This will require repair. Generally the repairs may be implemented insitu, but a split pilaster at the first floor will need to be carefully removed and replaced. Other cracked stones may be pinned in place with stainless steel anchors, subject to the engineer's assessment on site. Mortar joints will need to be repointed.

2. West wall. There is extensive cracking evident on the facade, generally repairable insitu. The majority of this happened during the September 4 quake, with further movement evident after the Boxing Day quake. Although the cracking is fairly evenly distributed, there is some evidence of settlement towards the centre, adjacent to the dividing wall between the two parts of the building.

   Strip linings and repair any damaged piers as South wall. Prepare wall and fix FRP strengthening to surface prior to relining. The benefit of the FRP is its thickness, at less than 3mm for two layers. Any alternative would be more intrusive, apart from centre-coring, ruled out as above.

   Repair the facade, similar to the south wall.

3. North wall. The third floor northwest columns (two in total) were severely damaged in the September 4 quake, and will need to be rebuilt completely. This will entail shoring the adjacent roof beams (propping over two floors should be sufficient) and rebuilding the piers, removing any loose brick and repairing adjacent areas where necessary. The two

piers at the northeast corner were relatively undamaged following the original quake, but were significantly damaged in the Boxing Day aftershock. The worse of the two has had a remedial repair using galvanised steel rods drilled centrally through the column and grouted in place. The other has been shored and strapped in place using timber and strops. Subject to the effect of any further movement, these piers should be repairable as the south facade.

The third floor will then require strengthening with added stiffness. Because the openings below are to be reinstated, this will extend over the full height of the north facade. A 150mm concrete skin is proposed , as the south wall, with the same alternative solutions considered.

4. East wall. The east wall is solid masonry, with the exception of the walls to the lightwell, and the third floor, where it projects above the adjacent property. There is significant damage to the piers of the north section of the wall at the third floor, and the adjacent return wall of the lightwell.

   The two worst damaged piers of the north section need to be rebuilt, similar to the northwest section of the north wall. The balance of the wall at the third floor is then to have all linings removed for repair of cracks as described above, following which FRP is to be applied.

5. Central east-west wall (including central stairwell). This wall has suffered extensive damage from the Boxing Day event, resulting in lateral movement at and above the third floor.

   Cracks to the wall at third floor level (to the stairwell and the adjacent south wall of the lightwell) need repair with Helifix anchors and grout as described above. Once repaired, apply FRP prior to re-lining.

6. Roof level. There is damage to the tower at the southwest corner, from both the original and Boxing Day earthquakes. The 'crows nest' lattice work was removed following the original event. The parapets have in some cases cracked severely, mostly along the north and east facades. There is non-structural damage to the roof membrane, causing leaks thoughout.

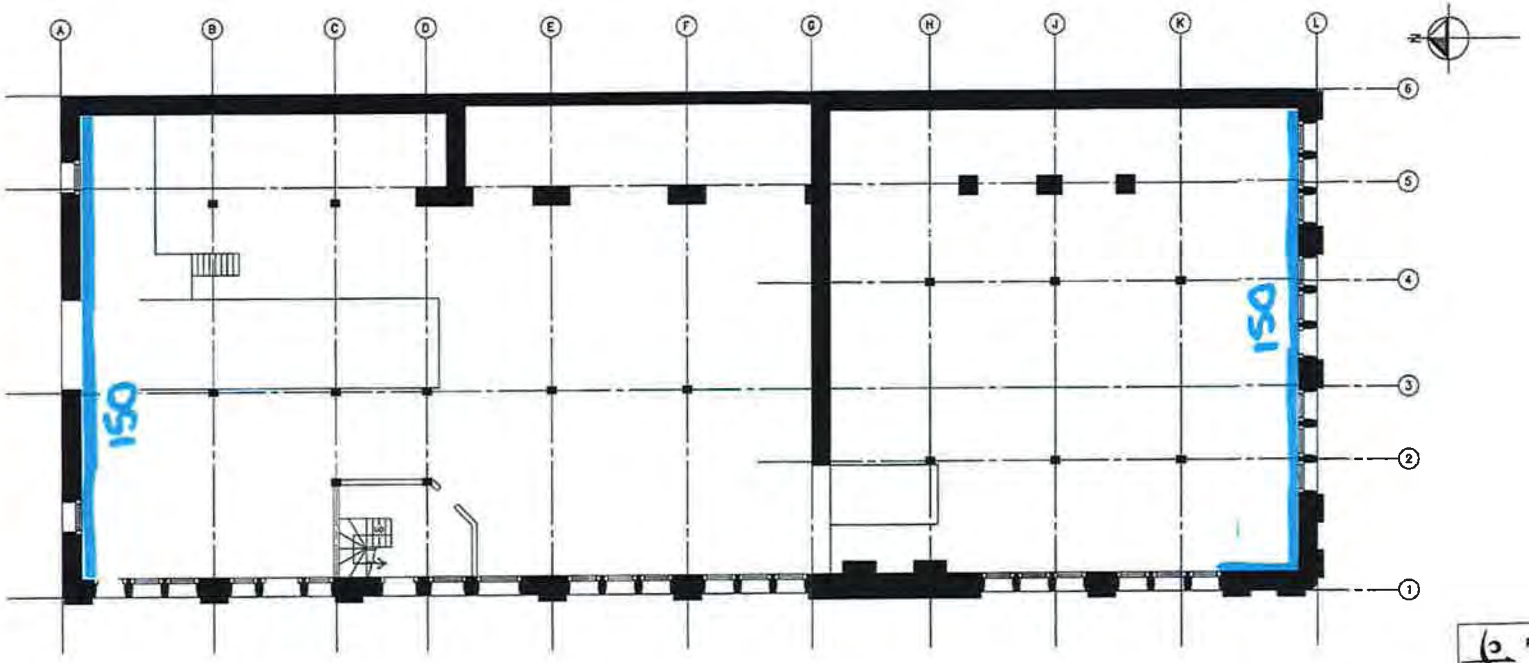
   The parapet bracing needs to be upgraded to the increased minimum load levels, noting that the original CCC parapet ordinance required only that parapets to public streets be braced, and to a relatively low level of load. Exposed structural steel to the back of the parapet can be installed or upgraded.

The tower needs strengthening. WE have proposed use of FRP to the inside of the tower, minimising the intrusion of new material into the space. Some exposed steel bracing may be required at the top of the tower to re-support the crows nest.

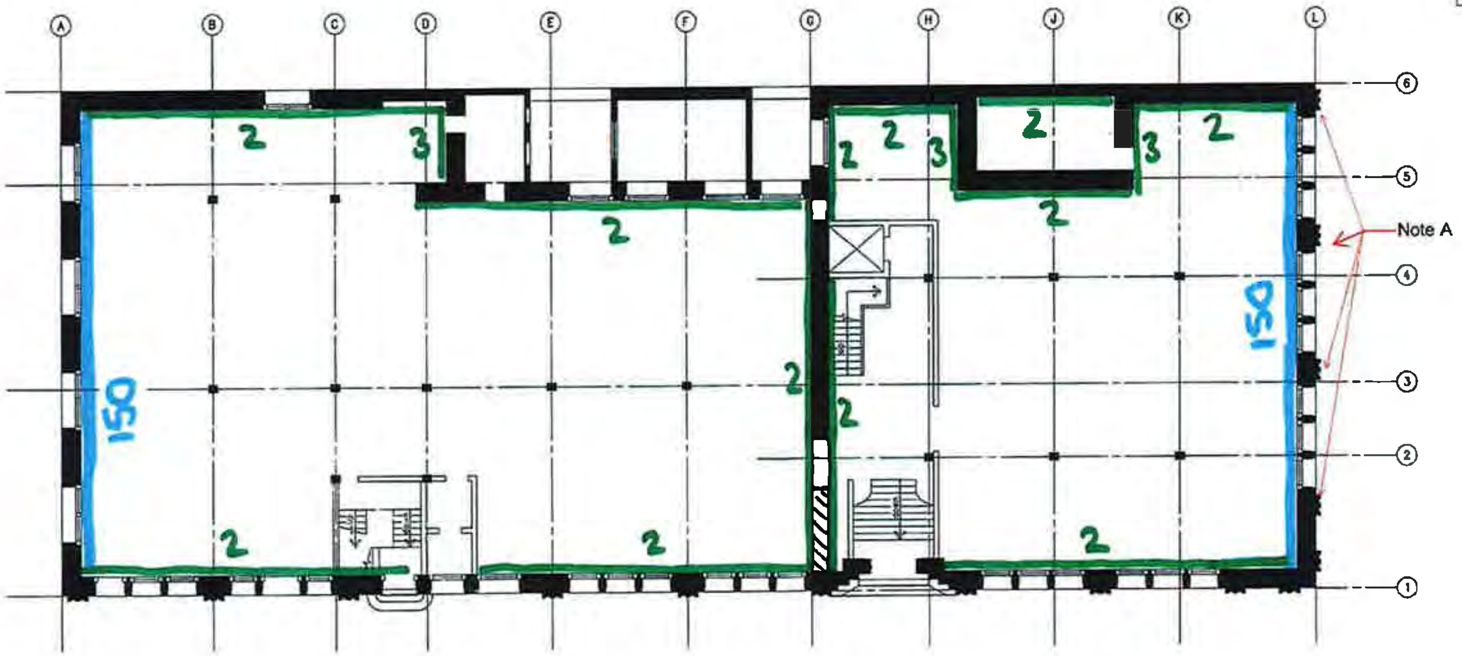
7. It is proposed to remove existing boxed fire-rating to the cast-iron columns. Fire sprinklers are to be installed, but the columns will need additional protection, using intumescent paint – refer to the architect's and fire reports.

John Hare
DIRECTOR

before making any shop drawings or commencing any work.



basement floor plan



ground floor plan

— FRP SIKAWRAP 100G or TYFC SEH-51

3 # LAYERS

— SHOTCRETE

150 THICKNESS

Allow 125 kg/m3 reinforcement with additional D12-600, ew L-bar anchors to be drilled and epoxied to the existing masonry wall.

PROJECT: PRESS CO. BUILDING
JOB NO: 105849 SSK: 001 REV: A
HolmesConsultingGroup DATE: 28/1/11

Consultants
Architect
DAVE PEARSON ARCHITECTS LTD

HolmesConsultingGroup
STRUCTURAL AND CIVIL ENGINEERS
123 Victoria Street
PO Box 2532
Christchurch
New Zealand
Telephone 366 3366
Facsimile 379 2169

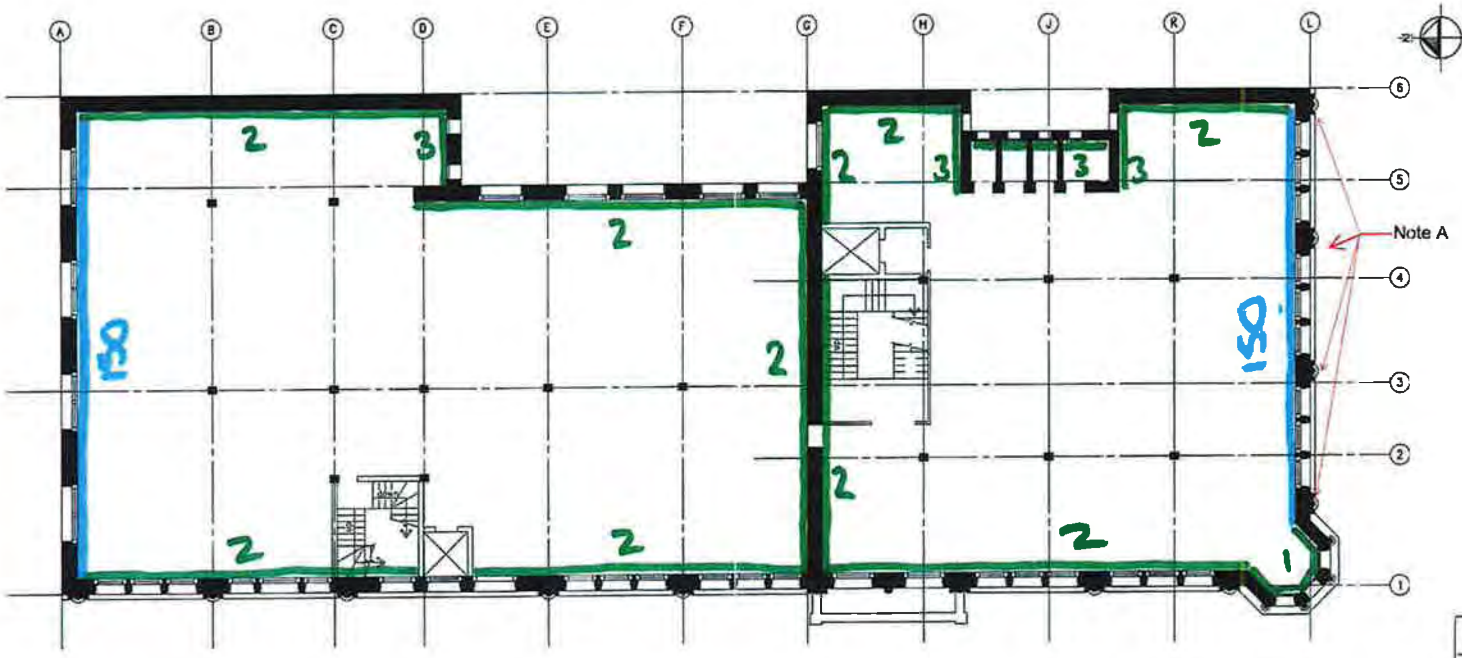
THE PRESS
HERITAGE BUILDING

Seismic Strengthening

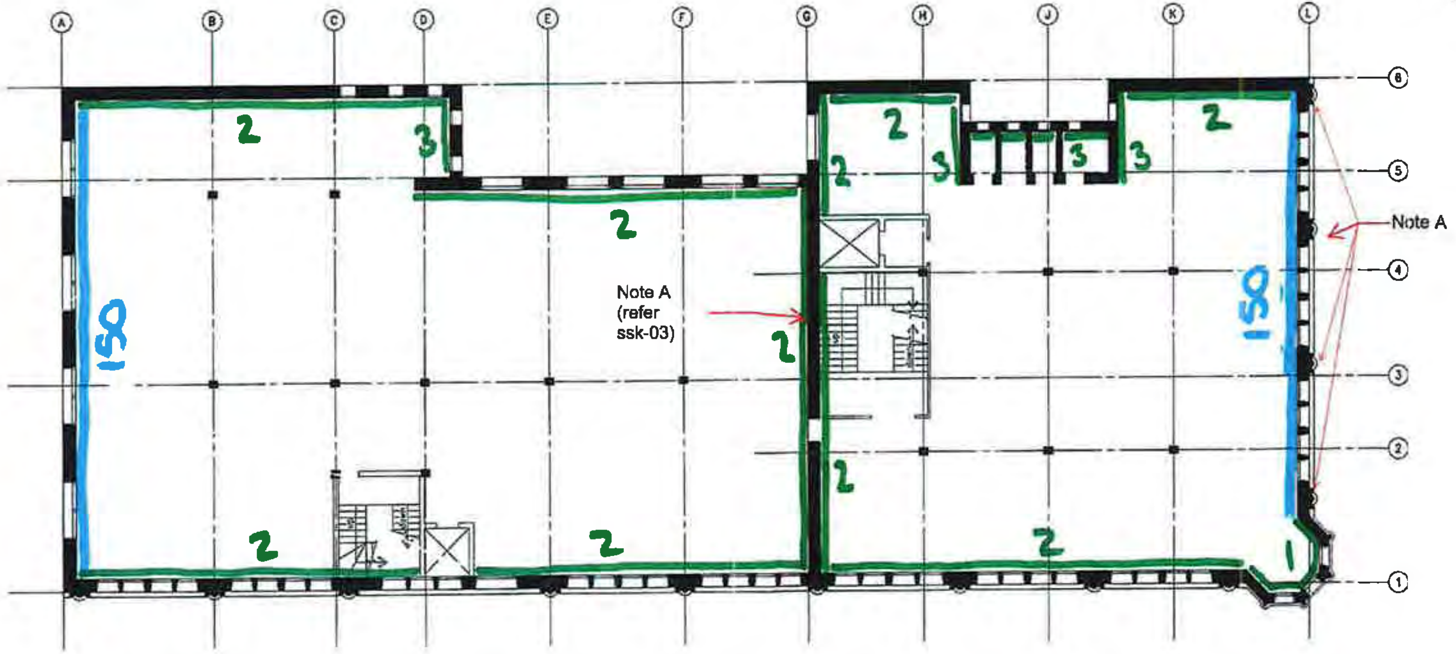
Drawn BS Scale 1:100@A1, 1:200@A3
Approved Arad Filename S1-01
Sheet Title

existing basement and
ground floor plans

Job No Sheet No Rev
105849 1



first floor plan



second floor plan

before making any shop drawings or commencing any work. The copyright of this drawing remains with Holmes Consulting Group.

— FRP SIKAWRAP 100G or TYFO SEH-51

3 # LAYERS

— SHOTCRETE

150 THICKNESS

Allow 125 kg/m3 reinforcement with additional D12-600, ew L-bar anchors to be drilled and epoxied to the existing masonry wall.

