



Planning and Land Use Committee Report

Date: May 22, 2014 **From:** Murray G. Miller, Senior Heritage Planner

Subject: **Development Permit Application #000347 for 845 Yates Street**
Application to remove existing tile on the east elevation and apply a painted mural.

Executive Summary

The purpose of this report is to present Council with updated information, analysis and recommendations regarding a Development Permit Application for the property located at 845 Yates Street. This report responds to the Planning and Land Use Committee (PLUC) motion of April 17, 2014 which was:

That Committee recommends that Council postpone consideration of the motion until the applicant provides more information on the need for replacement of the tiling.

The applicant has provided this information and while it is noted that technically tiles could be used in a new mosaic, the applicant's preferred approach is to remove the existing wave mural (quartzite tiles) from the east elevation and replace it with a painted mural.

The key issues associated with this Application are the appearance of the proposed wave image that would likely result from the change in materials and the contemporary interpretation of the original image and the durability and resulting maintenance requirements of a painted finish. The subject property is within the DPA 2 (HC): Core Business Urban Place Designation and the Downtown and Harris Green Neighbourhood.

Staff recommends that Committee support this application subject to the applicant reducing the size of the proposed grid to be more representative of the existing grid.

Recommendation

That Council authorize the issuance of Development Permit #000347, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

Respectfully submitted,

Murray G. Miller
Senior Heritage Planner
Community Planning

Deb Day, Director
Sustainable Planning and Community
Development Department

Report accepted and recommended by the City Manager:

Date:

Jason Johnson
May 28, 2014

MGM:aw

1.0 Purpose

The purpose of this report is to present Council with additional information regarding the reasons why the quartzite tile failed and outline specifications for materials that were considered by the applicant as potential substitutes for the tile.

2.0 Background

2.1 Description of Proposal

This proposal consists of the removal of the existing quartzite tile that extends from the second floor level up to the roof. The area of work would be within the narrow section of wall that forms the east elevation of the exit stair tower. The scope of work includes the repair and reconditioning of the existing concrete substrate prior to the application of a painted mural.

The proposed work would increase the colour pallet of the original design from eight to dozens of colours. It would also increase the grid size of the existing mural, making the proposed grid approximately three times the size of the present design. Staff have concerns that the size of the grid proposed which is discussed in the original report and the staff recommendation aims to address these concerns. The proposed mural will be an abstract contemporary interpretation of the present design. The balance of the wall that is not a mural could be painted concrete.

2.2 Legal Description

Strata Lots 1-100 of Lots 318, 319 and 322, Victoria City, Strata Plan VIS6115 together with an interest in the common property in proportion to the unit entitlement of the Strata Lot as shown on Form V.

2.3 Relevant History

At its regular meeting of April 17, 2014, the Planning & Land Use Committee considered Development Permit Application # 000347 for 845 Yates Street (report attached) and discussed whether a painted mural was an appropriate substitute for the tile. The Planning & Land Use Committee moved:

That Committee recommends that Council postpone consideration of the motion until the applicant provides more information on the need for replacement of the tiling.

3.0 Issues

The key issues associated with the additional information are:

- reasons why the quartzite tile failed
- options considered by the applicant as potential substitutes for the tile.

4.0 Analysis

4.1 Reasons Why the Quartzite Tile Failed

The findings of the report entitled *RDH Building Engineering Ltd. Performance Review of Tile and Adhered Thin Stone* (attached), can be summarized as follows:

- surface irregularity of stone resulted in offsets and ledges at most joints

- cracks and gaps in the grout at stone/tile joints were widespread
- removal of “hollow” sounding stone/tile units revealed poor adhesion
- the joint between the stone and the concrete structure was filled with mortar. The mortar had failed in locations providing an opening for water entry.
- the tile and adhered thin stone should have been installed in accordance with the British Columbia Building Code with professional design and field review
- insufficient levelling prior to installation
- lack of consistent “back buttering” resulting in inconsistent contact between stone and mortar
- improper installation of control joints and/or lack of control joints
- lack of sealant at tile/stone interfaces
- it was recommended that the Owners review options to remove the existing tile and adhered thin stone
- it was recommended that if the Owners wish to reinstate the “mosaic-like” wave representation, that alternate assemblies be identified and the installation of exterior tile or adhered thin stone on the existing concrete substrate be avoided.

4.2 Options Considered by the Applicant as Potential Substitutes for the Tile

In RDH's presentation of options to the Strata Corporation (attached) entitled *Stone Tile Repair – Design Option Presentation*, the three key approaches can be summarized as follows:

- Option 1: New Mosaic Tile and Stone Cladding
- Option 2: Painted Mural and Stone Cladding
- Option 3: Painted Mural and Painted Concrete.

In discussions with the applicant, staff learned that although a new tile mosaic is possible the strong preference, primarily related to costs, is to introduce a painted mural and painted concrete (Option 3.) Staff also explored with the applicant the possibility of introducing a tile mosaic in the location of the existing wave mosaic and then using painted concrete on the lower portions of this elevation to reduce costs. However, the contractor, through the applicant, indicated that such an option had not been considered because of a desire to eliminate the current liability of having tile on the side of the building.

5.0 Conclusions

The resulting visual effect of using a painted grid versus a tile mosaic for the image will not be significant; however, the proposed increase in the size of the grid will likely have a considerable visual effect resulting from the contemporary interpretation of the existing wave mural. Staff therefore recommend that Council authorize Development Permit #000347, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

6.0 Recommendations

6.1 Staff Recommendation

That Council authorize Development Permit #000347 for 845 Yates Street, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

6.2 Alternate Recommendation (Application as submitted.)

That Council authorizes the Development Permit #000347, as submitted.

6.3 Alternate Recommendation (Decline.)

That Council decline the application.

7.0 List of Attachments

- Staff report for Development Permit Application #000347, dated April 3, 2014
- *RDH Building Engineering Ltd. Performance Review of Tile and Adhered Thin Stone*, dated January 20, 2012
- *Stone Tile Repair – Design Option Presentation*, dated July 18, 2013



Planning and Land Use Committee Report

Date: April 3, 2014

From: Murray G. Miller, Senior Planner

Subject: Development Permit Application #000347 for 845 Yates Street
Application to remove existing tile on the east elevation and apply a painted mural.

Executive Summary

The purpose of this report is to present Council with information, analysis and recommendations regarding a Development Permit Application for the property located at 845 Yates Street.

The proposal is to remove the existing wave mural (quartzite tiles) from the east elevation of the exit stair tower that extends from the second floor level up to the roof. The proposed exterior finish would instead consist of a painted mural to replace the existing wave image.

The key issues associated with this Application are the appearance of the proposed wave image that would likely result from the change in materials and the contemporary interpretation of the original image and the durability and resulting maintenance requirements of a painted finish. The subject property is within the DPA 2 (HC): Core Business Urban Place Designation and the Downtown and Harris Green Neighbourhood.

Staff recommends that Committee support this application subject to the applicant reducing the size of the proposed grid to be more representative of the existing grid.

Recommendation

That Council authorize the issuance of Development Permit #000347, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "M. G. Miller".

Murray G. Miller
Senior Planner
Development Services

A handwritten signature in dark ink, appearing to read "D. E. Day".

Deb Day, Director
Sustainable Planning and Community
Development Department

Report accepted and recommended by the City Manager:

Date:

A handwritten signature in dark ink, appearing to read "Jason Johnson".
Jason Johnson

April 6, 2014

MGM:aw

1.0 Purpose

The purpose of this report is to present Council with information, analysis and recommendations regarding a Development Permit Application for the property located at 845 Yates Street. The proposed exterior finish would consist of a painted mural finish, replacing the existing mosaic tile wave image.

2.0 Background

2.1 Description of Proposal

This proposal consists of the removal of the existing quartzite tile that extends from the second floor level up to the roof. The area of work would be within the narrow section of wall that forms the east elevation of the exit stair tower. The scope of work includes the repair and reconditioning of the existing concrete substrate prior to the application of a painted mural.

The proposed work would increase the colour pallet of the original design from eight to dozens of colours. It would also increase the grid size of the existing mural making the proposed grid approximately three times the size of the present design. The proposed mural will be an abstract contemporary interpretation of the present design. The balance of the wall that is not mural will be painted concrete.

2.5 Legal Description

Strata Lots 1-100 of Lots 318, 319 and 322, Victoria City, Strata Plan VIS6115 together with an interest in the common property in proportion to the unit entitlement of the Strata Lot as shown on Form V.

2.6 Relevant History

On September 18, 2003, Council adopted Bylaw No. 03-71 Zoning Regulation Bylaw, Amendment Bylaw (No. 673) to rezone land known as 837 and 843 Yates Street to the R-48 Zone, Harris Green District, to permit the land to be used for construction of a residential building of 10 and 13 storeys, with height and setback relaxations.

In September 2003, revisions to the design in response to Design Panel and Council requests were provided to Mayor and Council. Included in these changes was "a ceramic tile mosaic representing a stylized wave" to be installed on the east-facing wall of the exit stair.

On November 27, 2003, Council authorized the issuance of a Development Permit for 837-847 Yates Street in accordance with conditions, including Plans stamped "Development Permit Application #03-30B" dated November 7, 2003. The motion also noted that, "Final Plans be in accordance with plans identified above with responses to Advisory Design Panel's recommendations to the satisfaction of the Director of Planning and Development." A mosaic colour palette, dated-stamped September 2, 2004, for consideration by Advisory Design Panel, shows eight colours associated with the wave design.

In 2011, some of the quartzite stone and tile that was installed on the east elevation of the exit stair tower became detached and fell off the building face. A recent report by RDH Group has recommended that the complete removal of the tile finish from the second floor to the roof was necessary.

3.0 Issues

The key issues associated with this Application are:

- the appearance of the proposed wave image; and
- the durability and resulting maintenance requirements of a painted finish.

4.0 Analysis

4.1 Appearance of the Proposed Wave Image

While the proposed work employs a different medium and approach in representing the wave image, it is considered that the location of the image lends itself more appropriately to distant views. Therefore the resulting visual effect of using a different material for the image will not be significant.

The proposed increase in the size of the grid from 4" squares to 9" squares represents an increase in the grid size of 225%. This will have a considerable visual effect resulting from the intended abstract contemporary interpretation of the present design. The proposed increase in grid size in conjunction with an increase in the colour palette would considerably transform the recognizable image. While the intention of the proposed tile replacement is to ensure a durable finished product, the proposed increase in the grid size is not necessary to achieve this objective. Staff have discussed the possibility of reducing the grid size with the applicant and the applicant has indicated a strong preference to proceed with the 9" squares as reducing the grid size increases costs.

4.2 Durability and Resulting Maintenance of a Painted Finish

The proposed finish would be two coats of artist's paint and a clear top coat by Golden Paints. The surface preparation of a direct-adhered finish is understood to be critical in relation to its durability. According to the Application Information Sheet for Painting Exterior Murals prepared by Golden Artist Colours, a major coatings manufacturer, states that as much as 80% of all coating failures can be directly related to insufficient surface preparation. It is understood that the proposed painted finish would have a life expectancy of approximately ten years under favourable conditions. While the life expectancy of an effectively applied tile finish would be in the order of twenty-five to thirty years, ongoing maintenance and re-application of the painted finish will be the responsibility of the building's strata corporation.

6.0 Options

Option One (Recommended)

That Council authorize the Development Permit #000347, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

Option Two (Application as submitted)

That Council authorize the Development Permit #000347, as submitted.

Option Three (Decline)

That Council decline the application.

7.0 Conclusions

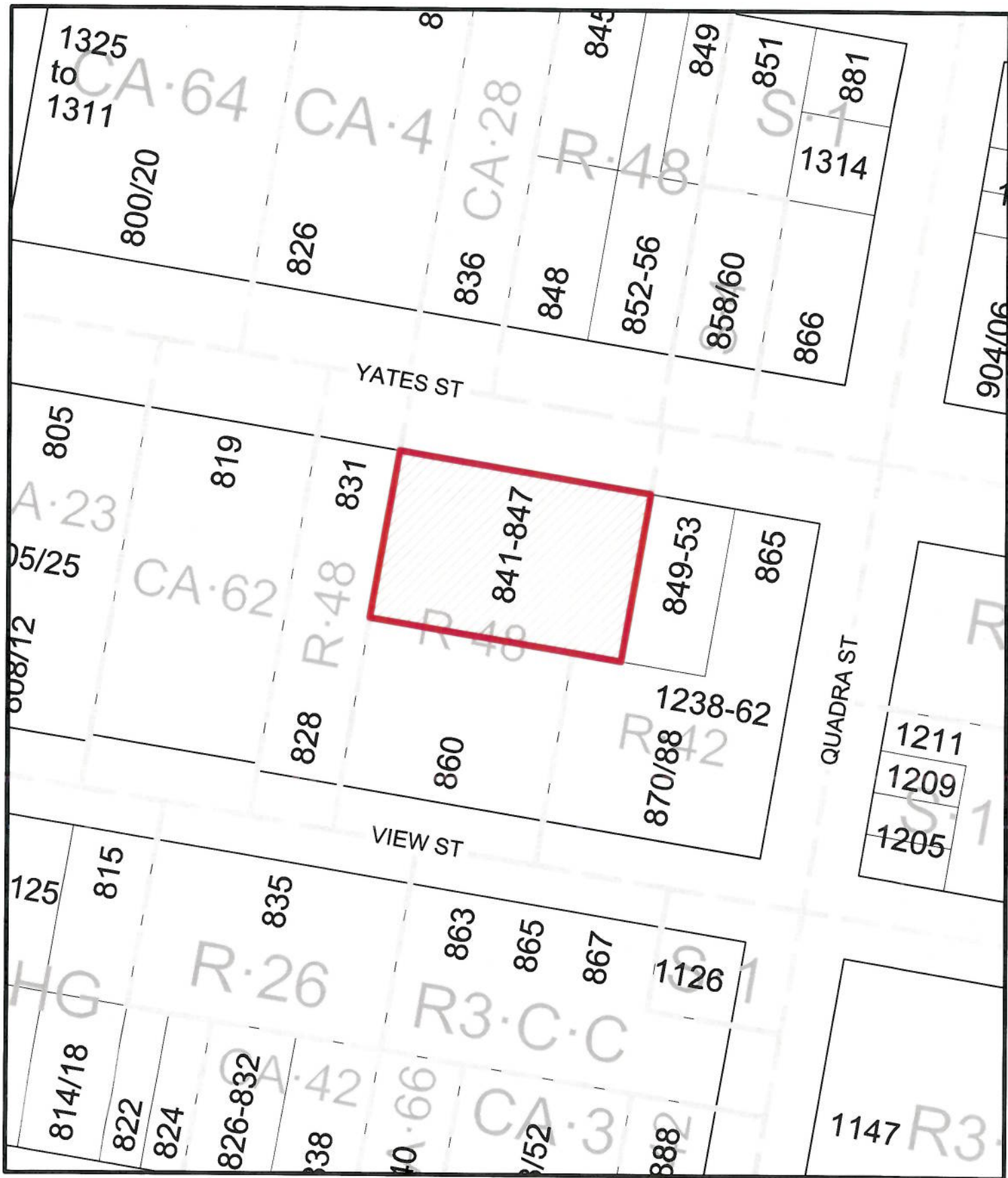
The resulting visual effect of using a painted grid versus a tile mosaic for the image will not be significant, however, the proposed increase in the size of the grid will likely have a considerable visual effect resulting from the contemporary interpretation of the existing wave mural. Staff therefore recommend that Council authorize Development Permit #000347, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