PROJECT: PRESS CO. BUILDING
JOB NO: 105849 SSK: 002 REV: A
HolmesConsultingGroup DATE: 28/1/11

Consultants
Architect
DAVE PEARSON ARCHITECTS LTD

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Christchurch
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379 2169

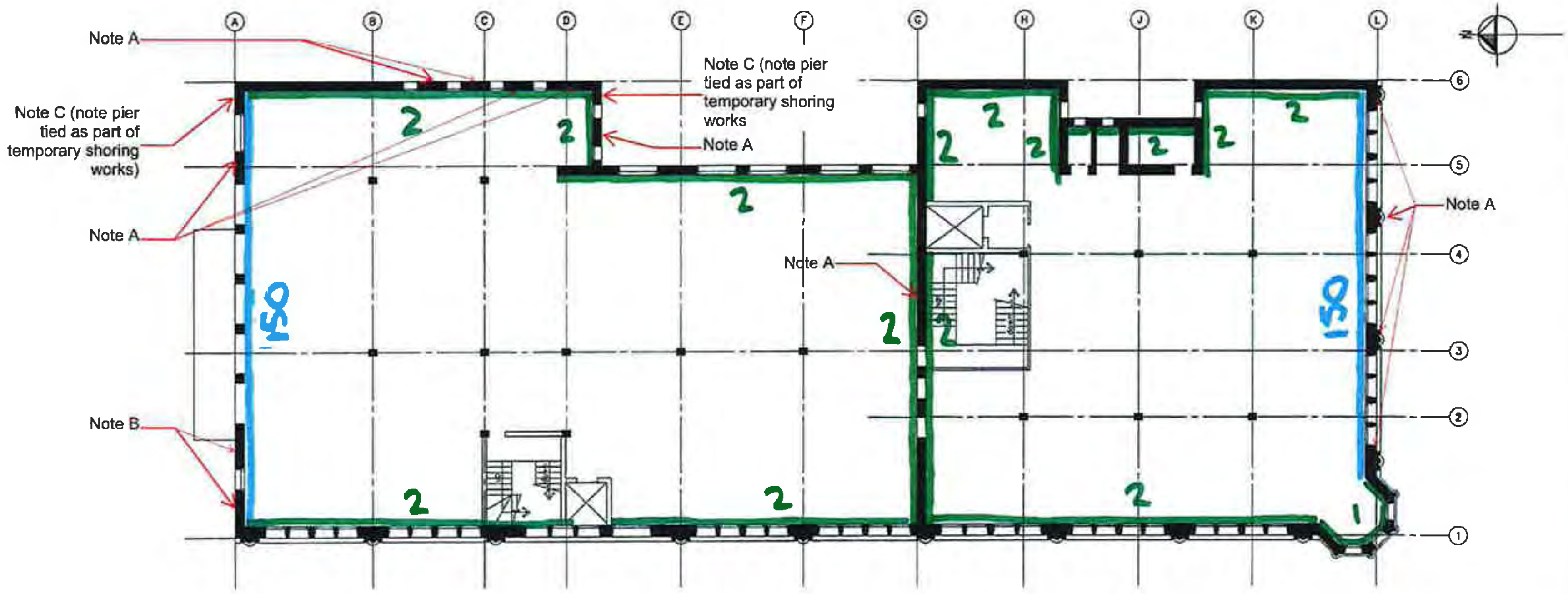
THE PRESS HERITAGE BUILDING

Seismic Strengthening

Drawn RIS Scale 1:100@A1, 1:200@A
Approved Arch Filename S1-01
Sheet Title

existing first and
second floor plans

Job No	Sheet No	Rev
105849		1



third floor plan

— FRP SIKAWRAP 100G or TYFO SEH-51

2 # LAYERS

— SHOTCRETE

150 THICKNESS

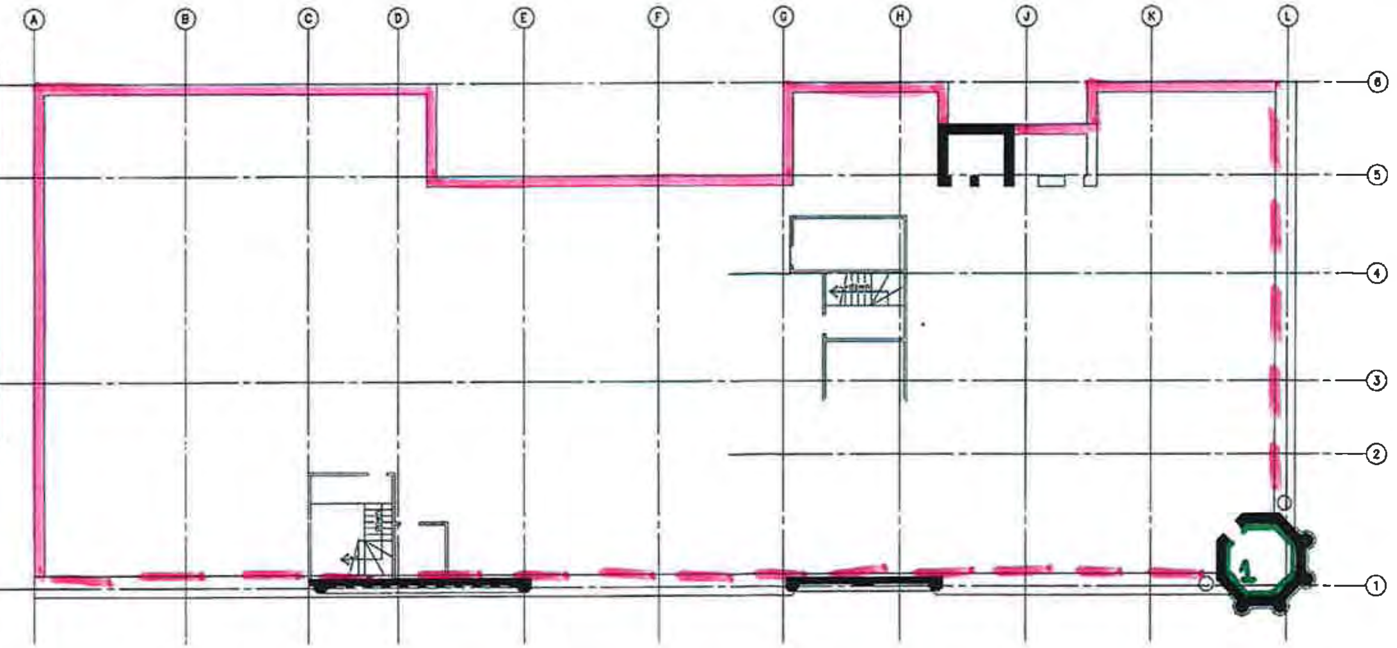
Allow 125 kg/m3 reinforcement with additional D12-600, ew L-bar anchors to be drilled and epoxied to the existing masonry wall.

— PARAPET BRACING

- - POSSIBLE BRACING ADDED.

NOTE KEY

A	Existing brick to be retained. Tie cracks with Helifix anchors prior to grouting cracks in accordance with outline specification.
B	Existing damaged brick piers to be demolished and rebuilt prior to strengthening. Prop adjacent roof area to floor below while completing demolition and rebuild.
C	Grout cracks in pier in accordance with specification



roof plan

PROJECT: PRESS CO. BUILDING
JOB NO: 105849 SSK: 003 REV: A
HolmesConsultingGroup DATE: 28/1/11

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THE PRESS HERITAGE BUILDING

Seismic Strengthening

Drawn RS Scale 1:100@A1, 1:200@A
Approved Acad Filename S1-01
Sheet Title

existing third floor
and roof plans

Job No 105849 Sheet No 1 Rev

2. FIBRE REINFORCED POLYMER MASONRY STRENGTHENING

2.1 PRELIMINARY

Refer to the Preliminary and General Clauses of this Specification and to the General Conditions of Contract which are equally binding on all trades. This section of the Specification shall be read in conjunction with all other sections.

2.2 SCOPE

This section of the Contract consists of the design, supply and installation of all fibre reinforced polymers (FRP) and carbon fibre strips (CFS) for masonry repair and strengthening. This includes the preparation of surfaces prior to applying FRP materials.

2.3 RELATED DOCUMENTS

In this section of the Specification reference is made to the latest revisions of the following documents:

The New Zealand Building Code		(BIA)
ACI 440.2R-08	Guide for the Design & Construction of Externally Bonded FRP Systems for Strengthened Concrete Structures	(ACI)
ACI 440.3R-04	Guide Test Methods for Fibre Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures	(ACI)
ASTM D3039	Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials	(ASTM)
ASTM D4541	Standard Test Method for Pull-off Strength of Coating Using Portable Adhesive-Testers	(ASTM)
ICC AC125	Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber Reinforced Polymer (FRP) Composite Systems	(ICC)
ICC AC178	Interim Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber Reinforced (FRP) Composite Systems	(ICC)

2.4 QUALITY ASSURANCE

2.4.1 General

It is the Contractor's responsibility to ensure that all work associated with this part of the contract is performed in accordance with the plans and specifications.

The Contractor's quality assurance procedures should encompass, but are not limited to, the following items:

1. Substrate surface preparation
2. Mixing of epoxy
3. Saturating the fibre with epoxy
4. Application of composite system
5. Placing of composite anchors
6. Curing of composite material
7. Preparing and painting composite surfaces
8. Testing of samples

The Contractor shall advise the Engineer in writing of the name of a suitably qualified and experienced representative to be responsible for ensuring that quality assurance procedures are being followed, prior to commencement on site.

From time to time the Engineer may elect to audit the quality records. They shall be kept up to date and be made available for audit by the Engineer at all times during the construction of this project.

If so instructed, the Contractor shall forward copies of all or part of the records to the Engineer.

2.4.2 Producer Statement – Construction (PS3)

When the works are sufficiently complete that they are ready for application to the Territorial Authority for a Code Compliance Certificate, or otherwise at key handover dates for particular sections of the works, the nominated representative responsible for the quality assurance procedures for the FRP trade will be required to certify to the main Contractor that all FRP work has been carried out in full accordance with all Contract Documents and Contract Instructions in the form of a Producer Statement - Construction. This statement will be required to be completed prior to the issue of the Producer Statement – Construction Review by the Engineer for the whole or sections of the works as appropriate.

No Practical Completion Certificate shall be issued until such time as all the Producer Statements for the relevant section of the works have been received.

Refer to the Appendix for additional explanation and a sample of the form of these Statements.

2.4.3 Testing

The Contractor shall provide evidence of material compliance with the required testing as defined in this section of the Specification. The Contractor shall engage an independent materials testing laboratory to carry out any testing deemed to be necessary by the Engineer to confirm the design parameters used for their FRP concrete repair design.

Batch numbers for fabric and epoxy used, locations of installations, measurements of quantities of fabric and volume of epoxy used shall be recorded daily.

Allow an additional provisional sum of $5000 for additional random testing, to be instructed at the Engineer's discretion.

2.5 SAFETY

The Contractor shall conform fully both on and off site with the provisions of the New Zealand Building Code in all matters related to construction safety, in particular with approved documents F1 (Hazardous Agents on Site), F2 (Hazardous Building Materials), F4 (Safety from Falling) and F5 (Construction and Demolition Hazards).

2.6 MATERIALS AND WORKMANSHIP

2.6.1 Materials

FRP and CFS where required shall comply with the minimum cured laminate properties shown on the FRP and CFS materials schedule detailed on the drawings. The properties shown on the materials schedule are the required 5% design percentile values for the cured laminate.

#Refer below for examples of typical FRP and CFS materials schedules that would be included on the structural drawings. Adjust, delete, and change as desired. Note that other alternative solutions will exist and may be suitable for your situation.

FRP Strengthening Schedule

Lay-Up ID	*Fabric Type*	*Min. Et (GPa-mm)*	*Min. f_u (MPa)*
GFRP1	*Glass*	*20*	*450*
GFRP2	*Glass*	*40*	*450*
CFRP3	*Glass*	*60*	*450*
CFRP1	*Carbon*	*65*	*700*
CFRP2	*Carbon*	*130*	*700*

CFS Strengthening Schedule

Strip ID	*Min. Width (mm)*	*Min. Et (GPa-mm)*	*Min. f_u (MPa)*
CFS1	*120*	*190*	*2500*
CFS2	*360*	*190*	*2500*
CFS3	*120*	*380*	*2500*
CFS4	*360*	*380*	*2500*

Standard FRP systems from Tyfo & Sika: Please confirm availability with supplier prior to design. The New Zealand distributor with Tyfo is Building Chemical Supplies (BCS).

For glass fibre reinforced fabric strengthening:

Component	**Tyfo**	**Sika**
Composite fabric	*Tyfo SHE-51*	*SikaWrap -100G*
Epoxy saturant	*Tyfo-S*	*Sikadur-300*
Primer/filler		*Sikadur-300 epoxy*
Smooth Surfaces		*Sikadur-330 epoxy or Sikadur-300 epoxy with max 5% thixoxtropic agent Extender*
Rough Surfaces		
Cured Laminate Design Properties:		
Elastic Modulus	*20.9 GPa*	*24.0 GPa*
Tensile Strength	*460 MPa*	*555 MPa*
- Ply Thickness	*1.0 mm*	*1.016 mm*
Sheet Size	*1400 mm x 45.7 m long roll.*	*600 mm x 50 m long roll*

For carbon fibre reinforced fabric strengthening:

Component	**Tyfo**	**Sika**
Composite fabric	*Tyfo SHE-41*	*SikaWrap -103C*
Epoxy saturant	*Tyfo-S*	*Sikadur-300*
Primer/filler		*Sikadur-300 epoxy*
Smooth Surfaces		*Sikadur-330 epoxy or Sikadur-300 epoxy with max 5% thixoxtropic agent Extender*
Rough Surfaces		
Cured Laminate Design Properties:		
Elastic Modulus	*82.0 GPa*	*65.0 GPa*
Tensile Strength	*834 MPa*	*715 MPa*
- Ply Thickness	*1.0 mm*	*1.016 mm*
Sheet Size	*600 mm x 91.4 m long roll.*	*600 mm x 50 m long roll*

For carbon fibre strip strengthening:

	Tyfo	**Sika**
Composite plate	*Tyfo UC*	*Sika Carbodur S*
Adhesive/Bonding Agent	*Tyfo-TC Epoxy*	*Sikadur-30 epoxy*
Filler/Repair Mortar		*Sikadur-41 repair mortar or Sikadur-30 epoxy mixed 1:1 with Sikadur-501 quarz sand.*
Laminate Design Properties:		
Elastic Modulus	*139 GPa*	*162 GPa*
Tensile Strength	*2510 MPa*	*3000 MPa*
Standard Strip Size	*1.4 mm x 50.8 mm* *1.4 mm x 101. 6mm* *1.9 mm x 50.8 mm* *1.9 mm x 101. 6mm* *30, 75 or 150 m long. Other sizes available on request. Refer Catalogue*	*1.2 mm x 50 mm* *1.4 mm x 120 mm* *250 m long. Other sizes available on request. Refer Catalogue*

Acceptable manufacturers and composite strengthening systems:

a) Glass fibre reinforced fabric (GFRP) strengthening:
1. SikaWrap -100G composite fabric with Sikadur-300 epoxy saturant/primer.
2. Tyfo SHE-51A composite fabric with Tyfo-S epoxy saturant/primer.

b) Carbon fibre reinforced fabric (CFRP) strengthening:
1. SikaWrap -103C composite fabric with Sikadur-300 epoxy saturant/primer.
2. Tyfo SCH-41 composite fabric with Tyfo-S epoxy saturant/primer.

c) Carbon fibre strip (CFS) strengthening:
1. Sika Carbour S carbon fibre strip with Sikadur-30 epoxy bonding/primer and Sikadur 41 levelling agent.
2. Tyfo UC carbon fibre strip with Tyfo-TC epoxy bonding agent and Tyfo S epoxy primer.

The New Zealand distributor for Tyfo products is Building Chemical Supplies.

The Engineer may approve an equivalent system that satisfies all of the requirements and shows equality to the composite strengthening systems defined above. Approval for the equivalent system shall be sought prior to submission of tender, refer also to the Submittals section below

2.6.2 Workmanship

All work with FRPs shall be carried out by licensed applicators of the material manufacturer's. The licensed applicator shall have a minimum of two years experience in performing composite retrofits with the wet lay-up systems.

Undertake all preparatory work necessary prior to application of the composite coating system to ensure proper bond and clean, true surfaces in the finished work.

All materials shall be mixed and applied in accordance with best trade practice and applied by skilled applicators to the manufacturer's recommendations.

All adjoining work shall be adequately protected during mixing and application and utmost care shall be taken not to damage surrounding fixtures and fittings. All damage consequent upon this operation shall be completely made good.

Remove debris at regular intervals and leave the completed work free from defects of all kinds.

2.7 METHOD OF CONSTRUCTION – FRP FABRIC STRENGTHENING

The following sections of the Specification detail the procedures to be followed when applying FRP.

2.7.1 Substrate Surface Preparation

The surface to receive FRP shall be free from fins, sharp edges and protrusions that will cause voids behind the FRP (or damage the fibres or inhibit adhesion). Uneven surfaces shall be filled with an approved filler to create a flat, or slightly convex, surface.

Round off sharp and chamfered corners to a radius of 20 mm radius by means of grinding. Alternatively, the radius can be formed with the approved filler or cementitious mortar. Variations in the radius along the edge shall not exceed 12 mm for every 300 mm of length.

All contact surfaces shall then be cleaned by compressed air and shall be free of laitance, standing water, grease and oils.

All concrete surfaces shall be prepared by abrasive or high pressure water blasting or scabbling to achieve a +/- 1.5mm minimum amplitude. All contact surfaces shall then be cleaned by compressed air.

2.7.2 Primer Application

The masonry surfaces shall have no free moisture on them at the time of FRP application.

a) Mix together the standard ratio of approved epoxy resin parts thoroughly for not less than five minutes using a slow speed mixing drill (400 – 600 rpm).

b) Apply primer coat of the mixed epoxy resin to the prepared surface by brush or roller.

c) Allow epoxy to 'tack up'. The time will vary, depending on the ambient temperature.

d) Where undulations still exist, ie small blowholes and voids, apply approved filler in a 'paste' consistency, using trowel, spatula or hand. Note: To prepare the thickened mixture, use the following process:

  - Mix together the standard ratio of approved epoxy resin as a) above.
  - Mix in small amounts of Aerosil until the desired consistency is achieved. Do not add the Aerosil before the epoxy resin is completely mixed. Ensure that the Aerosil is well mixed in. The quantity of the Aerosil used will depend on the required consistency and ambient temperature. Consistency can vary from a 'paste' to a 'butter-like' mix.
  - Allow the applied primer time to 'tack-up'. The time will vary, depending on the ambient temperature.
  - Any primer that cures before the FRP sheet material is applied shall be "scuffed" or ground and re-primed.

2.7.3 FRP Sheet Application

a) Mix together the approved epoxy resin parts thoroughly (for not less than five minutes duration), using a slow speed mixing drill. Apply the mixed epoxy resin to the FRP sheet through the "wetting-out" saturator. Roll in the main fibre direction only. Repeated passes through the saturator may be required to fully 'wet-out' the fibre sheet. Ensure the gap setting between the rollers is sufficient to fully wet out the sheet without excess resin.

b) Work the saturated FRP Sheet into place by hand and/or roller to ensure that there is no air entrapment. Apply uniformly and smoothly, ensuring that the sheet is applied with even tension and with the primary fibres straight .

c) Apply subsequent layers, continuously or spliced 'wet on wet', until specified number of layers shown on the drawings is achieved. If it is not possible to apply all layers at a single pass, allow the applied material to cure and then follow with subsequent layers. It will be necessary to re-prime the previously applied material.

d) Gaps between composite bands parallel to the main fibres shall not exceed 12 mm. A lap length of at least 150 mm is required at all necessary over-laps in the longitudinal direction of the fabric. Where more than one layer is being applied, laps shall be staggered.

2.7.4 Bonding of Steel Plates to FRP

All steel surfaces to receive FRP shall be prepared by blastcleaning to Sa 2.5 and primed if required. Generally a primer will be required unless steel plates are to be bonded to FRP within 48 hours of blastcleaning (refer manufacturer's recommendations).

If steel plate application is to be undertaken within 48 hours of blastcleaning and a primer is not required clean the bonding surface with acetone or other manufacturer approved cleaner. Wait until the surface is dry before applying the adhesive (minimum of 30 minutes). Care should be taken to avoid leaving finger prints on the cleaned surface.

FRP surfaces to receive the steel plates shall be free of dust, grease, rust, water and any other contaminants which could reduce or prevent adhesion.

The steel plates shall be bonded to the FRP with manufacturer approved bonding agent .

2.7.5 Curing of FRP Composite Material

The composite system shall be protected from contact by moisture for a minimum period of 24 hours. The cured composite shall have uniform thickness and density, and lack of porosity.

2.7.6 Inspection and Repair of Defects

Inspect FRP application after work has cured. Repair any air bubbles or pockets (greater than 50 x 50mm size) by injecting with approved epoxy resin, using the following method:

a) Drill a small (3mm diameter) hole into the top and bottom of the air pocket.

b) Using a disposable plastic syringe, inject properly mixed epoxy resin into the bottom hole until it appears from the top hole.

c) Seal the injection holes with candle wax, plasticene, or similar type material.

Where areas of delamination have occurred, cut out the affected area and remove the delaminated FRP material. Apply a 'patch' of the equivalent number of layers of saturated FRP sheet ensuring at least 150mm of overlap to all edges.