8.0 Recommendation

That Council authorize Development Permit #000347 for 845 Yates Street, subject to the applicant reducing the size of the proposed grid to the satisfaction of the Director of Sustainable Planning and Community Development.

9.0 List of Attachments

- Zoning map
- Aerial map
- Letters from applicant dated January 20, 2014, and March 18, 2014
- Plans stamped "Revised drawings Planning & Development DP #000347" dated March 19, 2014.



845 Yates Street
Development Permit #000347





845 Yates Street
Development Permit #000347





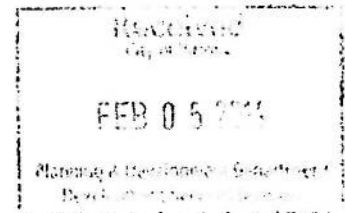
PRAXIS
architects inc.

Michael D. Levin, Architect, AIBC
Robert Rocheleau, Architect, AIBC

401- 1245 Esquimalt Road, Victoria, B.C. V9A 3P2
Tel: (250) 475-2702 • Fax: (250) 475-2701
prax@telus.net

January 20, 2014

Mayor and Council
C/O Murray G. Miller,
Senior Planner
Urban Design Development Services Division
Planning and Development Department
City of Victoria
1 Centennial Square, Victoria, BC, V8W 1P6



Re: 8455-Yates *845 Yates.*
The Wave
Remediation of Image

The building was completed and occupied in 2006. In 2011 some of the quartzite stone and tile (of the wave image) installed on the east face of the stair tower fell off. A report by RDH Consultants noted that the tile and stone had a number of issues stemming from the initial installation. RDH recommended complete removal of the existing installation. In the short term to protect the public and until the legal issues were resolved a protective sheathing was put over the wave mural to protect the public. It has taken some time to determine an approach to the repair of the wave graphic. The final proposal is to remove the tile and stone running from the second floor of the stair well wall up to the roof. The concrete underneath will be remediated. This reconditioned concrete will be painted over and finally the Wave mural will be reinstated in its current height and width as a painted mural. In this way we will avoid future issues with the deterioration of the existing tile face.

Jeremy Herndl, a visual artist has been commissioned to interpret the Wave Image and to complete its painting. His CV is attached. Jeremy has provided the following artists statement:

"This mural maintains the original decision to feature a rendition of "The Great Wave of Kanawaga" (1830) by the Japanese artist Katsushika Hokusai. The failure of the tiles in the mosaic presents an opportunity to update the idea in a way that is contemporary and respectful to the original. The original tile mosaic was reduced to eight colours in a grid of 152 by 45 squares. This proposed painted version will be made with dozens of colours, on a grid comprised of 52 by 15 squares.

The mural, made with a larger cell size and more colours will be instantly recognizable to viewers on street level and from a distance as the ubiquitous classic. As the viewer approaches the building the image will fragment into an engaging pixilated architectural abstraction. The Japanese classic is re-imagined in a contemporary, technological context in the full colour range of the original."

We respectfully hope that Council will support this proposal.

Sincerely
PRAXIS ARCHITECTS INC

A handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke extending to the right.

Per: Michael Levin, AIBC
Director



P R A X I S
architects inc.

Michael D. Levin, Architect, AIBC
Robert Rocheleau, Architect, AIBC

401- 1245 Esquimalt Road, Victoria, B.C. V9A 3P2
Tel: (250) 475-2702 • Fax: (250) 475-2701
prax@telus.net

March 18, 2014

Mayor and Council
City of Victoria
1 Centennial Square, Victoria, BC,
V8W 1P6



Re: 845 Yates
The Wave DP 000347
Remediation of Image

We are pleased to submit a revised image of the proposed repair to the Wave. The previously submitted image consisted of 1' square painted cells. There were 15 cells horizontally and 52 vertically (780 cells). Per the request of the Development Services Division we have provided for the same overall sized image to be represented by a smaller grid of painted cells. The new grid consists of 9" hand painted squares - 20 cells horizontally by 70 cells vertically (1400 cells).

The team responsible for reconstituting the image will not be responsible for the maintenance of the image. Once the image is repaired and accepted our responsibilities are done. The image will be painted on the Limited Common Property of the Strata for 845 Yates. The maintenance of that image will become part of the ongoing responsibility of the Strata and their Property Management Team. The question of a maintenance program should be asked of the Strata Corporation and their Property Managers. It will become part of their annual budgeting I am sure as is roof repair, painting etc.

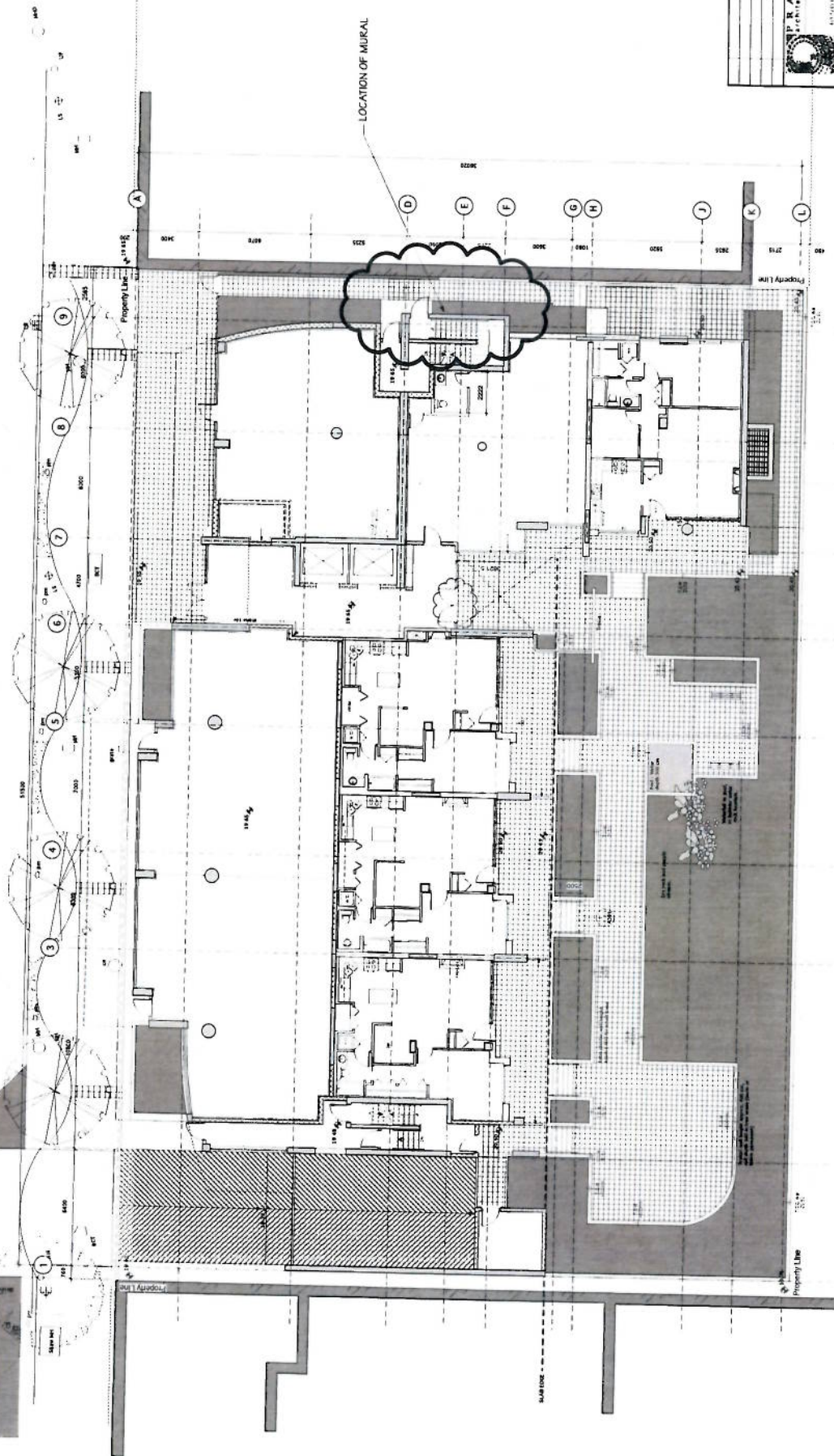
We respectfully hope that Council will support this proposal.

Sincerely
PRAXIS ARCHITECTS INC


Per: Michael Levin, AIBC
Director

CC Murray G. Miller,
Senior Planner
Urban Design Development Services Division
Planning and Development Department

YATES STREET



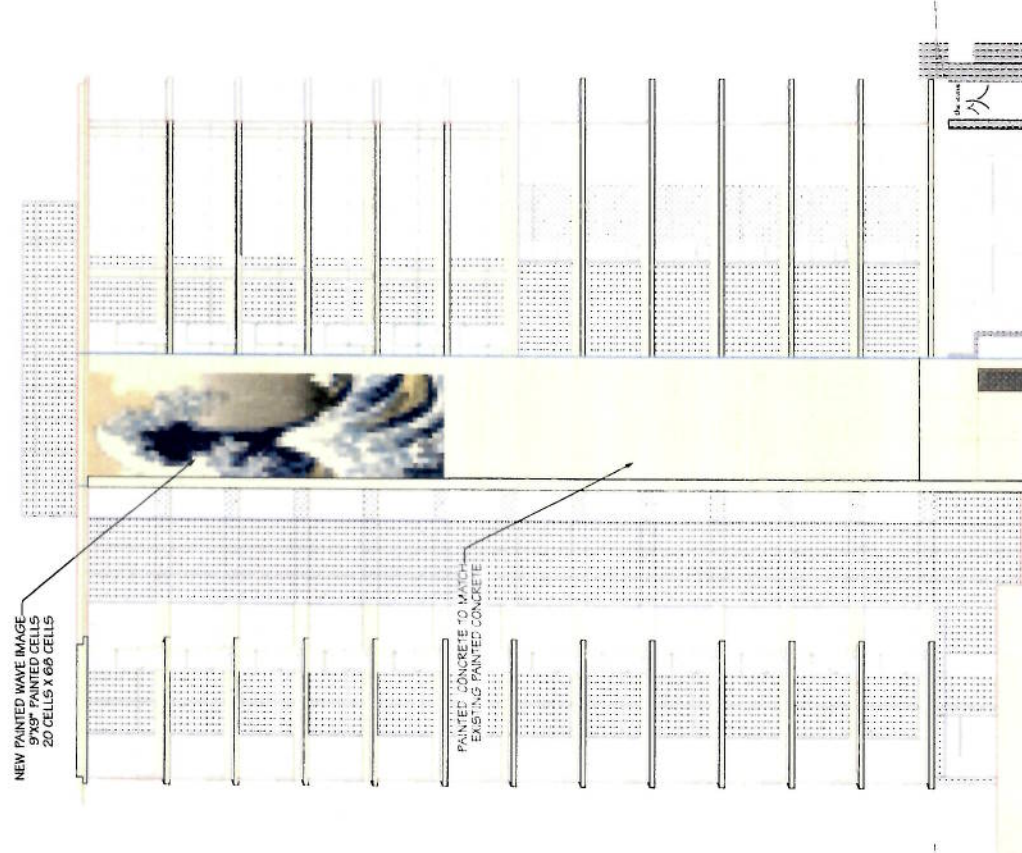
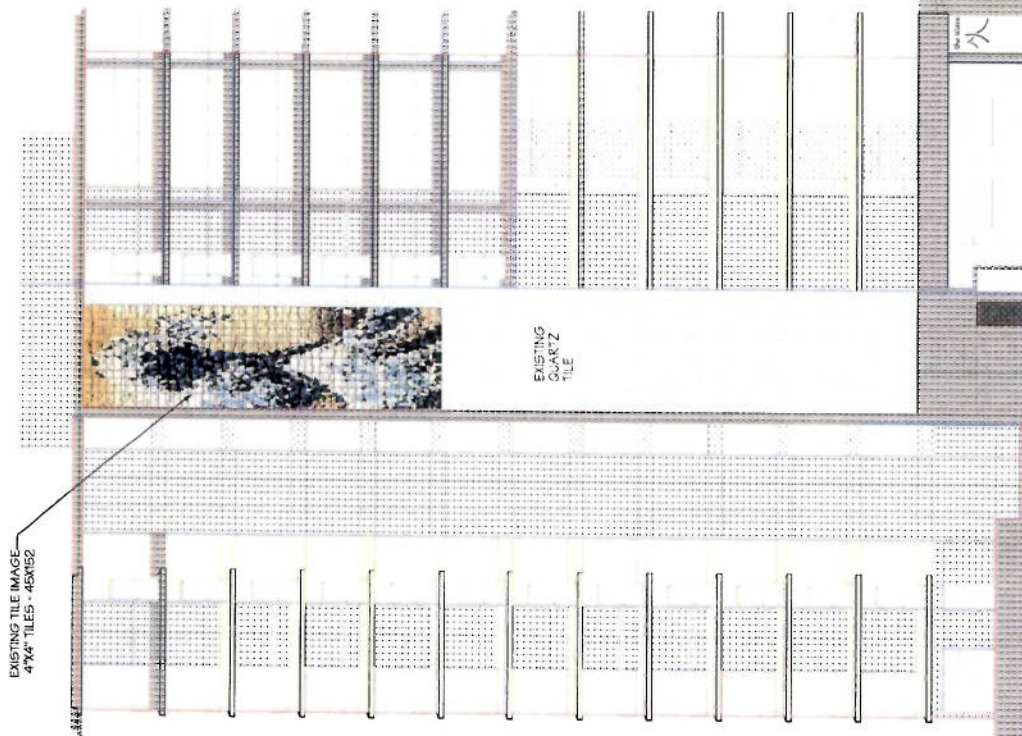
LOCATION OF MURAL