2.7.7 Painting of the FRP Surfaces

Cured FRP material shall be painted with manufacturer approved elasto-plastic coating to protect it from the effects of atmosphere and UV. Where the FRP is exposed to view in its final condition, the Contractor shall be responsible for ensuring that the protective system used complies fully with the appropriate provisions of the Architects specification for gloss and colour. Where there is any conflict between the Architects specification and this document, clarification must be sought from the Engineer.

All laps and edges are to be ground/sanded smooth before coating. Painting shall take place after the composite coating has achieved an initial cure, one where a light finger touch results in no transfer of epoxy to the finger but still exhibits a slightly tacky feeling. From this time, until 72 hrs after the final application of epoxy, two finish coats of either acrylic or urethane paint may be applied. After this period it may be necessary to apply a coat of etch primer.

All primer and top coats must be supplied by the same manufacturer. Apply paint by brush, roller or airless sprayer to suit location of the coating and application method recommended by the paint manufacturer. Carry out painting work within the temperature and humidity limits as set by the coating manufacturer's recommendations.

2.7.8 Testing

2.7.8.1 Pull-Off Testing

Direct tension adhesion testing of cored samples shall be conducted using the method described by ASTM D4541. A minimum of two tests shall be performed for each day of production or for each 50 m² of FRP application, whichever is less. Pull-off tests shall be performed on a representative adjacent area to the area being strengthened whenever possible. Tests shall be performed on each type of substrate or for each surface preparation technique used.

The prepared surface of the bonded FRP system shall be allowed to cure a minimum of 72 hours before execution of the direct tension pull-off test. The locations of the pull-off tests shall be representative and on flat surfaces. If no adjacent areas exist, the tests shall be conducted on areas of the FRP system subjected to relatively low stress during service. The minimum acceptable value for any single tension test is 1.5MPa.

Test locations shall be filled with thickened epoxy after the values have been recorded and the test dollies have been removed.

2.7.8.2 Laboratory Testing

A minimum of one sample batch shall be made daily. A sample batch shall consist of two 300 mm x 300 mm squares of cured composite. Samples shall be identified with records of lot numbers of the fabric and epoxy used and the location of installation.

Prepare sample on a smooth, flat, level surface covered with polyethylene sheeting, or 16 mil plastic film, prime with epoxy resin. Then place one layer of saturated fabric and apply additional topping of epoxy. Cover with plastic film and squeegee out all bubbles. Once prepared, the samples should be stored undisturbed for a minimum of 48 hours.

Test coupons shall be cut from samples and tested for ultimate tensile strength, tensile modulus and percentage elongation as per ASTM D3039 in the longitudinal fibre direction. Test a minimum of two coupons per day of FRP application. If one coupon fails, specimens from the same 300mm x 300mm sample will be tested. If these specimens also fail, the other 300mm x 300mm sample from the same "sample batch" will be tested.

Testing results shall be made available within 4 weeks of sample submission.

FRP design values specified in the 'Materials' section of this specification must be lower than the value determined from the test results received from the ASTM D3039 field test specimens.

Any values below the submitted design values are considered a failure and require remedial works.

2.7.9 Completion

Clean all adjoining surfaces and fittings of any paint contamination. Replace all hardware without damage to it or the adjoining surface. Take away from the site all painting materials, equipment and rubbish leaving the surrounding area clean, tidy and undamaged.

2.8 METHOD OF CONSTRUCTION – FRP STRIP STRENGTHENING

The following sections of the Specification detail the procedures to be followed when applying FRP strip strengthening.

2.8.1 Substrate Surface Preparation

The surface to receive FRP shall be free from fins, sharp edges and protrusions that will cause voids behind the FRP (or damage the fibres or inhibit adhesion).

Surfaces be prepared by abrasive or high pressure water blasting or scabbling to achieve a +/- 1.5mm minimum amplitude. All contact surfaces shall then be cleaned by compressed air and shall be free of laitance, standing water, grease and oils.

2.8.2 Filler Application

The concrete surfaces shall have no free moisture on them at the time of FRP application. Repairs and levelling shall be undertaken with approved structural repair mortar. If levelling has been conducted more than 2 days before applying the plates, the level surface shall be ground again to ensure proper bond between the repair mortar and the bonding agent.

2.8.3 FRP Plate Application

a) Prior to the application of bonding agent wipe the plate bonding surface with acetone or other manufacturer approved cleaner to remove contaminants. Wait until the surface is dry before applying the adhesive (minimum of 30 minutes).

b) Mix together the approved epoxy adhesive parts thoroughly (for not less than three minutes duration), using a slow speed mixing drill until the material becomes smooth in consistency and a uniform grey colour. Avoid aeration when mixing. Then, pour the whole mix into a clean container and stir again for one minute. Mix only that quantity that can be used within its pot life (refer manufactures product data sheet).

c) Apply the epoxy adhesive with a special "dome" shaped spatula onto the cleaned FRP laminate. Apply the epoxy adhesive to the properly cleaned and prepared substrate with a spatula to form a thin layer for substrate wetting.

e) Within the open time of the adhesive (refer manufactures product data sheet) place the adhesive coated FRP laminate onto the adhesive coated substrate. Using a rubber roller press the plate into the adhesive until the material is forced out on both sides of the laminate. Remove surplus adhesive.

2.8.4 Curing of FRP Composite material

The composite system shall be protected from contact by moisture for a minimum period of 24 hours. The cured composite shall have uniform thickness and density, and lack of porosity.

2.8.5 Painting of the FRP Surfaces

Cured FRP material shall be painted with manufacturer approved elasto-plastic coating to protect it from the effects of atmosphere and UV. Where the FRP is exposed to view in its final condition, the Contractor shall be responsible for ensuring that the protective system used complies fully with the appropriate provisions of the Architects specification for gloss and colour. Where there is any conflict between the Architects specification and this document, clarification must be sought from the Engineer.

All laps and edges are to be ground/sanded smooth before coating. Painting shall take place after the composite coating has achieved an initial cure, one where a light finger touch results in no transfer of epoxy to the finger but still exhibits a slightly tacky feeling. From this time, until 72 hrs after the final application of epoxy, two finish coats of either acrylic or urethane paint may be applied. After this period it may be necessary to apply a coat of each primer.

All primer and top coats must be supplied by the same manufacturer. Apply paint by brush, roller or airless sprayer to suit location of the coating and application method recommended by the paint manufacturer. Carry out painting work within the temperature and humidity limits as set by the coating manufacturer's recommendations.

2.8.6 Testing

2.8.6.1 Pull-Off Testing

Direct tension adhesion testing of cored samples shall be conducted using the method described by ASTM D4541. A minimum of two tests shall be performed for each day of production or for each 50 m^2 of FRP application, whichever is less. Pull-off tests shall be performed on a representative adjacent area to the area being strengthened whenever possible. Tests shall be performed on each type of substrate or for each surface preparation technique used.

The prepared surface of the bonded FRP system shall be allowed to cure a minimum of 72 hours before execution of the direct tension pull-off test. The locations of the pull-off tests shall be representative and on flat surfaces. If no adjacent areas exist, the tests shall be conducted on areas of the FRP system subjected to relatively low stress during service. The minimum acceptable value for any single tension test is 2.0 MPa.

Test locations shall be filled with thickened epoxy after the values have been recorded and the test dollies have been removed.

2.8.6.2 Completion

Clean all adjoining surfaces and fittings of any paint contamination. Replace all hardware without damage to it or the adjoining surface. Take away from the site all painting materials, equipment and rubbish leaving the surrounding area clean, tidy and undamaged.

2.9 COORDINATION

The Contractor shall coordinate all associated trades so as to ensure the correct finished relationship, both as to dimensions, details, and finishes, between concrete repair work and all other trades, in particular finishing trades who will be working in the same areas.

2.10 SUBMITTALS

The Contractor shall supply the following documentation for review, at least 10 days prior to installation of the system:

A complete list of proposed materials for the system, including the following areas and clearly identifying any proposed variances from this specification:

1. Composite fabric material
2. Epoxy saturant product / Adhesive

3. Primer / filler
4. Anchorage system proposed
5. Fire resistant coating
6. Protective coating.

The individual component materials proposed for the system must be confirmed by the manufacturers to be mutually compatible.

The manufacturer must be able to demonstrate compliance with the Materials section of this specification above.

The manufacturer must also be able to provide supporting evidence of adequate testing of the performance of the proposed system, to the satisfaction of the Engineer.

Manufacturers shall supply structural and environmental durability testing equivalent to that defined in ICC AC125 or supply an approved ICC Evaluation Service Report for the proposed FRP systems.

Manufacturers shall provide specific information on physical, mechanical and chemical properties of the fiber, epoxy and FRP composite. Different FRP systems shall be equated based on the relative stiffness in terms of the products tensile modulus and the associated gross laminate area (E × A). These values shall be verified by ASTM D3039 test results on the proposed materials.

Only epoxy resins will be accepted for construction of FRP systems referenced in this specification. Other resins, such as polyesters/vinyl esters, are not permitted as substitutes.

A complete methodology shall be provided for the system, addressing the following areas and clearly identifying any proposed variances from this specification:

1. Substrate surface preparation
2. Mixing of epoxy
3. Saturating the fibre with epoxy
4. Application of composite system
5. Installation of anchors
6. Curing of composite material
7. Preparing and painting composite surfaces
8. Testing of samples

HolmesConsultingGroup

SITE REPORT

Project Name: Press Co.

Project No: 105849

S.R. No:

Date: 27/12/10.

Reviewed By: HSH

Work Reviewed:

. Post E/Q inspection.

Observations & Comments:

1. Major damage at:
   - South wall, mostly @ 2 & 3. Diagonal shear failures in brick piers.
   - Central stairwell at level 3. Diagonal shear failure, compressing fire escape door. ~~fire~~ Running across to sliding shear at approx 400 below level 3.
   - North wall, piers cracked at east end & piers at west end have moved another 10mm on ~~line of~~ previous cracks.
2. Moderate cracking to tower above roof level & in walls below.
3. Propping & shoring required to South wall. Remove windows adjacent to piers & profile cut timber packing to shape of stone. Tie around piers with 4 - 2.5 t straps. Prop adjacent

Copies to:

HolmesConsultingGroup

Project Name:

Project No:

S.R. No:

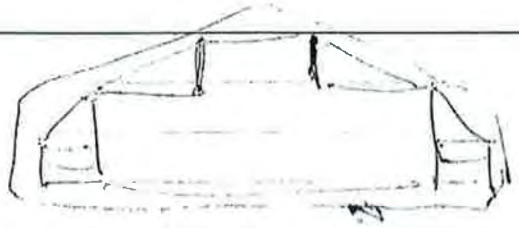
Date:

Reviewed By:

2

SITE REPORT

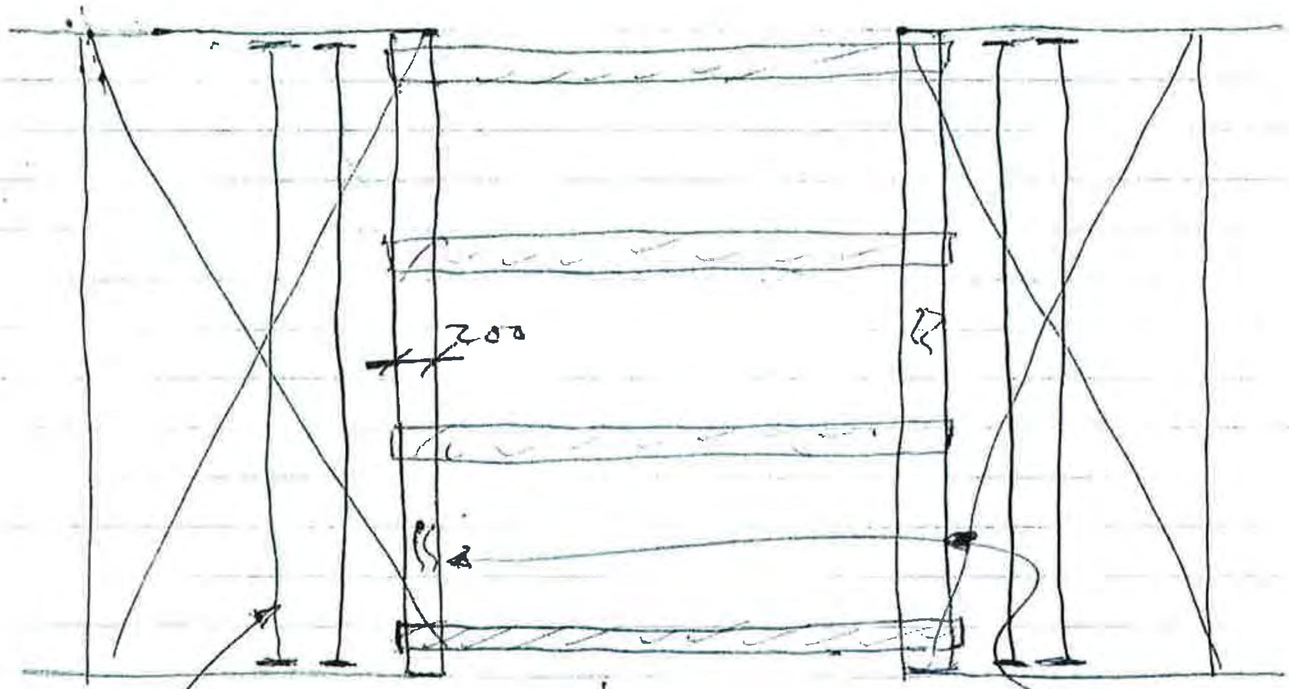
Work Reviewed:



Observations & Comments:

from spandrel below to spandrel above

For 2 central piers at ~~3~~ 4 + 1 only at 1



4. Similar shoring required to north wall @ east end.

Copies to:

HolmesConsultingGroup

Project Name:

Project No:

S.R. No:

Date:

Reviewed By:

SITE REPORT

Work Reviewed:

Observations & Comments:

5. Neighbour (Worcester Tower) to be advised to lower parapets at light well.

6. At stairwell, ease door to enable access & remove loose plaster on wall.

Copies to:

HolmesConsultingGroup

SITE REPORT

Project Name: Press Co.
Project No: 105849
S.R. No:
Date: 07/01/11
Reviewed By: BRD

Work Reviewed:

- Follow up assessment of securing works following the 26/12/10 & subsequent after-shocks.

Observations & Comments:

- Securing works to South wall have been completed as per HJH site report.

- North wall strengthening to pillar & building corner as per HJH site report.

- Stairwell loose plaster has been removed as per HJH site report.

- Collapsed parapet into central atrium from adjacent building. Remaining loose sections of parapet to be removed down to roof level & temporary waterproofing installed. Notify building owner of works required to be completed. Also noted that the concrete lintel beam at the window head has sustained a series of moderate sized cracks & should be inspected further.

- Once the above works have been completed the building will be safe to occupy. We have been informed by Nick Jennings of Ganellen that this has been done (07/01/11)

- BRD 07/01/11

Copies to:

HolmesConsultingGroup

CORRESPONDENCE

STRUCTURAL AND CIVIL ENGINEERS

Christchurch

Telephone

+64 3 366 3366

Facsimile

+64 3 379 2169

Internet Address

www.holmesgroup.com

Level 5

123 Victoria Street

PO Box 25355

Christchurch 8144

New Zealand

Offices in

Auckland

Hamilton

Wellington

Queenstown

San Francisco

12 January 2011

Christchurch City Council - Building Recovery Office
Ground floor Civic Offices
53 Hereford Street, Christchurch

Attn: James Clark

Statement by Chartered Professional Engineer in respect of the building at:

THE PRESS BUILDING
32 CATHEDRAL SQUARE
CHRISTCHURCH

I, Benjamin Richard Dare, am a Chartered Professional Engineer (No. 1002459) with relevant experience in the structural design of buildings for earthquake actions.

I have been engaged to provide advice to the owner on the interim securing / strengthening of the above building following the earthquake of 26 December 2010. I am aware of all the measures taken to secure or strengthen the building (the work) which were carried out by:

Ganellen Pty Ltd.
150 Gloucester Street
Christchurch 8013
New Zealand

I have inspected the work on completion and am satisfied on reasonable grounds that:

a *Structural integrity and performance.* Where the structural integrity and/or structural performance of the building (or part of the building) was materially affected by the Boxing Day earthquake or any aftershocks to date, interim securing measures have been taken to restore the structural integrity and performance of the building to at least the condition that existed prior to the earthquake of 26 December 2010.

b *Potentially dangerous features.* Potentially dangerous features on the building such as unreinforced masonry chimneys, parapets and walls have been removed or secured so that their integrity and level of structural performance is consistent with that generally achieved in other parts of the building, and so reduces the danger to people's safety and of damage to other property.

c *Threat from nearby buildings.*

- Protective measures installed on the subject building are sufficient in nature and extent to protect its occupants in the event of collapse of potentially dangerous features on *adjacent or nearby buildings.*

- I have identified *all* potentially dangerous features such as unreinforced masonry chimneys, parapets and walls *on all adjacent or nearby buildings* that have potentially dangerous features which threaten the subject building or its occupants.

- Buildings which I have identified in the above category are:
  i 105 Worcester Street.

- I have advised the owner of the subject building that approval for resumption of occupancy and use will be subject to Council approval to remove the red or yellow safety notices from the buildings listed above.

Signed:

B R Dare
CHARTERED PROFESSIONAL ENGINEER

Charlotte Leslie

From: John Hare [JohnH@holmesgroup.com]
Sent: Friday, 28 January 2011 7:42 p.m.
To: Michael Doig
Cc: Christian Tonnius; Matt Bonis; Mario Evangelo; Peter Maneas; Doug Moult; Alistair Boys
Subject: Structural concept for the Press Building
Follow Up Flag: Follow up
Flag Status: Red
Attachments: 105849 Post EQ Damage Repair 28 Jan.pdf; 105849FRP Concrete Strengthening 28 Jan.pdf; 105849Outline Specification 28 Jan.pdf; 105849_SSK 001-003_Preliminary Strengthening Solution.pdf

Hi Michael

Attached is the proposed concept for the Press Building.

This contains the structural plans marked up with the proposed structure to achieve reinstatement to a level about equivalent to where we need to be. We will complete a report on exactly what this means (% code etc) to follow. But this is what we consider the minimum standard as we discussed last week.

I have included an outline specification describing basic elements as required (much of which is not needed right now, but covers steel finishes etc. And two more specialised sections regarding repair and FRP overlay (used on some walls). Some of this will need some explanation, but it will get us started.
I will probably need to talk through methodology in some cases with Doug, but we can do that next week. We need to look at some mark-ups on elevations possibly to clarify some of the FRP overlay, but that can also be talked through next week.

The repair specification is at this stage not quantified, but will tally in most cases with the Lewis Bradford report, although we need to come back and verify the Boxing Day damage against it. That will include allowance for crack repair, particularly on the south and west facades where it may be hidden behind linings.

I think this is most of it. I will complete the assessment schedule for Matt based on this, and also the words that go with it for the RC application.

Any questions, give me a call...

Regards,

John Hare
DIRECTOR

Holmes Consulting Group
PO Box 25355 I Christchurch 8144
Phone: +643 366 3366 I Fax: +643 379 2169
Email: johnh@holmesgroup.com

Charlotte Leslie

From:	Melanie Jones
Sent:	Thursday, 10 February 2011 10:53 a.m.
To:	Michael Doig
Subject:	FW:
Attachments:	20110210083903974.pdf

20110210083903974.pdf

Melanie Jones
RECEPTION

30 montague street
balmain nsw 2041

tel +61 2 9555 2444
fax +61 2 9555 5600
m.jones@ganellen.com

www.ganellen.com

-----Original Message-----
From: ricoh@ganellen.com.au [mailto:ricoh@ganellen.com.au]
Sent: Thursday, 10 February 2011 11:39
To: Melanie Jones
Subject:

This E-mail was sent from "RNP0037C7" (Aficio MP C4000).

Scan Date: 10.02.2011 08:39:03 (+0800)
Queries to: ricoh@ganellen.com.au

Head Office

Christchurch
City Council

Mel

Fax To Michael Dag

Note: Both Sides Of This Page

7 FEB 2011

2nd February 2011

C/O GANELLEN PTY LTD
30 MONTAGUE STREET
SYDNEY NSW 2041
AUSTRALIA

Dear Sir / Madam

RE: Section 124 Notice on 32 Catheral property

I am writing to you regarding your building (above), which was identified by the Council as dangerous. You were served a Section 124 Building Act 2004 notice requiring you to address the danger. Your outstanding s124 notices expired on 31 January 2011 and we want to ensure that work is progressing on removing the dangerous aspects of your building to protect public safety. We would like to work with you to establish the current status of your building and discuss how we can help resolve any issues you may have in making progress towards removing the danger your building poses to neighbouring properties and the public.

The Council has commenced the reassessment of all dangerous buildings with outstanding s124 notices. Our structural engineers are doing safety assessments over the next few weeks to determine if your building still poses a danger to people or other buildings. You do not need to be present for that assessment, but if you wish to be, you can make an appointment to meet the structural engineer onsite. To make an appointment, please call the Council on Ph 941 8350. Please bear in mind this is not a comprehensive engineering assessment of the damage to your building, it is a Council assessment/determination of the danger your building poses to people or other property. You are still required to provide your own engineering assessment of the property to determine repair work required to address the dangerous aspects, so your building can be declared safe.

We are working with individual building owners to assist in making their buildings safe and may already have been in contact with you. If not, one of our case managers will contact you within a few weeks of the reassessment to ascertain the status of your property.

Where building owners have taken some action but are unable to completely resolve the issues that make their buildings dangerous, a new s124 notice will be issued. This new notice requires a mutually agreed completion date - by which time work will be complete on making the building safe and mitigating the impact on surrounding businesses or properties. To determine the completion date for the new s124 notice, you are required to provide us with:

- A post Boxing Day structural engineer's assessment of the building
- A proposed timeline and schedule of works that addresses the dangerous building aspects
- A letter clarifying actions taken to date to address the building issue and updating the Council on progress made to date, including details of any barriers encountered or mitigating factors beyond your control (for instance, issues with insurance claims or obtaining quotes for works)

- If your property is a listed or protected building under either the Christchurch City Plan or the Banks Peninsula District Plan you will need to consider the heritage values of the property in determining your scope of works and should contact the Council's Heritage Planners on Ph 941 8156 to discuss.

Please send this information to BuildingRecoveryOffice@ccc.govt.nz

There is a small minority of building owners who have taken no action to address their dangerous buildings. The Council will look at enforcement measures rather than reissuing s124 notices in these cases.

Public safety is our priority and we are steadily working towards getting Christchurch city back to business as usual – which includes reducing cordons around dangerous buildings, improving traffic flow and enabling pedestrian and vehicular access to all of our city's business and public spaces. Building owners who do not meet their obligations under the Building Act 2004 will be managed using enforcement measures available to the Council (including infringement notices with instant fines and/or prosecution for failing to comply with a s124 notice).

To avoid these measures, we encourage all building owners to send us the documentation outlined above so our files are kept up to date. If you have difficulties obtaining the required information, please either phone us on 941-8350 or email us at BuildingRecoveryOffice@ccc.govt.nz to discuss your situation with a case manager. Thank you for helping us make Christchurch safe during these extraordinary circumstances and we look forward to the time when all buildings affected by the earthquakes are made safe.

If you have any queries resulting from this letter, please call us on Ph 941 8350 and we will endeavour to address your questions or put you in contact with a case manager who will be able to help you.

Yours sincerely,

Vincie Billante
Building recovery Programme Team Leader

Charlotte Leslie

From: Michael Doig
Sent: Tuesday, 9 August 2011 5:58 p.m.
To: Jack Hughes
Subject: FW: Press Building Application
Importance: High
Attachments: Attachment C Proposed Plans.pdf; Press Building V2.pdf; L NZHPT.pdf; Attachment I Mechanical.pdf; Attachment H - Repair Summary Holmes.pdf

Michael Doig
DEVELOPMENT AND BUSINESS DIRECTOR
NEW ZEALAND
GANELLEN
BUILT ON EXPERIENCE
150 Gloucester Street
PO Box 13574
Christchurch, New Zealand 8013
tel: +64 3 377 3373
fax: +64 3 377 6450
mob: +64 21 458 661
m.doig@ganellen.com
www.ganellen.com
www.pressprecinct.com

From: Matt Bonis [mailto:Matt@Planitassociates.co.nz]
Sent: Thursday, 10 February 2011 6:42 p.m.
To: Michael Doig; Christian Tonnius
Subject: Press Building Application
Importance: High

Hi Guys,

I have dropped the attached off to both Mel Smith (CCC) and Dave Margetts (NZHPT) – they are aware that it is a draft and I will be seeking feedback (and approval from HPT) in a week. Mike, Mel S has informed that she would prefer the Cheque at final lodgement. I have also attached the letter to HPT.

The Architectural Statement is as sent on 21 December, and the Prelim Fire report is as received by me on the 8th Feb.

Christian, all of your comments from 1 Feb have been added, along with Jenny's reference to the revised Heritage ICOMOS Charter, and the Prelim Fire options. I have also talked with John at Holmes re the para on seismic strengthening and we're happy that it fudges the issue appropriately.

If there are any changes to the project between now and final lodgement please let me know ASAP, otherwise I can start hounding Council and HPT.

Regards

Matt Bonis

Matt Bonis

Associate
Planit Associates
P O Box 1845
Christchurch
ph 372 2286
fax 377 9833
mob 021 796 670

Charlotte Leslie

From: John Hare [JohnH@holmesgroup.com]
Sent: Thursday, 10 February 2011 5:30 p.m.
To: Michael Doig
Subject: Re: FW:

Hi Michael
You are basically right but I think this is something that I may be able to make go away for a while. I already sent in the statement post- Boxing Day, so all they really need may be a letter explaining the process that is in train. I can check with Vincie on that, she is pretty reasonable in my experience. As the letter says, they are really trying to chase up the inscribe owners, but haven't the means to make it more specific

Regards

John

Sent from my phone

On 10/02/2011, at 2:08 PM, "Michael Doig" <m.doig@ganellen.com> wrote:

> Hi John,
> Please see the attached letter from Council that was sent to our
> Sydney office.
>
> How do you advise that we proceed on this? My understanding is that
> our notice has been lifted and there is no further action required
> between us and Council, until we make movements to effect the
> permanent solutions on the building.
>
> Is this simply a bulk format letter that has been sent to all owners
> that were initially red stickered?
>
> Cheers,
> Michael
>
> -----Original Message-----
> From: Melanie Jones
> Sent: Thursday, 10 February 2011 10:53 a.m.
> To: Michael Doig
> Subject: FW:
>
>
>
>
> Melanie Jones
> RECEPTION
>
>
>
> 30 montague street
> balmain nsw 2041
>
> tel   +61 2 9555 2444
> fax   +61 2 9555 5600
> m.jones@ganellen.com
>
> www.ganellen.com
>
> -----Original Message-----
> From: ricoh@ganellen.com.au [mailto:ricoh@ganellen.com.au]
> Sent: Thursday, 10 February 2011 11:39
> To: Melanie Jones
> Subject:
>
> This E-mail was sent from "RNP0037C7" (Aficio MP C4000).

```
>
> Scan Date: 10.02.2011 08:39:03 (+0800) Queries to:
> ricoh@ganellen.com.au <20110210083903974.pdf>
```

Charlotte Leslie

From: Alistair Boys [AlistairB@holmesgroup.com]
Sent: Monday, 21 February 2011 1:08 p.m.
To: 'Wilby, Phil - FH Civil South'; Michael Doig
Cc: John Hare
Subject: RE: The Press, investigation
Attachments: The Press investigation testing.pdf

Phil,

Thankyou for your prompt response to our request for investigative works. The intent and scope of the proposed testing meets our needs adequately. Billing will be to Ganellen via Holmes Consulting Group.

We will need to coordinate with Michael Doig from Ganellen with regards to access and timing, and the locations of the investigations to minimise the impact on the existing tenants. Due to the tight timeframe it would be prefferable to perform the investigations ASAP in order to perform the required modelling prior to the submission of the Building Consent documentation. Hopefully if your schedule allows we can target the week of the 14th to 18th March as this will coincide with the vacation of the premises.

Michael,

Attached is the proposed testing scheme. Can you please confirm that these dates are acceptable to you in terms of minimising the impact on the tenants etc.

Regards,

Alistair Boys

From: Wilby, Phil - FH Civil South [mailto:Phil.Wilby@fultonhogan.com]
Sent: Thursday, February 17, 2011 3:55 PM
To: Alistair Boys
Subject: The Press, investigation

Alistair,
Offer as discussed.
Regards,

Phil Wilby ¦ Divisional Manager ¦ Fulton Hogan Ltd ¦ 1115 Main North Road Belfast P O Box 761-65 Northwood, Christchurch 8548 ¦ Phone +64 3 375 9060 ¦ Fax +64 3 323 7346 ¦ Mobile +64 27 222 5654 ¦ Web www.fultonhogan.com

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http://www.fultonhogancareers.com

attached files or the cost of having the attached files.

Charlotte Leslie

From: Wilby, Phil - FH Civil South [Phil.Wilby@fultonhogan.com]
Sent: Monday, 21 February 2011 4:26 p.m.
To: Alistair Boys
Cc: Michael Doig
Subject: RE: The Press, investigation

Alistair/ Michael,

I have programmed in a crew for the 15th onwards. I will wait for the confirmed testing details before sending the formal paperwork for approval

Regards

Phil Wilby | **Divisional Manager** | **Fulton Hogan Ltd** | 1115 Main North Road Belfast P O Box 761-65 Northwood, Christchurch 8548 | Phone +64 3 375 9060 | Fax +64 3 323 7346 | Mobile +64 27 222 5654 | Web www.fultonhogan.com

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Charlotte Leslie

From: John Hare [JohnH@holmesgroup.com]
Sent: Friday, 4 March 2011 1:50 a.m.
To: Mario Evangelo; Michael Doig; Doug Moult; Alistair Boys
Subject: Fwd: Press Company
Attachments: 105849RS0302.001.pdf; ATT00001..htm

forwarded copy of email and report as sent to Ceciel delaRue earlier this evening

Regards

John

Sent from my phone

Begin forwarded message:

> **From:** "John Hare" <JohnH@holmesgroup.com>
> **To:** "DelaRue, Ceciel" <Ceciel.DelaRue@ccc.govt.nz>
> **Cc:** "Win Clark" <kksw.clark@clear.net.nz>
> **Subject: Press Company**
>
> Hi Ceciel
> Here is the press company report as discussed, I assume you will take it from here, but I am happy to follow through further if required
>
> Regards,
>
> John Hare
> DIRECTOR
>
> Holmes Consulting Group
> PO Box 25355 | Christchurch 8144
> Phone: +643 366 3366 | Fax: +643 379 2169
> Email: johnh@holmesgroup.com<mailto:johnh@holmesgroup.com>
>
>

Charlotte Leslie

From: Alistair Boys [AlistairB@holmesgroup.com]
Sent: Saturday, 12 March 2011 1:26 p.m.
To: Doug Moult; John Hare; Mario Evangelo; Michael Doig
Subject: RE: Original Structural Design for the Press Building
Attachments: 105849_Press Co_Original Structure.pdf; the_press_building.pdf

Gentlemen,

Attached are the marked up plans reflecting the original/as is construction of the Press Co. building.

With regard to the façade stonework sections/profiles please refer to the sections shown in the original heritage drawings (also attached for convenience). Additional confirmation via site measure may be required.

Please contact me if any clarifications are required.

Regards,

Alistair Boys

From: Doug Moult [mailto:d.moult@ganellen.com]
Sent: Thursday, 3 March 2011 1:39 p.m.
To: Alistair Boys; John Hare
Cc: Mario Evangelo; Michael Doig
Subject: RE: Original Structural Design for the Press Building

Alistair,

Thanks for that will discuss with the relevant people.

Doug Moult
SENIOR ESTIMATOR
GANELLEN
BUILT ON EXPERIENCE
30 montague street
balmain nsw 2041

tel +61 2 9555 2444
fax +61 2 9555 5600
d.moult@ganellen.com

From: Alistair Boys [mailto:AlistairB@holmesgroup.com]
Sent: Thursday, 3 March 2011 11:34 AM
To: Doug Moult; John Hare

Subject: RE: Original Structural Design for the Press Building

Doug,

We can provide you the information of the original construction in terms of the sizes of steel members, floor thicknesses, wall thicknesses etc for the building in order for the reconstruction to be costed. However, it may be beneficial to consider reconstructing the building to the original layout with the perimeter and core walls being formed of reinforced concrete with a façade reflecting the original form. I believe that this would simplify the construction, provide resilient load paths and mitigate the need to provide strengthening to the reconstructed building. I realise that there may be heritage limitations that override the structural concerns but it would be worth considering with regard to cost, reliability and time-frame.

I will collate all of the information on the existing structure and forward to you Monday or Tuesday as I am on leave on Friday and this weekend.

Regards,

Alistair Boys

From: Doug Moult [mailto:d.moult@ganellen.com]
Sent: Wednesday, 2 March 2011 3:59 p.m.
To: John Hare; Alistair Boys
Subject: RE: Original Structural Design for the Press Building

John/Alistair,

We are currently preparing an estimate for the demolition and rebuild of the existing building. Have you details of the existing structure, steel columns, beams, pads, etc.

We will provide a separate estimate to upgrade the new building to meet the earthquake code.

We would appreciate any other information you have on your records to prepare the above costings.

Regards

Doug Moult
SENIOR ESTIMATOR
GANELLEN
BUILT ON EXPERIENCE
30 montague street
balmain nsw 2041

tel +61 2 9555 2444
fax +61 2 9555 5600
d.moult@ganellen.com

From: John Hare [mailto:JohnH@holmesgroup.com]
Sent: Thursday, 17 February 2011 6:04 PM
To: Doug Moult
Subject: RE: Structural concept for the Press Building

Hi Doug

Sorry, I have not been able to make contact with you over this, and I know you have some questions for me. I am out of the office tomorrow, but you could try Alistair Boys, who I believe is in. Otherwise I will try again on Monday.

Regards

John

From: Doug Moult [mailto:d.moult@ganellen.com]
Sent: Monday, 31 January 2011 10:15 a.m.
To: John Hare
Cc: Mario Evangelo; Peter Maneas
Subject: RE: Structural concept for the Press Building
John,
Had a quick look at the information you sent, maybe later in the work we have a Skype meeting so we can talk about the proposal, in the meantime maybe you could give us some subcontractors who have carried out the FRP and shotcrete works on other projects.
Doug Moult
SENIOR ESTIMATOR
GANELLEN
BUILT ON EXPERIENCE
30 montague street
balmain nsw 2041

tel +61 2 9555 2444
fax +61 2 9555 5600
d.moult@ganellen.com

From: John Hare [mailto:JohnH@holmesgroup.com]
Sent: Friday, 28 January 2011 5:42 PM
To: Michael Doig
Cc: Christian Tonnius; Matt Bonis; Mario Evangelo; Peter Maneas; Doug Moult; Alistair Boys

Subject: Structural concept for the Press Building
Hi Michael
Attached is the proposed concept for the Press Building.
This contains the structural plans marked up with the proposed structure to achieve reinstatement to a level about equivalent to where we need to be. We will complete a report on exactly what this means (% code etc) to follow. But this is what we consider the minimum standard as we discussed last week.
I have included an outline specification describing basic elements as required (much of which is not needed right now, but covers steel finishes etc. And two more specialised sections regarding repair and FRP overlay (used on some walls). Some of this will need some explanation, but it will get us started. I will probably need to talk through methodology in some cases with Doug, but we can do that next week. We need to look at some mark-ups on elevations possibly to clarify some of the FRP overlay, but that can also be talked through next week.
The repair specification is at this stage not quantified, but will tally in most cases with the Lewis Bradford report, although we need to come back and verify the Boxing Day damage against it. That will include allowance for crack repair, particularly on the south and west facades where it may be hidden behind linings.
I think this is most of it. I will complete the assessment schedule for Matt based on this, and also the words that go with it for the RC application.
Any questions, give me a call...
Regards,
John Hare
DIRECTOR
Holmes Consulting Group
PO Box 25355 | Christchurch 8144
Phone: +643 366 3366 | Fax: +643 379 2169
Email: johnh@holmesgroup.com

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Charlotte Leslie

From: Alistair Boys [AlistairB@holmesgroup.com]
Sent: Wednesday, 4 May 2011 9:34 a.m.
To: Michael Doig
Cc: John Hare
Subject: Press Co. Building Report
Attachments: 105849 Press Building Evaluation.pdf

Michael,

John Hare reminded me that I had yet to send through the report I was preparing prior to the Feb 22nd EQ.

Note that the report was about 95% complete when the EQ happened and I have spent an hour or so this morning tidying it up for you but I have not fully vetted it as it would be a little redundant.

Apologies for the delay in getting this to you but as you can expect I have been focussed on structural assessments and stabilisation works since the Feb EQ

Regards,

Alistair Boys
STRUCTURAL ENGINEER

Holmes Consulting Group
PO Box 90745 I Auckland
Phone: +649 965 4789
Email: alistairb@holmesgroup.com

SEISMIC EVALUATION OF PRESS CO. BUILDING
SEISMIC STRENGTHENING

Prepared For: Ganellen (NZ) Ltd

Date: 18 February 2011
Project No: 105849
Revision No: 1

Prepared By:

Reviewed By:

Alistair Boys
STRUCTURAL ENGINEER

Holmes Consulting Group Limited
Auckland Office

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LIST OF FIGURES

EXECUTIVE SUMMARY

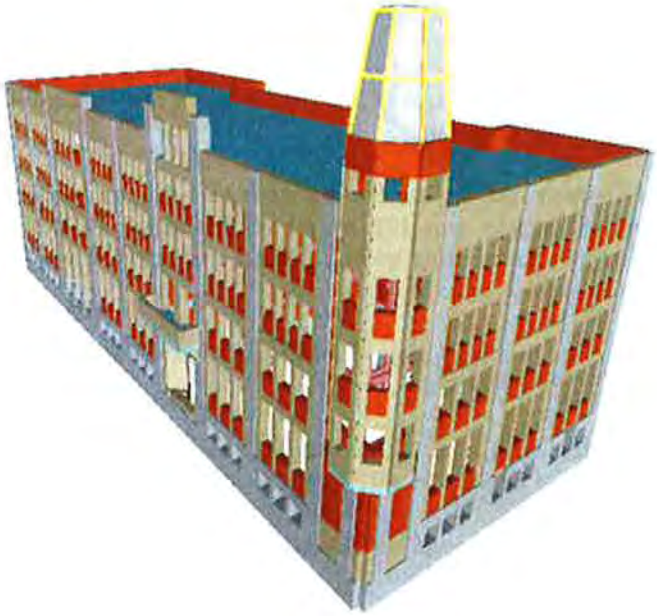
Background

Holmes Consulting Group have been commissioned to evaluate the earthquake performance of the Press Co. Building, a Category 1 heritage structure, located at 32 Cathedral Square in Christchurch. This report presents the remedial solutions for the damage sustained during the earthquakes on September 4th and December 26th, and the seismic performance evaluation of the building. Construction of the building typically consists of unreinforced brick and stone masonry, a configuration which is known to be vulnerable to earthquake damage as evidenced by the earthquake events of 2010.