 <p>THE WAVE ARCHITECTURE INC.</p>	
<p>847 Yates Street Victoria, BC</p>	
<p>Project No. _____ Drawing No. _____ Scale _____ Date _____</p>	
<p>Client: _____ Architect: _____ Engineer: _____ Interior Designer: _____ Landscape Architect: _____ Structural Engineer: _____ Mechanical Engineer: _____ Electrical Engineer: _____ Civil Engineer: _____ Surveyor: _____ Other: _____</p>	
<p>Sheet No. _____ of _____ Title: _____ Author: _____ Checker: _____ Date: _____</p>	

Received
City of Victoria

MAR 19 2014

Planning & Development Department
Development Services Division



EXISTING EAST ELEVATION

2. PROPOSED EAST ELEVATION

ILLUSTRATIVE ONLY, NOT AN ACTUAL
REPRESENTATION OF THE EXISTING GRID

Received
City of Victoria

MAR 19 2014

Planning & Development Department
Development Services Division

PERKINS
INC.

4000 12th Avenue S.W.
Seattle, WA 98148
206/462-4200

THE WAVE
847 Yates Street
Victoria, BC

FAST ELEVATOR ESTIMATING AND PROPOSING

A-2

FULL SIZE SECTION DETAILS



View 1 - Yates & Quadra



View 2 - Yates & Cook



View 3 - Yates & Vancouver



Map

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City of Victoria
MAR 19 2014
Planning & Development Department
Development Services Division

(F) 4740-B1A

RDH Building Engineering Ltd

4396 WEST SAANICH RD #130
VICTORIA BC V8Z 3E9

TEL 250 479 1110
FAX 250 479 0988

VIC@RDHBE.COM
WWW.RDHBE.COM

TO Geoff Kearney
Cornerstone Properties Ltd.
301- 1001 Cloverdale Avenue
Victoria BC V8X 4C9

**5098.10 – 845 Yates Street
Adhered Stone and Tile Review**

January 20, 2012

EMAIL geoff@cornerstoneproperties.bc.ca

REGARDING **Performance Review of Tile and Adhered Thin Stone**

Dear Mr. Kearney,

RDH Building Engineering Limited was retained by Strata Plan VIS 6115 to review the condition of the tile and adhered thin stone applied to the east exterior concrete wall of the building known as the Wave, located at 845 Yates Street, Victoria, BC (refer to RDH proposal dated November 30, 2011).

Background Information

Construction of the Wave was completed in or around the fall of 2006. The building is a concrete structure 13 stories in height containing approximately 101 residential suites. The tile and adhered thin stone in question is located on the east elevation of the building. The tile is located above the ninth floor level arranged with multi-colour units to provide a mosaic-like representation of a wave. The thin stone is applied from the 2nd floor level to the 13th floor. The wall area in question is the exterior wall of a stair tower.

The writer has been advised that at some prior time the owners became aware that tiles have fallen from the building. The ground area below the wall area in question is an area with restricted access designated as a means of emergency egress from the building.

Out of concern for additional falling tiles, the owners retained Knight Contracting to arrange access and review the installed tile and thin stone. A swing stage was erected and a review of the wall area confirmed three areas of loose tile and/or stone. Large areas of stone were removed from the 5th and 9th floor levels, a small area of tile was removed from the 9th floor level, and a large area of tile was removed from the 11th floor level.

Tile and Adhered Thin Stone

RDH was not provided with a set of construction documents or any formal confirmation of the materials and processes approved for use during construction. A review of previous correspondence from the Project Architect (Mr. Michael Levin, MAIBC of Praxis Architects Inc.) indicates that the project specifications may not have been followed.

At the present time the following summary represents the writer's understanding of the materials and processes implemented during the installation of the adhered tile and thin stone at the Wave:

- the tile was specified and reviewed by Praxis and supplied by C&S Ceramic Tile Distributors of Vancouver
- the stone (quartzite) was approved and supplied by the developer (source of stone is unknown)
- the thin set mortar used for both the tile and stone was "Megalite", manufactured by Custom Building Products,
- no information was provided for the grout material used at the tile and stone joints
- the tile and stone were installed by Pacific Coast Floor Coverings after the wall surface was washed and prepared by the general contractor. The details of surface preparation are not known. Once the surface was washed, the tile and stone installer proceeded as described below:
 - › acid washed surface
 - › installed control joints
 - › applied thin set
 - › installed the tile/stone
 - › applied grout & sealer (no information related to materials or sequence)
- no information has been provided related to project specific testing, site inspections, certification or any independent quality control/assurance processes implemented during construction

Codes and Industry Standards

Without review of the design documentation and construction drawings, it is not possible to confirm which version of the BCBC was in effect for the design and construction of the Wave.

The 1998 and 2006 British Columbia Building Codes (BCBC) do not provide specific requirements for exterior tile or adhered thin stone installation. The tile and adhered thin stone would however have been required to satisfy the performance requirements outlined in Part 5 of either edition of the code, including referenced Canadian Standards Association standard "*CSA A371 Masonry Construction*". Although the A371 standard provides mandatory design requirements and prescriptive installation procedures for "*thin veneers secured individually by mortar adhesion*" the standard only applies where the stone is installed at elevations less than 3 meters above the foundation level (clause 10.5.1 and Annex A). The requirements outlined in A371 would not have been applicable to the adhered thin stone at the Wave.

In addition to the BCBC and CSA standards, the following associations and industry standards provide assistance and guidance with respect to the installation of tile and adhered stone:

- Marble Institute of America (MIA)
- Building Stone Institute (BSI)
- Terrazzo Tile & Marble Association of Canada (TTMAC)

The design and installation of the tile and adhered thin stone at the Wave would have also been beyond the prescribed application of the above standards and would have required professional design and field review to confirm compliance with the BCBC.

Performance Review

The writer attended the site on December 6, 2011 to review the condition of the tile and adhered thin stone. Access to the building face was provided by swing stage.

The condition of the tile and stone was assessed by hammer tapping, removal of "hollow" sounding stones, removal of grout at stone and tile joints, and visual examination. The following key observations are provided:

Thin Stone

- The stone is a natural grey quartzite stone (metamorphic sandstone) containing quartz grains and mica. With close visual review, some of the original sedimentary layers that persist after metamorphism are still identifiable. The surface condition is considered somewhat friable raising a question as to the long term reliability of any bond achieved at time of placement.
- The stone was placed on the wall with the stone grain parallel to the wall surface.
- The stones vary in thickness with cut edges measuring 10-20 mm in thickness, the majority being approximately 15 mm.
- Joints between stones also varied from tight to approximately 5 mm (Photo 4,5)
- Surface irregularity of stone resulted in offsets and ledges at most joints (Photo 6).
- Cracks and gaps in the grout at stone joints were widespread (Photo 7).
- Efflorescence (white staining) at stone joints was widespread (Photo 6).
- At locations of prior stone removal, observations were made of large areas of undisturbed notched mortar (Photo 8 & 9).
- Removal of "hollow" sounding stone units revealed poor adhesion (Photo 9).
- One removed stone had been scored with a saw (Photo 9).
- A metal control joint was covered with grout (Photo 10 & 11)
- The joint between the stone and the concrete structure was filled with mortar. The mortar had failed in locations providing an opening for water entry (Photo 12).
- The joint between the stone and an adjacent cladding panel was filled with mortar. The mortar has failed in locations providing an opening for water entry (Photo 13).

Tile Observations

- The tile can be described a "100x 100 mm vitreous through coloured clay tile".
- The width of grout joints in the tile varied from 1/8 to 3/8 of an inch (Photo 14).
- Metal control joints were installed in the tile (Photo 14 & 15).
- Cracks and gaps in the grout between tiles were observed (Photo 14, 16 & 17).

- White staining was observed on the surface of the tiles. The stains originate from joints between tiles (Photo 14 & 18).
- Removal of "hollow" sounding tiles confirmed poor adhesion (Photo 19 & 20).
- The mortar at locations of tile removal appear compressed and in contact with the back of the tiles (Photo 21).
- Tile and concrete interfaces were not sealed to prevent water entry (Photo 22 & 23).
- Removed tiles revealed poor mortar adhesion (Photo 24).

Discussion

The following comments are provided related to the design, installation and performance of the tile and adhered thin stone at the Wave.

Design

At the time of this review there was no confirmation which design professional was responsible for the design of the installed tile and adhered thin stone at the Wave. In addition to missing design information there also appears to have been a lack of inspection or certification of the work by a design professional.

By any industry standard, the tile and adhered thin stone at the Wave should have been installed in accordance to the BCBC with professional design and field review.

Installation

The tile and stone appear to have been installed with a modified Portland cement mortar that was applied to the wall with a notched trowel and some level of "notched and/or spot back-buttering" for the installed stone. Observations of the installed tile and adhered thin stone indicate that (1) the bond between the stone and the mortar appears poor and (2) the bond between the mortar and the concrete appears satisfactory.

The poor bond could be the result of a general incompatibility between the stone and the mortar. The surface condition of the stone does not appear conducive to achieving a reliable bond (friable mica content and/or possible pyrite content). Improper surface preparation (lack of leveling) and/or excessive setting of the mortar prior to stone/tile installation could also have had a negative impact on the amount of bond achieved at time of installation. Additional testing of the stone and mortar would be required to further examine the significance of the above factors.

Other installation issues observed:

- Insufficient leveling prior to installation.
- Lack of consistent "back buttering" resulting in inconsistent contact between stone and mortar (much less than the normally required 95% - 100%).
- Improper installation of control joints (covered by grout) and/or lack of control joints.
- Lack of sealant at tile/stone interfaces with adjacent cladding surfaces

Performance

There are two main problems with the performance of the tile and adhered thin stone at the Wave.

Poor Bond

Falling tile/stone, hollow sounding tile/stone and easily removed tile/stone are all conditions that confirm "poor bond". Poor bond is a significant performance problem and safety hazard.

Hollow sounding stone units and stone surfaces free of mortar adhesion are observations that confirm poor bond. The degree of bond will not improve over time, and depending on the cause of the poor bond, it is likely that the condition will worsen with time resulting in additional incidences of loose/falling tile/stone units.

Poor bond could be a result of:

- poor design (incompatible stone and mortar),
- excessive stress in the mortar as a result of restrained movement caused by improperly installed and spaced control joints (concrete shrinks, tile/stone undergo cyclic thermal movements)
- poor tile/stone installation (mortar exposed too long before tile/stone placement, insufficient back-buttering/leveling), or
- deterioration due to water ingress and weather effects such as freeze/thaw.

Lack of Water-Tightness

Unsealed grout joints that have weathered, deteriorated or cracked and allow excessive water entry behind the tile/stones also represent a significant performance problem.

White stains on the surface of the tile/stone is an indication that an excessive amount of moisture is present behind the surface of the tile/stone causing dissolved salts to wash to the exterior and reform on the tile/stone surface – causing the white stain (efflorescence). Although this efflorescence can be washed away it is an indication of a moisture problem that needs to be resolved to prevent ongoing deterioration of the mortar from erosion and/or freeze/thaw damage.

The lack of water-tightness could result from:

- poor grout installation,
- poor sealing of potential water entry points such as interface joints with adjacent construction,
- cracks in the grout caused by restrained movement resulting from improper movement joint installation, or
- voids behind stone due to poor workmanship (poor surface leveling and/or poor stone installation)

Discussion

Poor bond and a lack of water tightness are performance problems that share common potential causes.

In order to assess the contribution of potential mortar and stone incompatibility requires highly specialised material testing. The testing will require the collection of additional samples and the costs of testing would be approximately \$5,000 to \$10,000.

In the event that testing confirms an inherent material incompatibility, it will be necessary to remove the stone from the building.

In the event that testing confirms that the stone and mortar are compatible, the existing condition of poor bond will be attributed to poor tile/stone installation, defective control joint installation, water ingress and/or weather effects (freeze/thaw). The recommended repairs that would be necessary to resolve the poor bond condition and existing deficiencies (in a manner including professional design assurance and certification) would likely result in full removal and replacement of the existing tile and adhered thin stone.

Recommendations

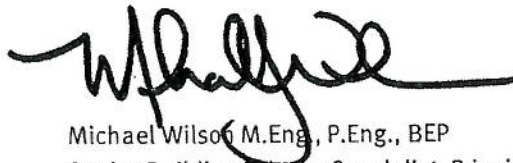
Based on the information reviewed, and the writer's field assessment of the existing performance problems, it is recommended that the Owners review options to remove the existing tile and adhered thin stone.

Confirmation of compatibility between the thin stone and the mortar will require material testing. Testing will however not address the existing performance problems or resolve concerns related to public safety. If the matter is not likely to be resolved in the short term, the installation of netting over the wall area in question, to contain any additional falling tile or stone, is recommended.

If the Owners wish to reinstate the "mosaic-like" wave representation it is recommended that alternate assemblies be identified and the installation of exterior tile or adhered thin stone on the existing concrete substrate be avoided.

Yours truly,

RDH Building Engineering Ltd.



Michael Wilson M.Eng., P.Eng., BEP
Senior Building Science Specialist, Principal
mjw@rdhbe.com

encl.