Evaluation Procedure

The seismic evaluation procedure is based on the use of a computer model of the building to simulate the effects of earthquakes. This model is developed using information from the as-built drawings of the building and properties of materials used at the time of construction and incorporates proposed changes to the configuration.

Computer Model of the Building



The evaluation is based on a time history procedure, using actual ground acceleration records from real earthquakes. The ground accelerations are applied to the base of the model in small steps, 1/200th of a second. At every step the structural elements are checked for damage and, if damage has occurred, the computer model is updated to reflect the changes before the accelerations at the next step are applied.

The time history procedure is very computationally intensive but provides the most accurate simulation of earthquake damage available to structural engineers.

Seismic Load Levels

In accordance with the recommendations of the New Zealand Society for Earthquake Engineering the building was evaluated using loads that are 67% of that which would be used to design a new building on that site as defined by NZS 1170.5. This level of strengthening will ensure that the structure is considered a low seismic risk to occupants and people or property adjacent to the building.

Evaluation of Building

Various building conditions and configurations have been investigated:

1. The proposed building configuration with the window openings in the north wall reinstated and without any strengthening applied (it is assumed for this model that all damage sustained in the previous earthquakes has been repaired and the original building performance has been restored).

2. The proposed building configuration with the appropriate strengthening measures in order to provide 67% of current requirements.

The performance of the proposed building configuration (i.e. reinstated window openings on the north wall) is less than 33% of current requirements; consequently a comprehensive strengthening solution is required to increase the performance of the building to 67%.

An iterative strengthening process was developed whereby deficient building elements were either strengthened, or supplemented by new elements, until an acceptable level of building performance was attained. Using this process it was determined that the following strengthening is required:

1. The western facade requires the installation of two layers of Sikadur 51 FRP strengthening over the entire elevation.

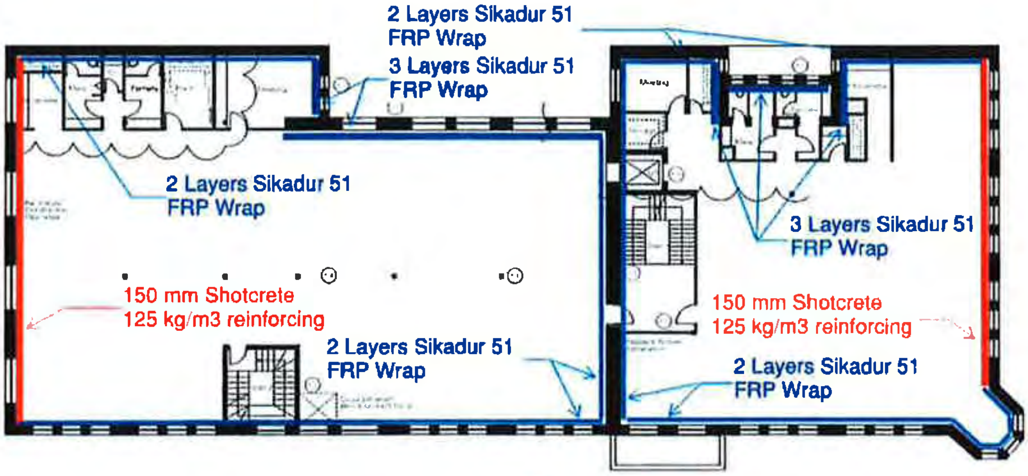
2. The Southern façade and the northern wall (in the proposed configuration) will require 150mm Shotcrete with 125 kg/m³ reinforcing and D12 starters anchored (drilled and epoxied into the existing wall @ 600mm centres each way) on the internal face extending from the basement to the roof.

3. The internal east-west core wall will require two layers Sikadur 51 FRP on each face over the full height of the wall.

4. The interior faces of the walls defining the light-well and services well will require two or three layers of Sikadur 51 FRP strengthening.

An illustration of the strengthening solution for a typical floor is illustrated below.

Typical Plan view of Strengthening Solution



Recommendations

It is recommended that the proposed remedial works and strengthening methodology for the existing building be adopted. Providing these recommendations are completed the analysis work described herein indicates that the building will have sufficient capacity to meet 67% of the current design level earthquake, as defined by NZS 1170.5 for the site.

Limitation

Evaluating the capacity of the existing floors to support maximum live loads is not within the scope of this assessment.

The seismic evaluation has been restricted to the structural performance of the building. Continued operability of a building after an earthquake is not assured in the absence of structural damage as damage to components, services and contents may impair functionality. The seismic resistance of these items has not been assessed.

1. INTRODUCTION

1.1 SCOPE OF WORK

This report relates to an evaluation of the seismic lateral load capacity of the existing Press Co. Building located at 32 Cathedral Square in Christchurch. The building was constructed circa 1909 and comprises a basement and four floors. As was typical for buildings of this age the structure consists of load bearing brick walls. The suspended floors and roof were constructed from in-situ concrete which was a departure from standard practise, in part due to the heavy loading requirements associated with printing and also to minimise the risk of fire. Walls on the street frontages have been dressed with Oamaru sandstone with a Bluestone Base. Figure 1-1 is a view of the building from Worcester St.

Figure 1-1 View of Building from Worcester St

Partial seismic mitigation and strengthening of the structure was undertaken circa 1970. This involved reducing the height and providing braces to the western and southern parapets and installing internal steel bracing and anchors in the tower roof.

Assessment of the existing structure has been separated into two facets; firstly the repair and remediation of the damage sustained during the earthquakes of September 4th and December 26th 2010, and secondly a performance assessment of the structure in order to attain 67% of the current design level earthquake, as defined by NZS 1170.5 for the site.

The proposed repair solutions are intended to reinstate the exterior fabric of the building and to provide structural performance comparable to or in excess of that prior to the damage sustained during the 2010 earthquakes.

The evaluation is restricted to an assessment of the resistance to earthquake loads of the structural system and does not consider the gravity load capacity of the floors or the performance of non-structural components and contents.

Stages involved in achieving this scope of work are:

1. Inspect the structure for earthquake damage and develop repair solutions for the damaged components to reinstate the original structural performance.
2. Develop a computer model of the structure using available drawings of the building.
3. Analyse this model using the time history analysis method as specified in NZS1170.5 (SANZ, 2004).
4. Evaluate the performance of the structural components under this level of load using NZSEE Guidelines for the Assessment and Improvement of the Structural Performance of Buildings in Earthquakes (NZSEE, 2006) and FEMA 356 – Pre-standard and Commentary for the Seismic Rehabilitation of Buildings (FEMA, 2000).
5. Develop conceptual strengthening measures to remedy identified deficiencies if necessary.
6. Repeat the evaluation until the performance achieves the objectives.

1.2 INFORMATION USED FOR THE EVALUATION

The information used for the analysis was based on the original architectural drawings circa 1906 and site visits on 24th of November 2010 and 12th of January 2011. The drawings were sufficient to provide the layout and geometry of the masonry walls but did not provide details of the original 1899 materials or construction. The site visits provided additional information as to the construction of the building, however where information was not available, assumptions were made based on the usual configurations of buildings of this age. In-situ material testing has been commissioned and the results will be incorporated into the modelling to enable more accurate material capacities to be implemented in the modelling in place of the conservative values as set out in the assessment guidelines

1.3 QUALIFICATIONS

Holmes Consulting Group is New Zealand's foremost structural and civil consultancy with a staff of over 80 and with offices in Auckland, Wellington, Christchurch, Queenstown and San Francisco. The company has a strong record of achievement in the development of effective solutions in structural design and construction. Its success over the past 40 years is manifested by its peerless portfolio of key structures throughout New Zealand.

Holmes Consulting Group has an extensive experience with seismic assessment and retrofit of existing buildings, especially historic buildings. Holmes' portfolio of significant historic buildings and sites includes:

- NZ Parliament House
- Christchurch Arts Centre
- Canterbury Provincial Government Buildings
- Christchurch Cathedral
- Auckland War Memorial Museum
- Auckland Railway Station
- Old BNZ, Wellington
- Wellington Maritime Museum
- Auckland Art Gallery

In addition to its experience with historic buildings, Holmes Consulting Group has developed unique in-house analysis techniques for the analysis of existing buildings. Its non-linear analysis is compliant with the most up-to-date international research and code writing, and has been adapted to incorporate new developments in materials and techniques. We can confidently say that it ranks as world-leading in this field.

1.4 LIMITATIONS

Findings presented as a part of this project are for the sole use of Ganellen (NZ) Ltd. The findings are not intended for use by other parties, and may not contain sufficient information for the purposes of other parties or other uses. Our professional services are performed using a degree of care and skill normally exercised, under similar circumstances, by reputable consultants practising in this field at this time. No other warranty, expressed or implied, is made as to the professional advice presented in this report.

Conclusions relate to the structural performance of the building under earthquake loads. We have not assessed the live load capacity of the floors, nor have we assessed the performance of non-structural components or building contents under earthquake loads.

2. SEISMIC INPUT

2.1 NZS 1170.5:2004 REQUIREMENTS FOR NEW BUILDINGS

Seismic loads for new buildings as defined in NZS1170.5 (SANZ, 2004) use a design spectrum which is based on a 500 year return period for ordinary buildings and a longer return period for important and essential buildings. For determination of inelastic effects and capacity actions the coefficient is based on a normalised spectrum scaled by site and structure factors:

$$C(T) = C_h(T) Z R N (T,D)$$

The seismic parameters for the site are listed in Table 2-1.

Table 2-1 Seismic Parameters

Design Code :	NZS1170
Soil Category :	D
R :	1.0
Z :	0.22
S_p :	1.0
L_u :	1.0
N(T,D) :	1.0

These factors provide a peak elastic spectral acceleration of 0.66g for a soft soil site.

For time history analysis, the code specifies a minimum of 3 time histories scaled such that the records envelope the code response spectrum in the range of 0.4 to 1.3 times the period of the structure.

2.2 NZSEE RECOMMENDATIONS FOR EXISTING BUILDINGS

Section 4.2 of the NZSEE Guidelines (NZSEE, 2006) recommends that for existing pre-1975 buildings to be classified as have a low risk to people or property in or adjacent to that building in a reasonably foreseeable event, the building should have adequate capacity to resist 67% of the NZS:1170.5 (SANZ, 2004) seismic load for an equivalent new building at that location.

2.3 EARTHQUAKE MOTIONS USED FOR EVALUATION

The NZSEE (NZSEE, 2006) recommendations were used to define seismic input. This equates to a peak elastic spectral acceleration of 0.44g for a soft soil site.

Table 2-2 lists the three earthquake records used, together with the scaling factors calculated when the primary components are oriented in the X (N-S) and Z (E-W) directions respectively. The scaling factor of the selected earthquake records is period dependant and the building model for the existing structure had an X period of 0.431 seconds and a Z period of 0.647 seconds.

Figures 2-1 to 2-3 show the spectra of the scaled records and Figure 2-4 compares the envelope of the scaled records with the design spectrum. Each plot contains the two scaled horizontal components of each record, plotted for the X direction factors.

Table 2-2 Earthquake scaling factors

Earthquake	X (N-S) Direction	Z (E-W) Direction
Imperial Valley 5/19/40 0439, El Centro Array #9, 180	0.64	0.70
Landers 06/28/92 1158, Joshua Tree (Station 22170)	0.76	0.71
Llayllay 280 Degrees Earthquake Of March 3, 1985	0.46	0.44

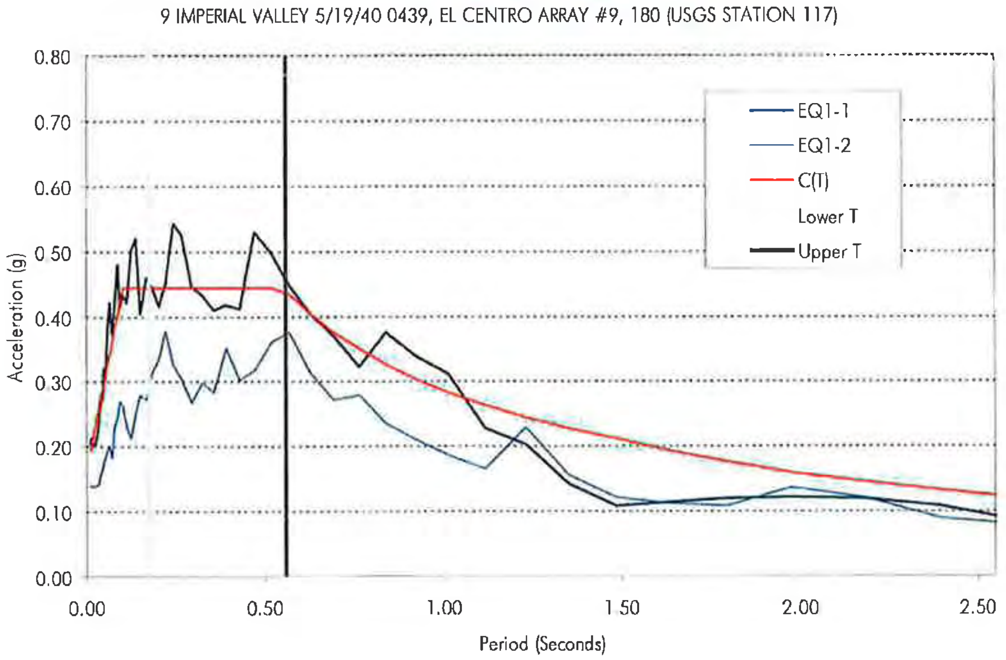


Figure 2-1 Scaled Imperial Valley

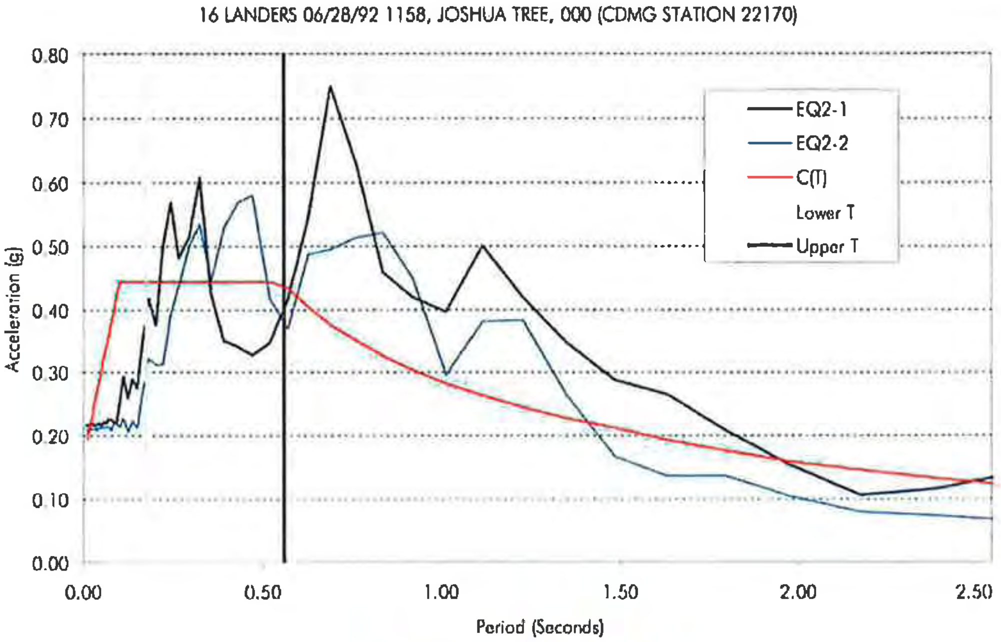


Figure 2-2 Scaled Joshua Tree

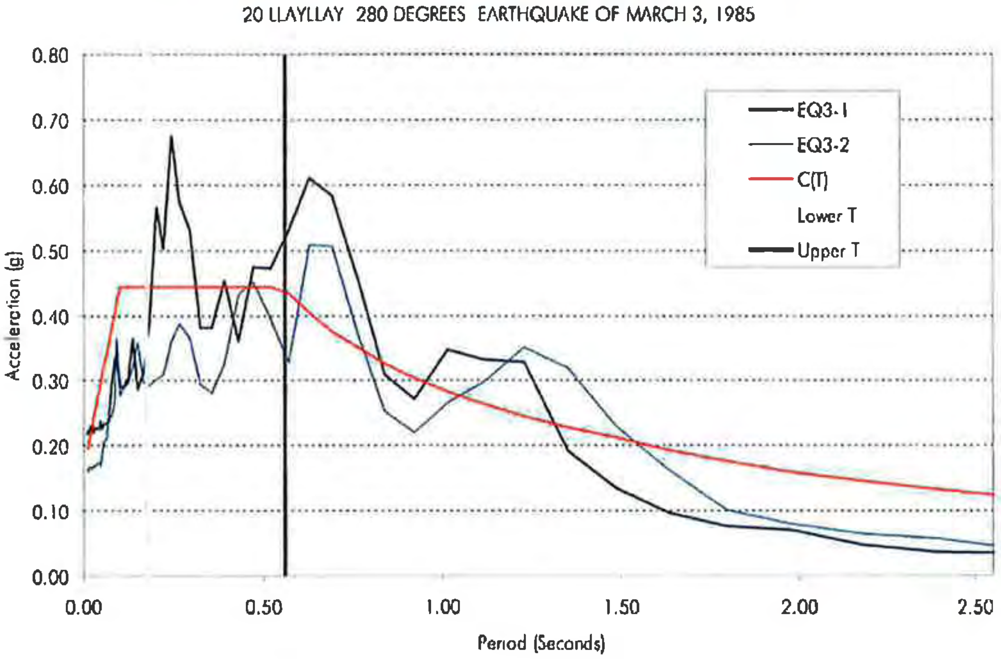


Figure 2-3 Scaled Llayllay

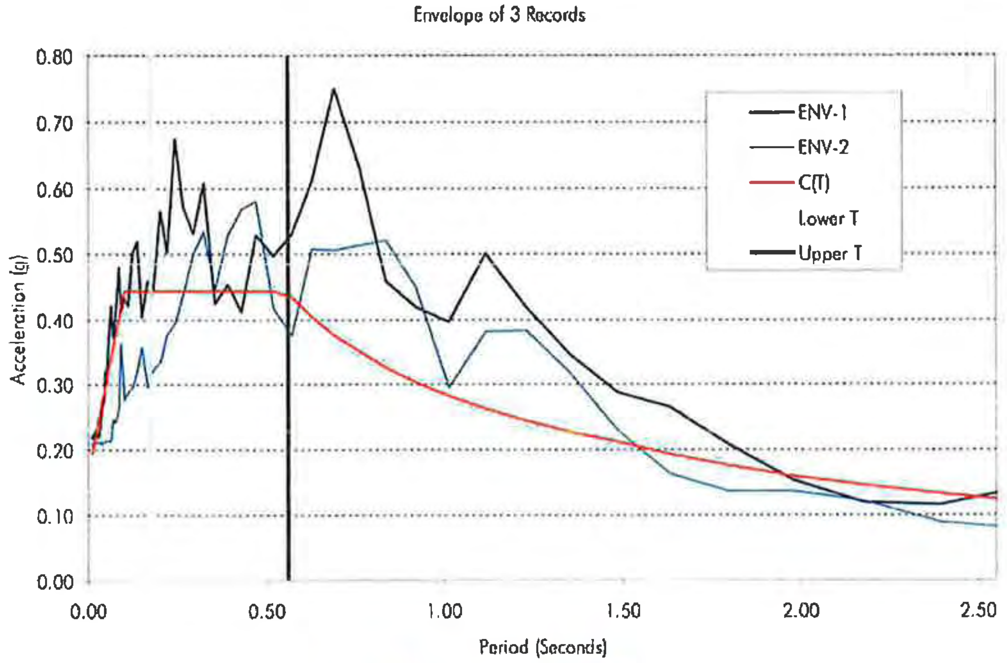


Figure 2-4 Envelope of Scaled Records

3. ANALYSIS PROCEDURE

The structure was analysed using the HCG nonlinear analysis procedure. This is based on a linked series of modules:

1. MODELA, an Excel spreadsheet for preparing input data and writing input files
2. ANSR-L, a general purpose nonlinear analysis program to analyse the structure
3. PROCESSA, an Excel spreadsheet to process output files and import envelope results.