January 20, 2012

The Wave



Photo 1



Photo 2

RDH Building Engineering Ltd

The Wave

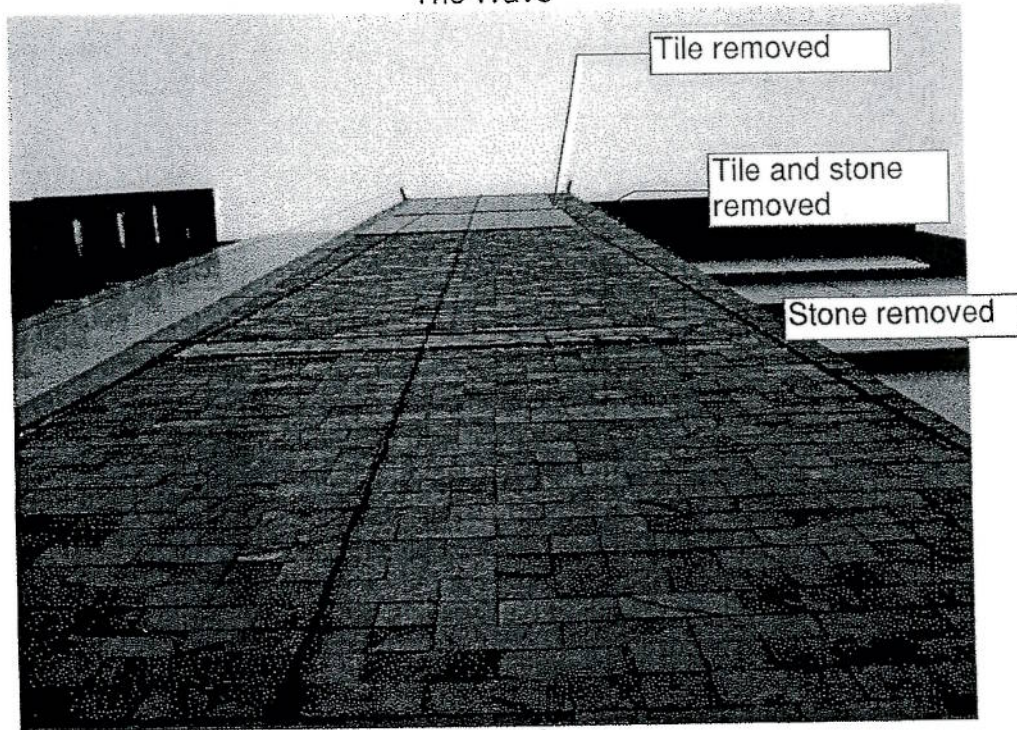


Photo 3

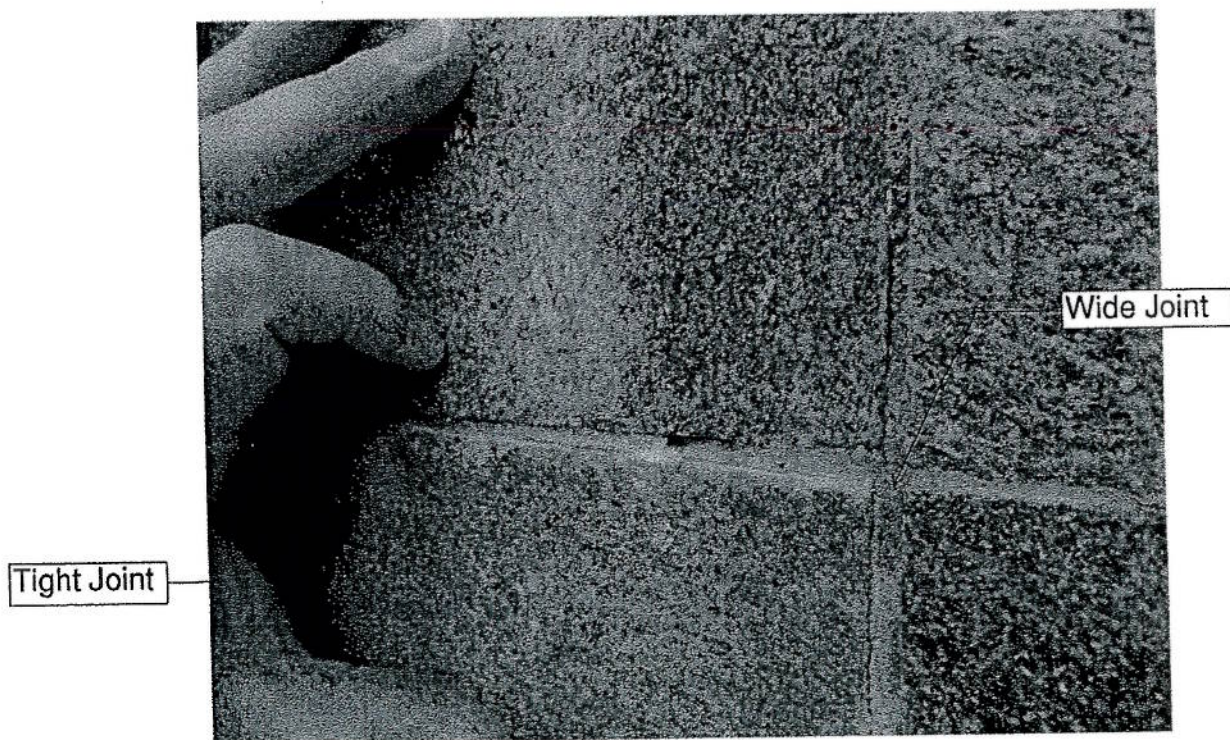


Photo 4

RDH Building Engineering Ltd

The Wave