These modules implement the time history method of analysis, as specified in NZS1170.5 (SANZ, 2004).

3.1 BASIS FOR PROCEDURE

3.1.1 Time History Analysis

The time history analysis is based on the provisions of NZS1170.5 (SANZ, 2004). A finite element model of the building is developed, including the strength of all elements. The response of the building is then evaluated under the actions of the three earthquakes described above. The earthquake accelerations are applied in small time increments, for this building of 1/200th of a second. At every increment the forces in every element are checked. If they exceed the strength of the element then the model is modified to reflect this change in element state and the analysis proceeds to the next step.

Each analysis involves from 8,000 to 13,000 steps, depending on earthquake duration (40 to 65 seconds). At the end of the analysis, maximum forces and deformations in the structure and in every element are printed. The envelope values from all analysis variations are accumulated and used to evaluate performance.

3.2 UNREINFORCED MASONRY

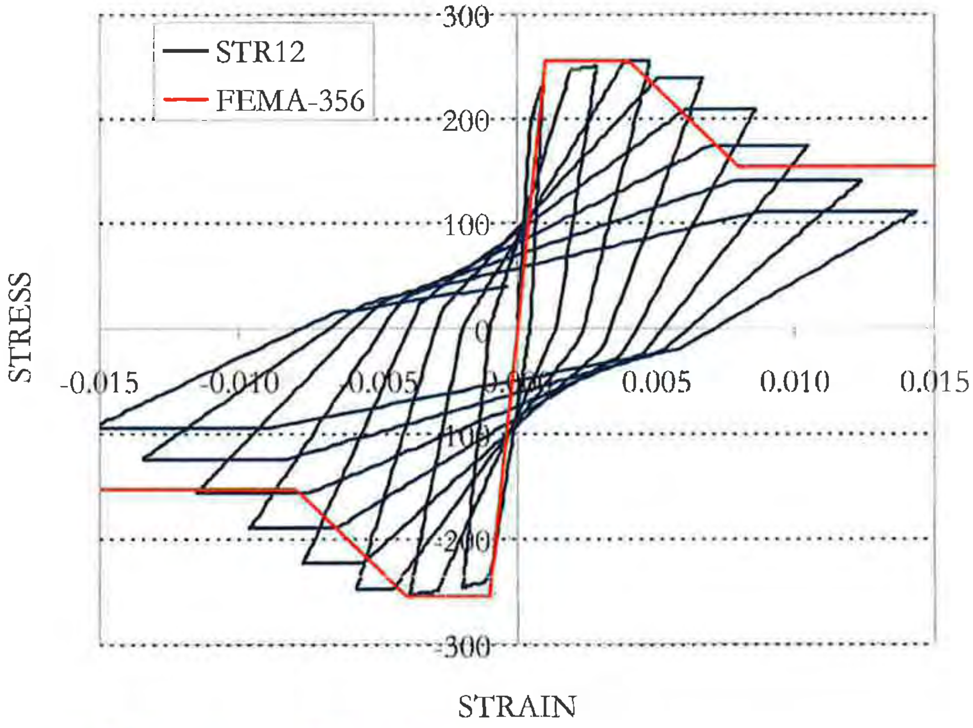
The lateral load resistance for the building is provided by load bearing unreinforced masonry walls (URM). These are modelled using plane stress elements with degrading strength and degrading stiffness characteristics. Properties of the elements are based on the provisions of FEMA-356 (FEMA, 2000).

3.2.1 Shear Strength Model

Although masonry is a brittle material, it can continue to support loads to relatively small displacements after cracking occurs. FEMA-356 (FEMA, 2000) sets this limit at a story drift of from 0.4% to 0.8%, compared to drifts of up to 2.5% for modern structures.

To model this brittle behaviour, the element shear stress – shear strain similar to the function shown in Figure 3-1 is used. The element shown in Figure 3-1 undergoes cracking at a shear stress of 230 kPa (plus a contribution from the vertical stress). After cracking, the strength of the element is initially maintained but the element stiffness reduces under cyclic loading. Once the shear strain exceeds 0.004 strength degradation occurs and the strength reduces to a residual level represented by friction alone.

Figure 3-1 URM Element for Cyclic Loads



Further investigation of the in-situ mortar shear strength is due to be undertaken in accordance with the NZSEE Guidelines for Assessing and Strengthening Earthquake Risk Buildings (NZSEE, 1995) to establish the mortar shear strength. Results of the in-situ mortar shear testing will be incorporated into the model and will allow a greater degree of certainty with regard to the capacity of the material strengths.

3.2.2 Rocking Model

The panel element described above models the shear degradation of walls. For slender wall piers, rocking may occur at the base before the shear strength is reached. To model flexural yielding, gap elements are placed at the node at each corner of the wall pier at the elevations at which separation is expected to occur.

The gap elements are pre-loaded by gravity loads on the structure. The elements are linear elastic in compression but, once seismic uplift forces exceed the gravity load, the element stiffness reduces to zero and a gap opens.

3.2.3 Evaluation of Masonry Wall Performance

The NZSEE Guidelines (NZSEE, 2006) provide the allowable strength for URM but do not provide detailed acceptance criteria for this type of modelling and so the requirements of FEMA-356 (FEMA, 2000) are adopted, as summarised in Table 3-1.

FEMA-356 defines primary components as elements *which are essential to the ability of the structure to resists collapse.* Secondary Elements are those not designated as primary but *which affect the lateral stiffness of the structure or are loaded as a result of lateral deformations. For nonlinear analysis, secondary elements can resist loads at residual strength levels.*

The elements used to model URM walls reduces to the residual strength once the CP limit for primary components is reached (Figure 3-1) and so the elements are effectively modelled as secondary elements if that strain is reached. In this situation, the limits for secondary components apply. For analysis, the criteria are applied as follows:

1. Elements which are part of the vertical load path (columns and piers) are required to meet criteria for primary components unless there is redundancy (for example, an intersecting cross wall which has a demand less than the primary limit), in which case secondary limits are used.

2. Elements which are not part of the vertical load path (spandrel beams) are required to meet criteria for secondary components.

Table 3-1 FEMA 356 Acceptance Criteria for URM Walls

	Acceptance Criteria (Drift, %)				
		Primary Components		Secondary Components	
	IO	LS	CP	LS	CP
Bare URM Wall					
Shear	0.10	0.30	0.40	0.60	0.80
Rocking	0.10	$0.3h_{eff}/L$	$0.4h_{eff}/L$	$0.6h_{eff}/L$	$0.8h_{eff}/L$
URM Wall with Overlay					
Shear	0.10	0.60	0.60		
Rocking	0.10	$0.6h_{eff}/L$	$0.8_{eff}/L$		

The drifts limits on rocking response are a function of the ratio of element height, h, to length, L. For primary elements, the limiting drift angle is $\delta = 0.004\ h\ /\ L$ and for secondary elements $\delta = 0.008\ h\ /\ L$. The numerical limit on gap openings is equal to the drift angle times the wall length, L. Therefore, gap openings are limited to 0.004h (primary) or 0.008h (secondary).

As the rocking mode of response is less susceptible to sudden failure than the shear mode the secondary element criteria are appropriate for evaluating gap openings.

3.2.4 Face Loading on Walls

FEMA 356 (FEMA, 2000) provisions for assessing the out-of-plane capacity were used for this project. The requirements are summarised in Table 3-2 where h/t is the height-to-thickness ratio of the wall and S_{X1} is the spectral response acceleration at 1 second period for the site.

Table 3-2 FEMA 356 Acceptance Criteria for Out-Of-Plane Response of URM Walls

	Permissible h/t Ratio		
Wall Types	**S_{x1}<0.24g**	**0.24g<S_{x1} <0.37g**	**S_{x1}>0.37g**
Walls of one-storey building.	20	16	13
First story wall of multi-storey building	20	18	15
Walls in top story of multi story building	14	14	9
All other walls	20	16	13

Using the NZSEE (NZSEE, 2006) recommendations S_{X1} can be calculated as 0.29 g. The h/t limits and corresponding minimum wall thickness' are summarised in Table 3-3 below. The minimum wall thickness in the Press Co building is 315mm (corresponding to 3 wythes), consequently all masonry walls in the building will have acceptable out-of-plane response.

Table 3-3 FEMA 356 Limiting H/T Ratios for Wall Face Loading

Floor	**Height h (m)**	**h/t Limit**	**Min Wall Thickness t (mm)**
4th	3.65	14	260
3rd	3.95	16	247
2nd	4.30	16	269
1st	[illegible]	16	288
Basement	4.00	18	222

3.3 PARAPETS

The building parapets on the south and east facades have existing bracing provided, whereas the parapets on the rear faces of the building are currently un-braced. Parapets require bracing if the height is greater than 2.5 times the thickness, for the rear faces of the building this corresponds to a maximum un-braced height of 575 mm (230 mm thick parapet). The typical parapet to the rear of the building is 900-1200mm high these will require additional bracing members.

3.4 IN-SITU CONCRETE FLOORS

The existing building has in-situ concrete floors and roof. These were implemented in the model as rigid diaphragms with an appropriate seismic mass as outlined in Sections 4.4 and 4.5. The use of rigid diaphragms in the model is appropriate due to the thickness of the floor slabs, although the capacity of the floors slab to carry the shear forces generated will need to be verified as the slab reinforcing material and quantities is verified.

3.5 FRAME ELEMENTS

3.5.1 Element Modelling

For beam and column elements the strength is modelled as a bi-linear yield function. The elastic stiffness is based on effective properties up to the calculated nominal yield moment. Properties are defined by axial area, shear area and moment of inertia about each axis.

Beams have a separate yield moment specified for positive and negative bending at each end of the beam. Once the yield moment is attained, the flexural stiffness is reduced to the initial stiffness times the specified strain hardening ratio.

Columns are represented by a flexural element similar to beams. However, the yield moments about each axis and the axial load are coupled. An interaction diagram is calculated based on nominal material strengths. The interaction between bending moments and axial load is defined by:

$$\sqrt{\left(\frac{M_y}{M_{yu}}\right)^2+\left(\frac{M_z}{M_{Zu}}\right)^2}+\left(\frac{F-F_o}{F_u}\right)=1.0$$

where

$$F_o=\frac{1}{2}(F_{ut}-F_{uc})$$

$$F_u=\frac{1}{2}(F_{ut}+F_{uc})$$

M_y, M_z and F denote bending moments about the element y and z axes and the axial force respectively. Subscript u denotes ultimate. F_{ut} and F_{uc} are axial ultimate strengths in tension and compression. As for the beams, a bilinear strain hardening yield function is generally used in the model.

The flexural element used for beams and columns permits degrading strength and/or stiffness characteristics to be specified. The FEMA-356 (FEMA, 2000) guidelines provide limiting plastic rotations beyond which strength degradation is assumed to occur and these limits are incorporated in the analysis procedure.

3.6 FOUNDATIONS

Foundations were not explicitly included in the evaluation. The structure is founded on strip footings. The masonry walls do not have any tension capacity and so cannot apply uplift forces to the foundations. To implement this, gap elements were used at ground level for every column line in the model.

The load resisting system is provided by the shear resistance of relatively long, low walls and so the vertical compression on the foundation will be relatively low. As the buildings do not exhibit any signs of foundation distress it was considered reasonable to assume the foundations would be satisfactory for earthquake loads.

4. DEVELOPMENT OF FINITE ELEMENT MODEL

4.1 FORM OF MODEL

Finite element models of the building have been developed in the existing configuration and the proposed reinstatement of the original windows in the northern façade. Figure 4-1 illustrates the existing and proposed north wall elevations. Figures 4-2 and 4-3 show views of the model from western and eastern elevations respectively. Figure 4-4 shows a cut-away view illustrating the internal gravity load carrying members. The main characteristics of the model are:

- Plane stress elements to model the unreinforced masonry walls.
- Flexural elements with yield a function of major axis moment to model beam elements.
- Self weight and distributed loads corresponding to dead plus seismic live load was applied prior to the dynamic analysis.

Development of the properties of these elements is described in the following sections. The finite element model of the building was large, with a total of 9,050 elements and 15,434 degrees of freedom.

Figure 4-1 Proposed and Existing North Elevation

Figure 4-2 Western Elevation

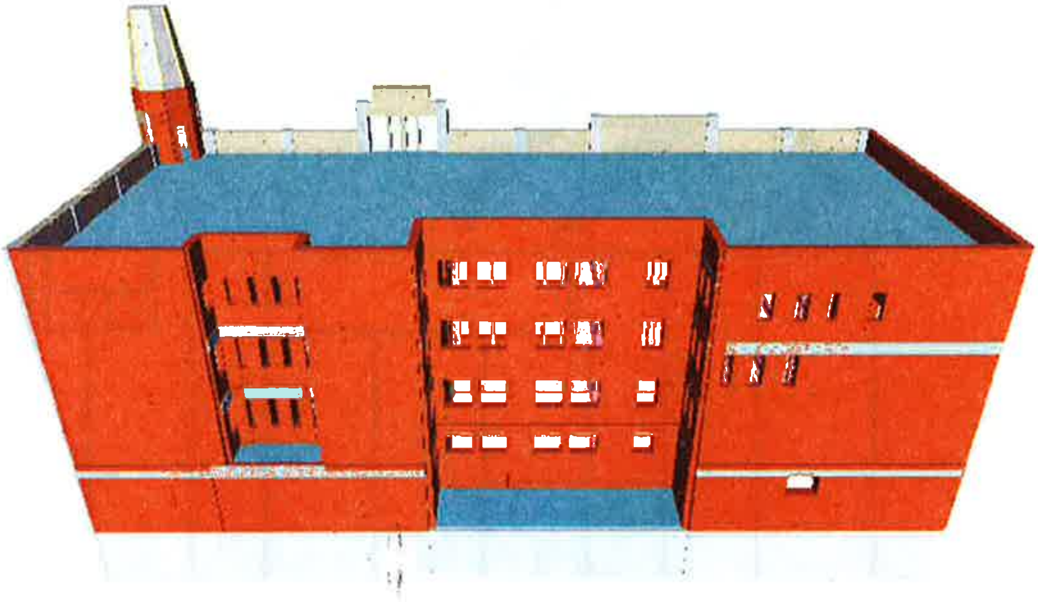


Figure 4-3 Eastern Elevation

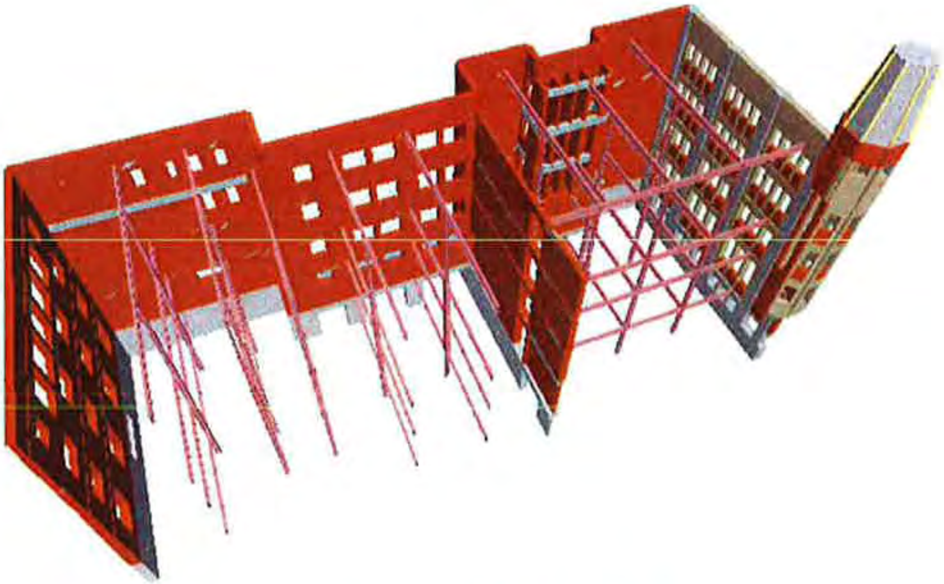


Figure 4-4 Interior View of Model

4.2 GEOMETRY

The geometry was described by a series of column numbers to identify plan locations and elevations to identify sections in the vertical plane. Figure 4-5 shows the column locations in a plan view of the model, note that the column line numbering is not shown for clarity. The column locations were selected so as to define all wall intersections and openings, floor finite elements and roof elements. The Z (East-West) axis in the model is parallel to Worcester Street.

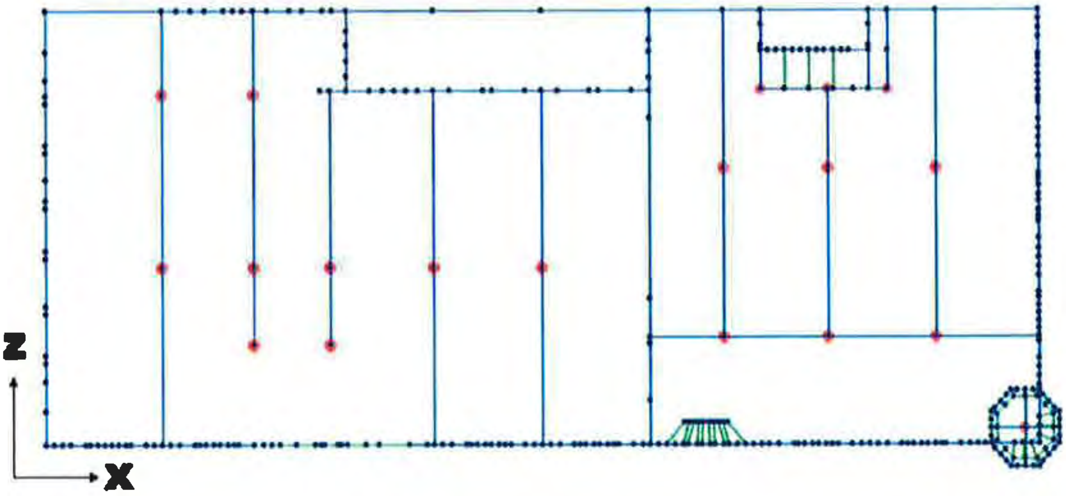


Figure 4-5 Plan View of Model

The vertical planes in the model were located at a total of 25 levels, as listed in Table 4-1. The building was assumed to be fixed at Level 1 against horizontal translation.

Table 4-1 Elevations in Model

Level Number	Level Name	Elevation (m)
1	Basement	0.000
2	Ground	1.880
3	Ground+1	2.380
4	Ground+2	3.200
5	G Floor	4.000
6	G Floor + 1	5.200
7	G Floor + 2	6.780
8	G Floor + 3	8.350
9	1st Floor	8.950
10	1st Floor + 1	10.150
11	1st Floor + 2	12.100
12	2nd Floor	12.900
13	2nd Floor + 1	14.100
14	2nd Floor + 2	16.050
15	3rd Floor	16.850
16	3rd Floor + 1	18.050
17	3rd Floor + 2	19.700
18	Roof	20.500
19	Parapet	22.100
20	Parapet + 1	23.100
21	Parapet + 2	24.100
22	Parapet + 3	25.100
23	Tower Roof	25.500
24	Tower Roof + 1	28.000
25	Tower Roof + 2	30.500

4.3 MASONRY WALLS

Plane stress panels were used to model walls around the perimeter of buildings, as shown in the view in Figure 4-6. All perimeter walls are of unreinforced masonry (URM) construction. The shear strength of the brick was taken as 230 kPa plus 0.3 times vertical stress, as per the NZSEE Guidelines. The thickness of the panels was based on the wall thickness shown on the drawings (with site verification), ranging from 230 mm to 710 mm.

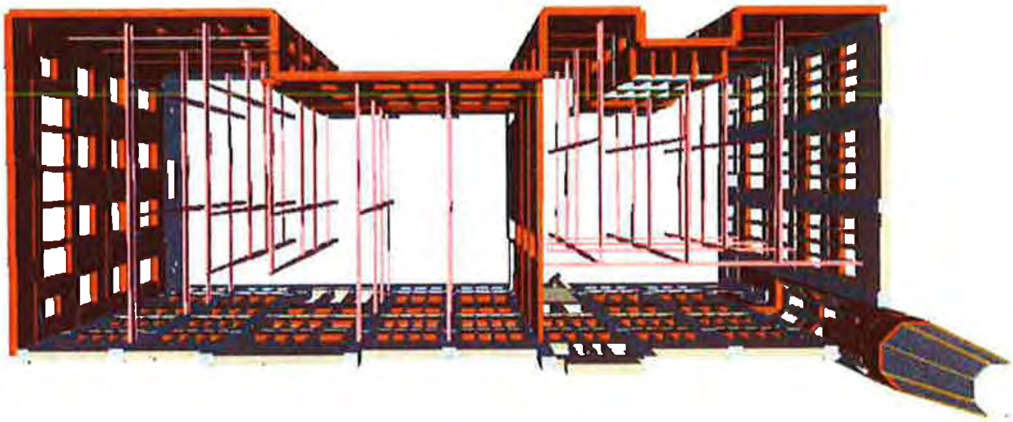


Figure 4-6 Masonry Wall Layout

Figure 4-7 plots the model elevation along the western facade, which shows the characteristics of the elements used to model the walls:

1. Plane stress elements to model the wall segments.
2. Beam elements to carry the gravity load and model the slab connection to the wall elements.

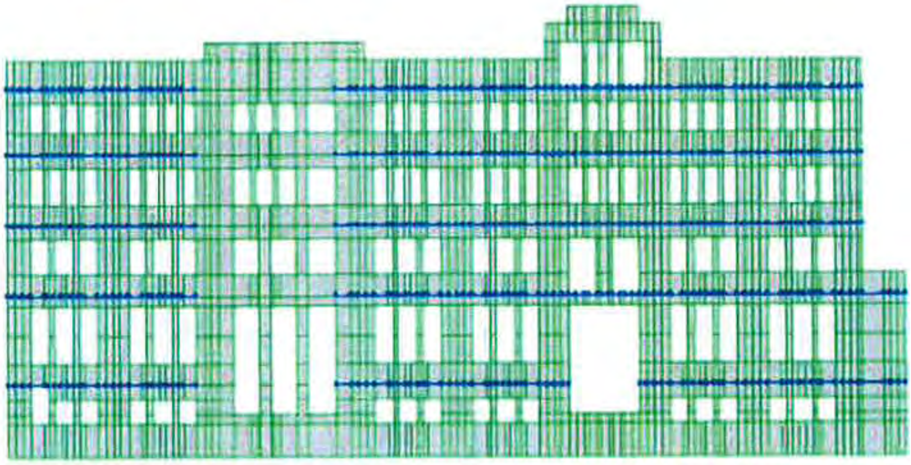


Figure 4-7 Wall on Western Facade

4.4 FLOOR MODELS

The floors and rooftop were modelled as rigid diaphragms with a seismic mass as outlined in the following section. The use of rigid diaphragms is appropriate as the floors are 200mm thick in-situ concrete with minimal openings in the floor plates for stairs and lifts etc.

The use of rigid diaphragms considerably simplified the modelling process. The capacity of the existing floor diaphragm to transfer the inertial seismic forces into the perimeter walls is likely to be adequate but will need verification upon investigation works confirming the reinforcing and material strengths of the floor slabs.

4.5 MASSES AND WEIGHTS

The seismic weight of the buildings was assembled from element self weights plus floor weights. The seismic floor weights of 7.0 kPa were based on a concrete slab depth of 200mm; a super imposed dead load (SDL) of 1.0 kPa and a reduced seismic live load of 0.9 kPa. A seismic weight of 6.5 kPa was used for the roof structure, based on 200mm slab depth and an SDL of 1.5 kPa (the additional SDL allows for the existing roof-top structures in addition to the services allowance).

Table 4-2 lists the weights at each elevation in the model. The total seismic weight of the un-strengthened building in the proposed configuration was 73,262 kN.

Table 4-2 Seismic Weight (kN)

Level Number	Level Name	Elevation (m)	Seismic Weight (kN)
25	TOWER_ROOF_+_2	30.500	13
24	TOWER_ROOF_+_1	28.000	29
23	TOWER_ROOF	25.500	47
22	PARAPET_+_3	25.100	61
21	PARAPET_+_2	24.100	119
20	PARAPET_+_1	23.100	181
19	PARAPET	22.100	880
18	ROOF	20.500	9,447
17	3RD_FLOOR_+_2	19.700	879
16	3RD_FLOOR_+_1	18.000	1010
15	3RD_FLOOR	16.900	10,104
14	2ND_FLOOR_+_2	16.000	1,099
13	2ND_FLOOR_+_1	14.100	1,256
12	2ND_FLOOR	12.900	11,183
11	1ST_FLOOR_+_2	12.100	1,315
10	1ST_FLOOR_+_1	10.100	1,511
9	1ST_FLOOR	8.950	12,753
8	G_FLOOR_+_3	8.350	1,148
7	G_FLOOR_+_2	6.780	1,658
6	G_FLOOR_+_1	5.200	1,560
5	G_FLOOR	4.000	12,851
4	GROUND+2	3.200	1,197
3	GROUND+1	2.380	923
2	GROUND	1.880	2,040
		TOTAL	73,262

5. AS-IS BUILDING SEISMIC EVALUATION

The finite element model was defined in the MODELA spreadsheet which was then used to develop a series of input files for the analysis programs:

1. A linear elastic model for the extraction of periods and mode shapes.
2. A nonlinear model for time history analysis. For the as is building assessment ANSR input files were generated for 3 earthquakes, each at 2 orientations, a total of 6 input files.

These two models were used to define the seismic response characteristics of the building and evaluate seismic response.

5.1 DYNAMIC CHARACTERISTICS

The dynamic characteristics of the structure are dominated by the eccentricity of the centre of rigidity from the centre of mass. The eastern wall of the building is considerably stiffer and stronger than the walls on the north, south and west faces of the building. This can be seen from the mass participation results shown in Table 5-1. The first translational mode (0.644s) is in the E-W direction and contributes over 60% of the participating mass in the Z direction. In the N-S direction however the torsional response of the building means that the second and third modes are both required to activate more than 50% of the participating mass of the building. Figure 5-1 below illustrates the first two translational modes of the building.

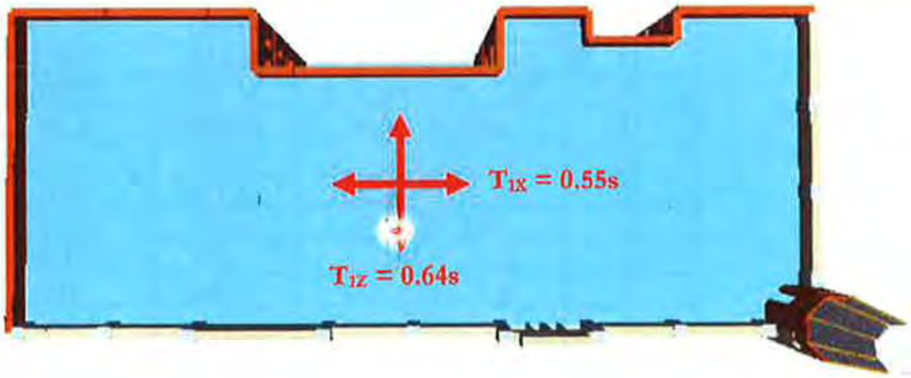


Figure 5-1 First and Second translational Modes

Table 5-1 Periods & Effective Masses

Mode Number	Period (s)	Effective Mass		Cumulative Mass	
		X	Z	X	Z
1	0.644	0.80%	61.23%	0.80%	61.23%
2	0.547	31.93%	2.28%	32.73%	63.51%
3	0.431	29.39%	0.15%	62.12%	63.66%
4	0.276	0.60%	1.99%	62.71%	65.65%
5	0.236	0.50%	7.22%	63.22%	72.86%
6	0.227	0.36%	1.78%	63.57%	74.65%
7	0.194	3.09%	0.26%	66.66%	74.91%
8	0.182	0.00%	0.01%	66.66%	74.92%
9	0.164	7.35%	0.33%	74.01%	75.24%
10	0.149	0.00%	0.00%	74.01%	75.24%
11	0.133	0.09%	1.61%	74.10%	76.85%
12	0.130	0.00%	0.01%	74.10%	76.86%
13	0.112	0.92%	0.18%	75.02%	77.04%
14	0.099	1.33%	0.26%	76.35%	77.30%
15	0.094	0.00%	0.13%	76.35%	77.43%
16	0.093	0.16%	0.41%	76.52%	77.84%
17	0.091	0.02%	0.01%	76.54%	77.85%
18	0.089	0.13%	0.00%	76.67%	77.85%
19	0.087	0.01%	0.00%	76.69%	77.85%
20	0.084	0.36%	0.04%	77.04%	77.89%
21	0.079	0.14%	0.00%	77.18%	77.89%
22	0.075	0.01%	0.00%	77.19%	77.89%
23	0.071	0.35%	0.04%	77.54%	77.93%
24	0.070	0.00%	0.00%	77.54%	77.93%
25	0.063	0.00%	0.00%	77.54%	77.93%
26	0.061	0.00%	0.00%	77.54%	77.93%
27	0.057	3.35%	7.43%	80.89%	85.36%
28	0.055	0.00%	0.00%	80.89%	85.36%
29	0.054	0.00%	0.00%	80.89%	85.36%
30	0.054	0.00%	0.00%	80.89%	85.36%
31	0.051	0.00%	0.00%	80.89%	85.36%
32	0.051	0.00%	0.00%	80.89%	85.36%
33	0.050	0.00%	0.00%	80.89%	85.36%
34	0.049	0.00%	0.00%	80.89%	85.36%
35	0.046	0.00%	0.00%	80.89%	85.36%
36	0.046	0.00%	0.00%	80.89%	85.36%
37	0.045	0.06%	0.00%	80.96%	85.36%
38	0.045	0.00%	0.00%	80.96%	85.36%
39	0.045	0.00%	0.00%	80.96%	85.36%
40	0.044	0.00%	0.00%	80.96%	85.36%
41	0.043	0.08%	0.13%	81.04%	85.49%
42	0.043	0.00%	0.00%	81.04%	85.49%
43	0.043	0.12%	0.09%	81.16%	85.58%
44	0.040	0.58%	0.78%	81.74%	86.37%
45	0.040	0.00%	0.00%	81.74%	86.37%
46	0.040	0.00%	0.00%	81.74%	86.37%
47	0.040	0.00%	0.00%	81.74%	86.37%
48	0.039	1.13%	1.11%	82.87%	87.48%
49	0.039	0.00%	0.00%	82.87%	87.48%
50	0.039	0.00%	0.00%	82.87%	87.48%
51	0.039	0.01%	0.01%	82.87%	87.49%
52	0.039	0.00%	0.01%	82.88%	87.49%
53	0.038	1.92%	5.31%	84.80%	92.80%
54	0.038	0.11%	0.29%	84.91%	93.09%
55	0.037	0.00%	0.00%	84.91%	93.09%
56	0.037	0.00%	0.00%	84.91%	93.09%
57	0.037	0.00%	0.00%	84.91%	93.09%
58	0.037	0.14%	0.11%	85.05%	93.20%
59	0.037	0.00%	0.00%	85.05%	93.20%
60	0.036	0.00%	0.00%	85.05%	93.20%

5.2 TIME HISTORY ANALYSIS

5.2.1 Solution Parameters

Time history analysis requires two solution parameters not used for other forms of analysis, damping and integration time step. NZS 1170.5 specifies these parameters in terms of T_1 (the fundamental period) and T_n (the period required to achieve 90% mass).

For the "as-is" building the fundamental periods are T_{1Z} = 0.64 seconds and T_{1X} = 0.55 seconds. However, even the first 60 modes did not achieve 90% mass in the X direction (85%). The analysis time step is required to be less then or equal to $T_1/100$, T_n or 0.01 seconds. For this building, T_{1x} governs and the minimum time step is 0.0055 seconds. A time step of 0.005 seconds was selected and used for all analyses.

NZS 1170.5 requires that where Rayleigh damping is used, as for time history analysis, there be no more than 5% of critical damping in the two first translational modes and no more than 40% damping in the mode with a period T_n.

For analysis, α and β factors and the fraction of critical damping are defined at two periods. The damping at all periods between these two limits will be less than or equal to the specified fraction. These factors were specified to provide 5% of critical damping at the longest period and at T_n = 0.05 seconds. This meets the requirements of NZS1170.5.

5.2.2 Maximum Response

Each of the three scaled earthquakes described in Section 2 was applied to the structure in two orientations, a total of 6 analyses. The results from these analyses were then processed to provide envelope deformations and forces. Table 5-2 summarises maximum response values.

Table 5-2 Peak Response of Buildings

	Imperial Valley USA		Joshua Tree USA		Llayllay Chile	
	1	2	1	2	1	2
Status	OK	OK	OK	OK	FAIL	OK
Maximum Time (Seconds)	40.000	44.000	62.500	40.000	23.900	62.500
Base Shear Coefficient						
X	0.21	0.23	0.22	0.17	0.14	0.17
Z	0.13	0.15	0.13	0.17	0.11	0.16
Displacements (mm)						
Maximum X	52.9	102.7	64.5	43.9	44.9	54.6
Maximum Z	93.6	99.1	114.7	114.7	69.4	100.4

5.2.3 Building Failure Mode

As noted in Table 5-2, the building completed the full earthquake duration for 5 of the 6 analyses. Note that the maximum displacement corresponds to the tower. At this level of earthquakes the building has suffered shear failure in a significant number of the shear panels

Figure 3-5 illustrates the resulting peak displacements recorded at the main floor levels in the model.

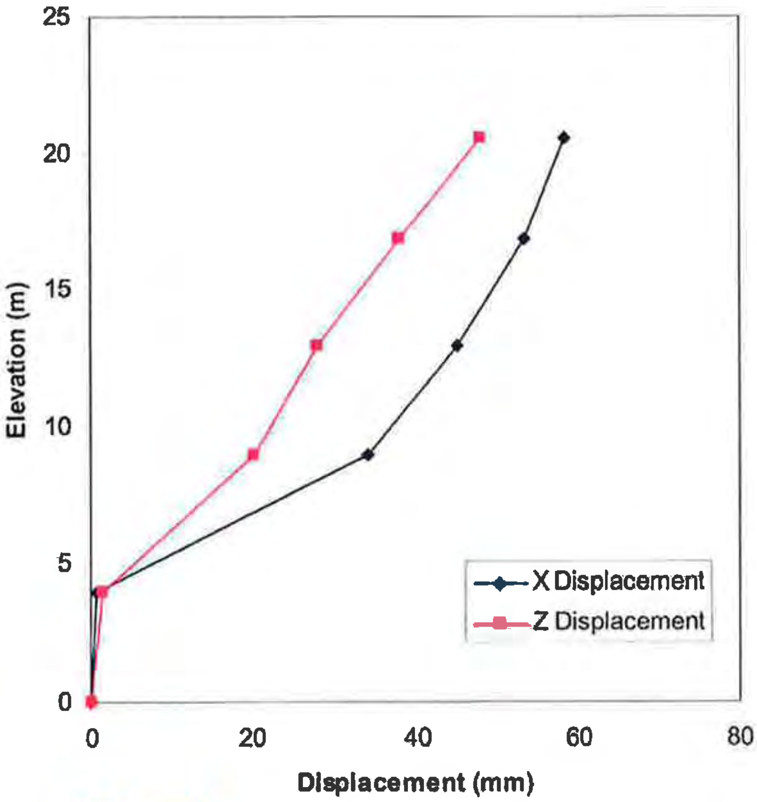


Figure 5-2 Peak Floor Level Displacements

6. BUILDING MODIFICATIONS AND STRENGTHENING

6.1 EXISTING BUILDING DEFICIENCIES

The as-is building was evaluated using a series of earthquake records corresponding to reducing levels of the seismic load level recommended by NZS1170.5 for new a building at this site. The evaluation showed that the perimeter walls on the north, south and west faces of the building did not have sufficient capacity to resist the target level (67% NBS) earthquakes. This is primarily due to the proportionally large open area of these walls and the large mass associated with the masonry walls and the concrete floor slabs.

6.2 IMPROVING SEISMIC PERFORMANCE

For a building which has insufficient seismic resistance, there are two options to enable the building to continue to fulfil its function:

1. Add a new structural system to resist the earthquake loads.
2. Strengthen the existing structural system so that it can resist seismic loads within acceptable damage limits.

The first option is often the only viable method for buildings which are seriously deficient and located in high seismic regions. However, it is very intrusive as the new structural elements subtract from useful floor area and impact the architectural fabric of the building. New foundations are usually required.

The option to strengthen the existing system can be much less intrusive and, if the load paths remain the same, foundation strengthening can be avoided. However, any strengthening must be compatible with the existing structure so that loads are shared. Strengthening which is much stiffer than the existing structure will attract a disproportionate share of seismic loads.

For this building the desired option was to strengthen with Fibre Reinforced Polymers (FRP) or provide additional strength via the use of reinforced Shotcrete on the internal faces of the walls. The relative merits of the strengthening solutions are outlined below:

1. FRP is the preferred solution as it best provides additional strength and ductility without significantly increasing the stiffness which has a corresponding increase in the seismic demands on the structure.
2. Shotcrete provides significantly greater strength increase but comes at the expense of increased stiffness, with the associated increase in seismic demand.

6.3 STRENGTHENING IMPLEMENTED IN MODEL

Seismic strengthening of deficient elements is an iterative process in that the first elements to fail, in this case the Un-Reinforced Masonry (URM) shear walls on the perimeter and through the centre of the building running east-west, may act as a fuse to prevent further damage occurring. This proved to be the case for this building. The first items of strengthening were the north and south URM walls, which were strengthened using 150mm of shotcrete. Subsequently Fibre Reinforced Polymer (FRP) sheets were added to the east, west and central URM walls, providing additional shear strength without significantly altering the stiffness of the structure.

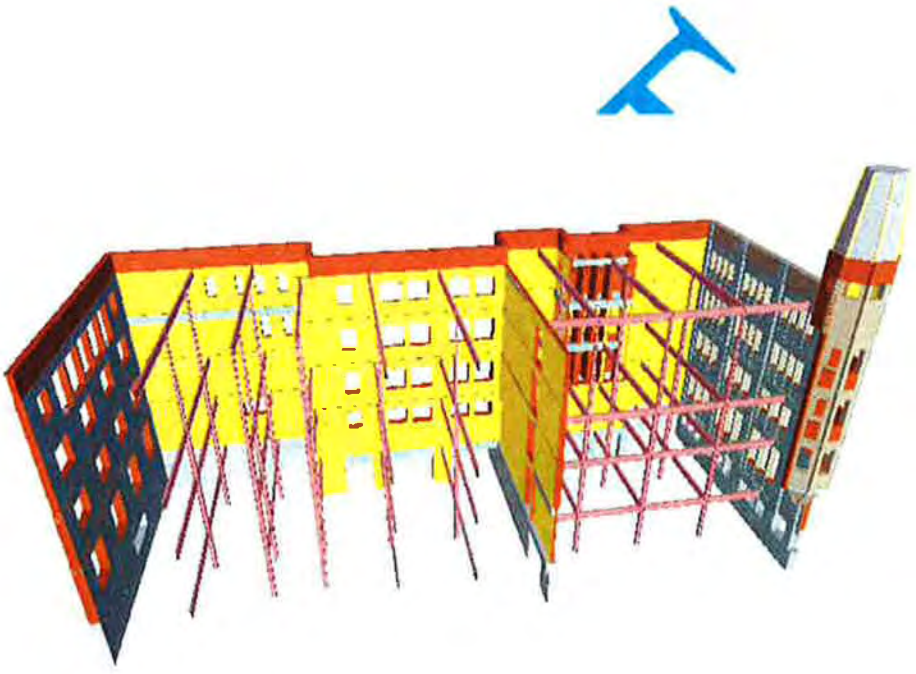


Figure 6-1 Interior View of Strengthening Solution (West Wall Cutaway)

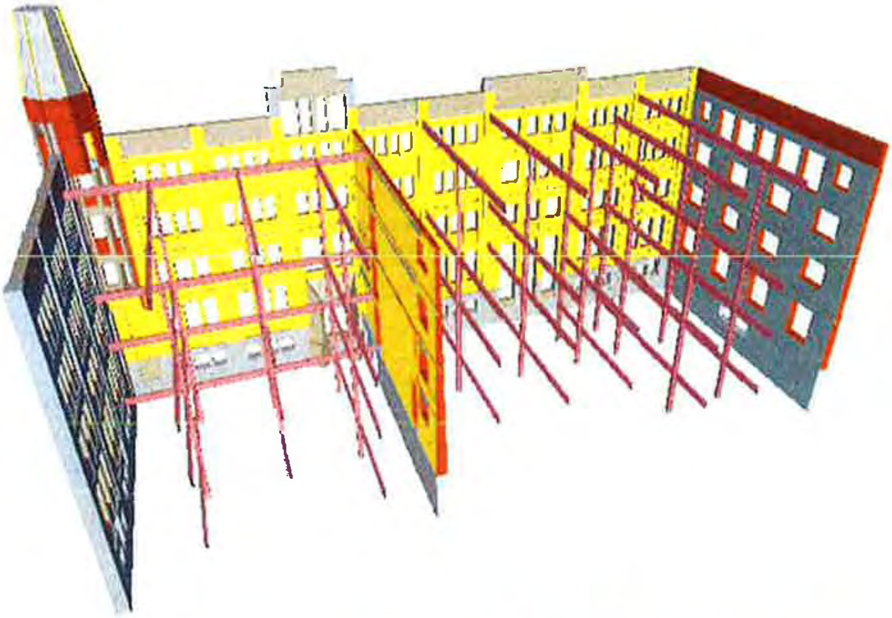


Figure 6-2 Interior View of Strengthening Solution (East Wall Cutaway)

6.4 TIME HISTORY ANALYSIS

The final strengthened building was evaluated using a time history analysis as for the "as-is" building. The performance of the building was than assessed against the project criteria. Note that the future option incorporating additional roof-top structure has not been specifically assessed due to a lack of information regarding construction type and extent. However if the additional structure does not exceed 25% of the floor plan, the additional strengthening requirements should not be too onerous.

6.4.1 Global Response

The time history analysis of the masonry buildings was repeated using the model as reported previously except that the new strengthening elements were now included in the model. The new strengthening elements modified the dynamic characteristics of the building. The fundamental periods are T_{1x} = 0.31 seconds and T_{1z} = 0.37 seconds.

Tables 6-3 and 6 -4 report the peak global response quantities of the strengthened building. An assessment of the results in Tables 6-3 and 6-4 show that:

1. The maximum base shear coefficient in the X direction was 0.25 and in the Z direction 0.24.

2. The maximum displacement in the x-direction was 31mm and in the z-direction 26mm.

3. The results of the modelling of the strengthened building show that a small number of panel elements within the larger wall panels have exceeded the allowable shear strain limits but assessing the wall panels in their entirety shows that the wall panel strain is below the allowable limits.

Table 6-1 Global Response of Strengthened Building (X & Z Directions)

	Imperial Valley USA		Landers USA		Llayllay Chile	
	1	2	1	2	1	2
Floor Displacements (mm)						
Maximum X	56.8	46.6	51.3	35.2	43.1	50.6
Maximum Z	50.4	37.1	59.4	54.1	40.8	44.1
Base Shear Coefficient						
V_X / W	0.24	0.16	0.25	0.20	0.17	0.21
V_Z / W	0.21	0.16	0.22	0.24	0.18	0.23

6.4.2 Peak Floor Displacements

Peak floor level displacements measured at the centre of mass for the floor diaphragms are summarised in Table 6-5 and Figure 6-5 below.

Table 6-2 Peak Floor Level Displacements)

Level	Elevation (m)	Max Displacement	
		X Direction (mm)	Z Direction (mm)
G	4	0	1
L1	8.95	13	12
L2	12.9	21	18
L3	16.85	28	23
RF	20.5	31	26

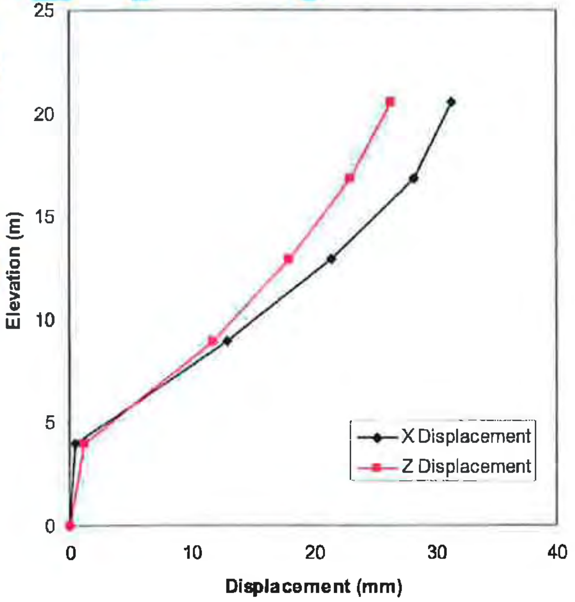


Figure 6-3 Peak Floor Level Displacements

From Figure 6-5 it can be seen that in the x-direction and z-direction the maximum floor displacements were all 30 mm or less.

6.4.3 Face Loaded URM Walls & Parapets

All of the existing URM walls meet the minimum thickness detailed in Section 3.2.4.

A review of the existing parapets has confirmed that they do not have adequate capacity to meet the required design loads and new parapet bracing should be provided.

6.4.4 Design Actions for New Structural Elements.

6.4.4.1 New Parapet Braces

The new parapet braces should be designed in accordance with Section 8 of NZS 1170.5 (SANZ, 2004) i.e.:

$$F_{ph} = C_p(T_p)C_{ph}R_pW_p < 3.6\ W_p$$

Seismic parameters for appropriate for the design of the new parapet braces are:

Table 6-3 Seismic Parameters

Design Code :	NZS1170
Soil Category :	D
$C_p(T_p)$:	1.48
C_{ph}:	0.85
R_p:	1.0

Adopting the NZSEE (NZSEE, 2006) recommendations, such that the building should have adequate capacity to resist 67% of NZS:1170.5 seismic load that would be for a new building at that location, F_{ph} can be calculated as 0.84g.

7. CONCLUSIONS AND RECOMMENDATIONS

This report presents the results of an evaluation of the earthquake performance of the Press Co. Building located at 32 Cathedral Square in Christchurch. Construction of the building typically consists of unreinforced brick with in-situ concrete floors, a configuration which is known to be vulnerable to earthquake damage. Walls on the street frontages have been faced with Oamaru sandstone.

Partial seismic strengthening of the structure was undertaken in the 1970's. The strengthening works consisted of the introduction of parapet bracing on the south and west facades in conjunction with the removal of the upper portion of the original parapet. At this time the timber roof members of the tower in the south west corner were strengthened by the addition of steel bracing members.

The existing building configuration was evaluated and it was found to exceed the allowable inelastic deformation limits as outlined in Section 3.2.3 using a set of earthquake records corresponding to 50% of the seismic load level required by NZS1170.5 (SANZ, 2004) for new a building at this site. This is reflected by the performance of the building during the September 4th Darfield Earthquake.

The proposed building configuration was evaluated and it was found to exceed the allowable inelastic deformation limit for masonry shear panels as outlined in Section 3.2.3 using a set of earthquake records corresponding to 33% of the seismic load level required by NZS1170.5 (SANZ, 2004) for new a building at this site.

An iterative strengthening process was developed whereby deficient building elements were either strengthened, or supplemented by new elements, until an acceptable level of building performance was attained. Using this process it was determined that the following strengthening is required:

1. Installation of new Shotcrete walls on the internal faces of the north and south exterior walls.
2. Application of FRP strengthening on the internal face of the east and west perimeter walls and to both faces of the central east-west wall.
3. Providing parapet braces for the north and east roof-top parapets. Providing supplemental bracing and connections to the existing parapet braces on the south and west roof-top parapets to provide adequate capacity to resist the higher design loads recommended.

It is recommended that the proposed strengthening methodology for the existing building be adopted. Providing these recommendations are completed the analysis work described herein indicates that the building will have sufficient capacity to meet 67% of the current design level earthquake, as defined by NZS 1170.5 (SANZ, 2004) for the site.

8. REFERENCES

FEMA, 2000. *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, FEMA-356, Federal Emergency Management Agency, Washington D.C. October, 2000

NZSEE, 1995. *Draft Guidelines for Assessing and Strengthening Earthquake Risk Buildings*, (The Red Book), New Zealand National Society for Earthquake Engineering, February, 1995.

Kelly, T.E, 2010. *Performance Based Evaluation of Buildings* Parts 1- 4 Revision 7, September, 2010 available on www.holmesgroup.com

Mondkar, D.P. and Powell, G.H., 1979. *ANSR II Analysis of Non-linear Structural Response User's Manual*, EERC 79/17, University of California, Berkeley, July.

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SANZ, 1993. *Timber Structures Standard*, NZS 3603. Standards New Zealand, Wellington, 1993

SANZ, 2005. *NZS 1170.5 Standard Structural Design Actions – Part 5 Earthquake Actions*, Wellington, New Zealand, 2005

SANZ, 2006. *Concrete Structures Standard : Part 1 - The Design of Concrete Structures*, NZS 3101:Part 1:2006, Standards New Zealand, Wellington, 2006.

Christchurch Eq RAPID Assessment Form - LEVEL 2

Inspector Initials: AW / KH
Territorial Authority: Christchurch City
Date: 26/2/11
Time: 1302
Final Posting (e.g. UNSAFE): R2

Building Name: PRESS BUILDING
Short Name:
Address: 32 Cathedral Square
GPS Co-ordinates: S° E°
Contact Name: Ash Wilson
Contact Phone: 021-800-157
Storeys at and above ground level: 4 (but now 3!)
Below ground level: 1
Total gross floor area (m²): ~3200
Year built: ~1900
No of residential Units: –
Photo Taken: [✓ Yes] No

Type of Construction

- ☐ Timber frame
- ☐ Steel frame
- ☐ Tilt-up concrete
- ☐ Concrete frame
- ☐ RC frame with masonry infill
- ☐ Concrete shear wall
- ☑ Unreinforced masonry
- ☐ Reinforced masonry
- ☐ Confined masonry
- ☐ Other:

Primary Occupancy

- ☐ Dwelling
- ☐ Other residential
- ☐ Public assembly
- ☐ School
- ☐ Religious
- ☑ Commercial/ Offices
- ☐ Industrial
- ☐ Government
- ☐ Heritage Listed
- ☐ Other

Investigate the building for the conditions listed on page 1 and 2, and check the appropriate column. A sketch may be added on page 3

Overall Hazards / Damage	Minor/None	Moderate	Severe	Comments
Collapse, partial collapse, off foundation	☑ ?	☐	☐	unknown.
Building or storey leaning	☐	☑	☐	
Wall or other structural damage	☐	☐	☑	
Overhead falling hazard	☐	☐	☑	
Ground movement, settlement, slips	☑	☐	☐	
Neighbouring building hazard	☐	☐	☑	
Electrical, gas, sewerage, water, hazmats	☐	☐	☐	unknown

Record any existing placard on this building:

Existing Placard Type (e.g. UNSAFE): NIL

Choose a new posting based on the new evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance. Transfer the chosen posting to the top of this page.

INSPECTED GREEN	RESTRICTED USE YELLOW	UNSAFE RED
G1 G2	Y1 Y2	R1 [✓ R2] R3

Record any restriction on use or entry: NO ACCESS IN OR AROUND.

Further Action Recommended: DEMOLISH ASAP.

Tick the boxes below only if further actions are recommended

☐ Barricades are needed (state location):
☐ Detailed engineering evaluation recommended
☐ Structural ☐ Geotechnical ☐ Other:
☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

None	☐		
0-1 %	☐	31-60 %	☐
2-10 %	☐	61-99 %	☐
11-30 %	☐	100 %	☐

Sign here on completion
Date & Time 26/2/11 1307
ID Team 36

Inspection ID: ________ *(Office Use Only)*

7S001242

Structural Hazards/ Damage	Minor/None	Moderate	Severe	Comments
Foundations	☐	☐	☐	unknown
Roofs, floors (vertical load)	☐	☐	☑	collapsed. floor has pancaked.
Columns, pilasters, corbels	☐	☐	☑	
Diaphragms, horizontal bracing	☐	☐	☑	
Pre-cast connections	☐	☐	☐	
Beam	☐	☐	☑	
Non-structural Hazards / Damage				
Parapets, ornamentation	☐	☐	☑	
Cladding, glazing	☐	☐	☑	
Ceilings, light fixtures	☐	☐	☑	
Interior walls, partitions	☐	☐	☑	
Elevators	☐	☐	☑	unknown?
Stairs/ Exits	☐	☐	☑	collapsed. Do NOT ACCESS
Utilities (eg. gas, electricity, water)	☐	☐	☐	unknown
Other	☐	☐	☐	
Geotechnical Hazards / Damage				
Slope failure, debris	☑	☐	☐	
Ground movement, fissures	☑	☐	☐	
Soil bulging, liquefaction	☑	☐	☐	

General Comment

- DEMOLISH ASAP.
- Anyone that says they want to keep it MUST volunteer to work in or around it to fix it.
Severe safety issues and access issues

Usability Category

Damage Intensity	Posting	Usability Category	Remarks
Light damage *Low risk*	Inspected (Green)	G1. Occupiable, no immediate further investigation required	
		G2. Occupiable, repairs required	
Medium damage *Medium risk*	Restricted Use (Yellow)	Y1. Short term entry	
		Y2. No entry to parts until repaired or demolished	
Heavy damage *High risk*	Unsafe (Red)	R1. Significant damage: repairs, strengthening possible	
		[✓ R2. Severe damage: demolition likely]	Bowl it before someone else dies.
		R3. At risk from adjacent premises or from ground failure	

Sketch (optional)
Provide a sketch of the entire building or damage points. Indicate damage points.

Recommendations for Repair and Reconstruction or Demolition (Optional)

PARTIALLY DEMOLISH PARAPET ONLY. Group 1/1 HPT

Christchurch Eq. RAPID Assessment Form - LEVEL 1

Inspector Initials: AHW
Territorial Authority: Christchurch City
Date of Inspection: 28/2/11
Time: 1400
Exterior Only ☑
Exterior and Interior ☐

Building Name
Short Name: THE PRESS BUILDING
Address: Cnr. Cathedral & Worcester 32 Cathedral Square
GPS Co-ordinates: S° E°
Contact Name: Andrew Marriott
Contact Phone: 021 667 630
Storeys at and above ground level: 3 ?
Below ground level: 1
Total gross floor area (m²):
Year built: ~~1900s.~~ 1907
No of residential Units: N/A
Photo Taken: [✓ Yes] ~~No~~

Type of Construction

☐ Timber frame
☐ Steel frame
☐ Tilt-up concrete
☐ Concrete frame
☐ RC frame with masonry infill
☐ Concrete shear wall
☑ Unreinforced masonry
☐ Reinforced masonry
☐ Confined masonry
☐ Other:

Primary Occupancy

☐ Dwelling
☐ Other residential
☐ Public assembly
☐ School
☐ Religious
☑ Commercial/ Offices
☐ Industrial
☐ Government
☑ Heritage Listed
☐ Other

Investigate the building for the conditions listed below:

Overall Hazards / Damage	**Minor/None**	**Moderate**	**Severe**
Collapse, partial collapse, off foundation	☐	☐	☑
Building or storey leaning	☑	☐	☐
Wall or other structural damage	☐	☐	☑
Overhead falling hazard	☐	☐	☑
Ground movement, settlement, slips	☑	☐	☐
Neighbouring building hazard	☐	☑	☐
Other	☐	☐	☐

Comments

9 top stry collaspe?
Parapet requires removal - urgent
Potential collaspe on pedestrian & vehic access.

Choose a posting based on the evaluation and team judgement. Severe conditions affecting the whole building are grounds for an UNSAFE posting. Localised Severe and overall Moderate conditions may require a RESTRICTED USE. Place INSPECTED placard at main entrance. Post all other placards at every significant entrance.

INSPECTED *GREEN* ☐
RESTRICTED USE *YELLOW* ☐
UNSAFE *RED* ☑

Record any restriction on use or entry: → 3 stories potentially retained.

Further Action Recommended:

Tick the boxes below only if further actions are recommended
☑ Barricades are needed (state location): Building perimeter
☑ Level 2 or detailed engineering evaluation recommended
☑ Structural ☐ Geotechnical ☐ Other:
☐ Other recommendations:

Estimated Overall Building Damage (Exclude Contents)

None	☐		
0-1 %	☐	31-60 %	☐
2-10 %	☐	61-99 %	☑
11-30 %	☐	100 %	☐

Sign here on completion
Date & Time 28/2/11 1400
ID

Inspection ID ________ *(Office Use Only)*