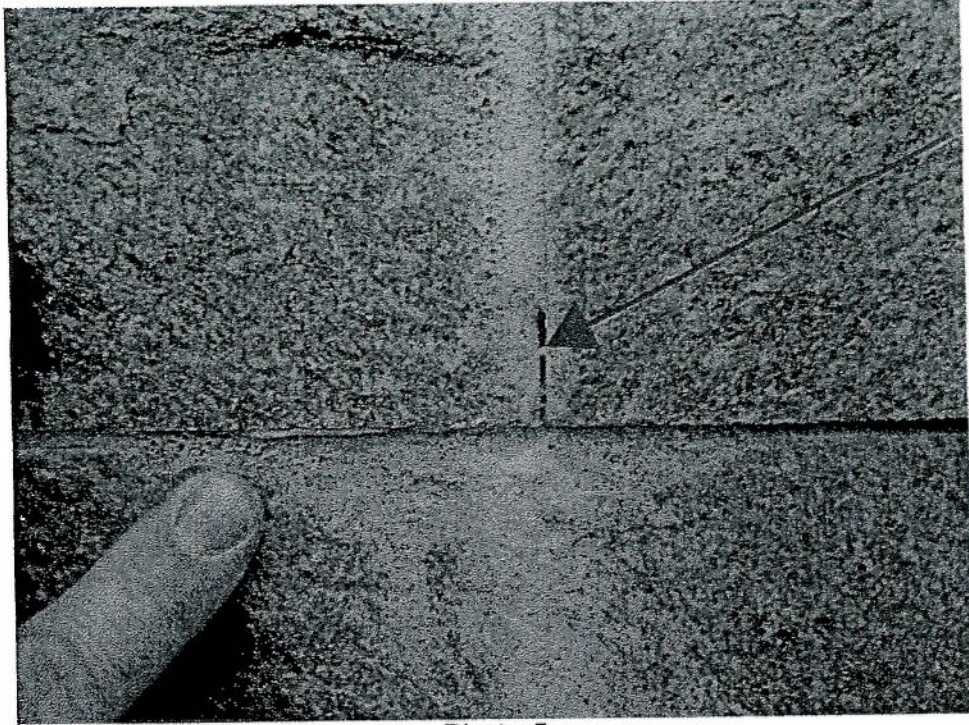


Photo 5

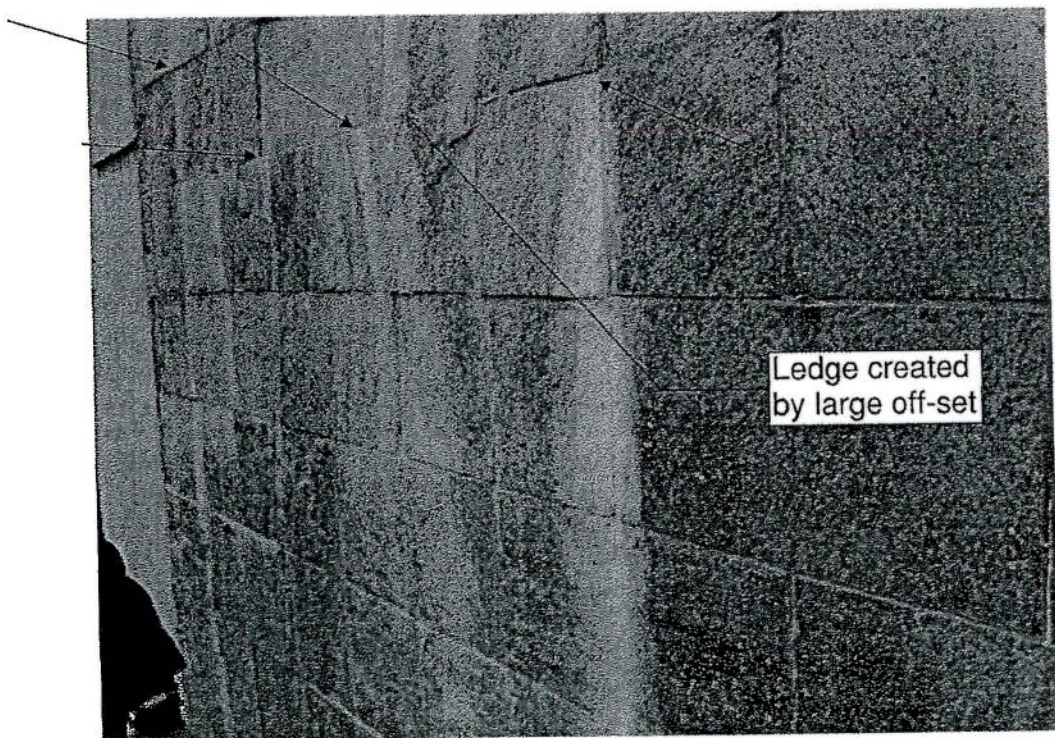


Photo 6

The Wave

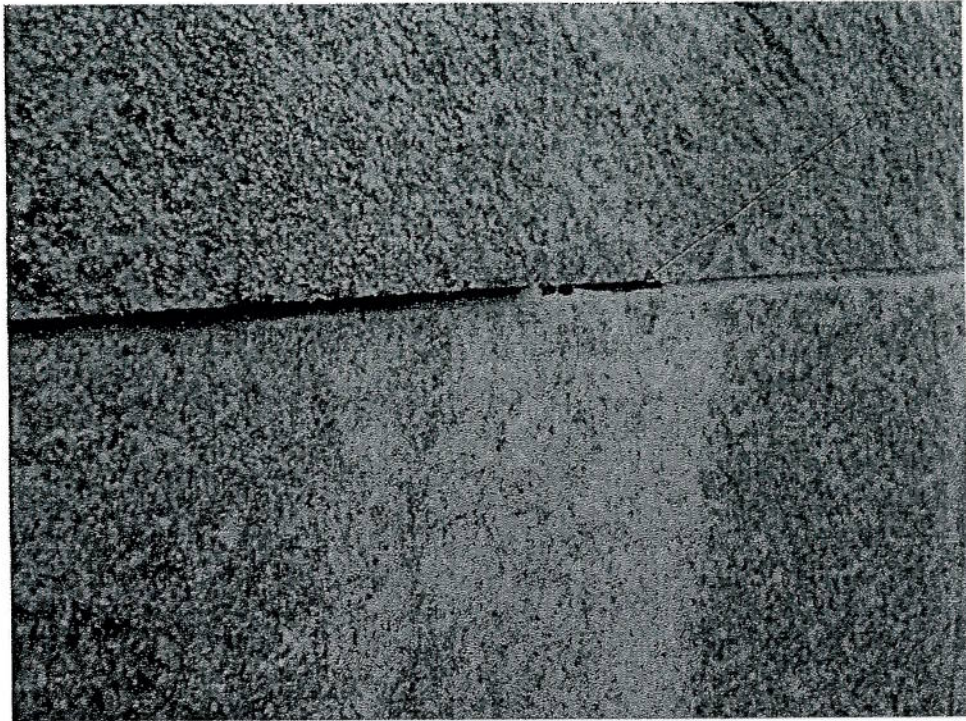


Photo 7

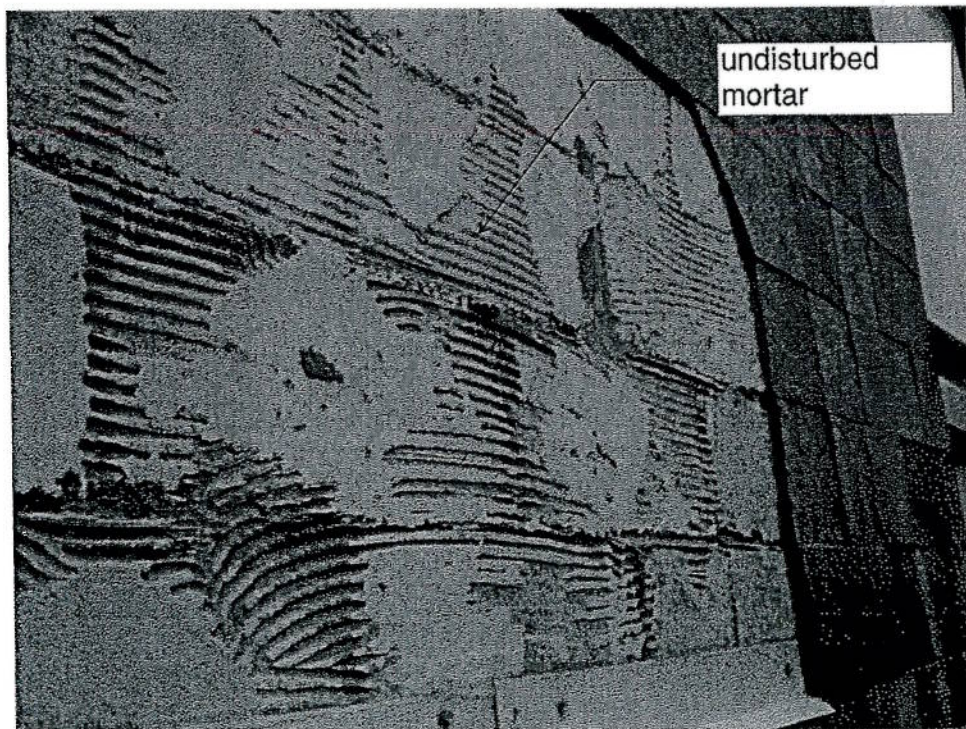


Photo 8

RDH Building Engineering Ltd

The Wave

Poor Bond

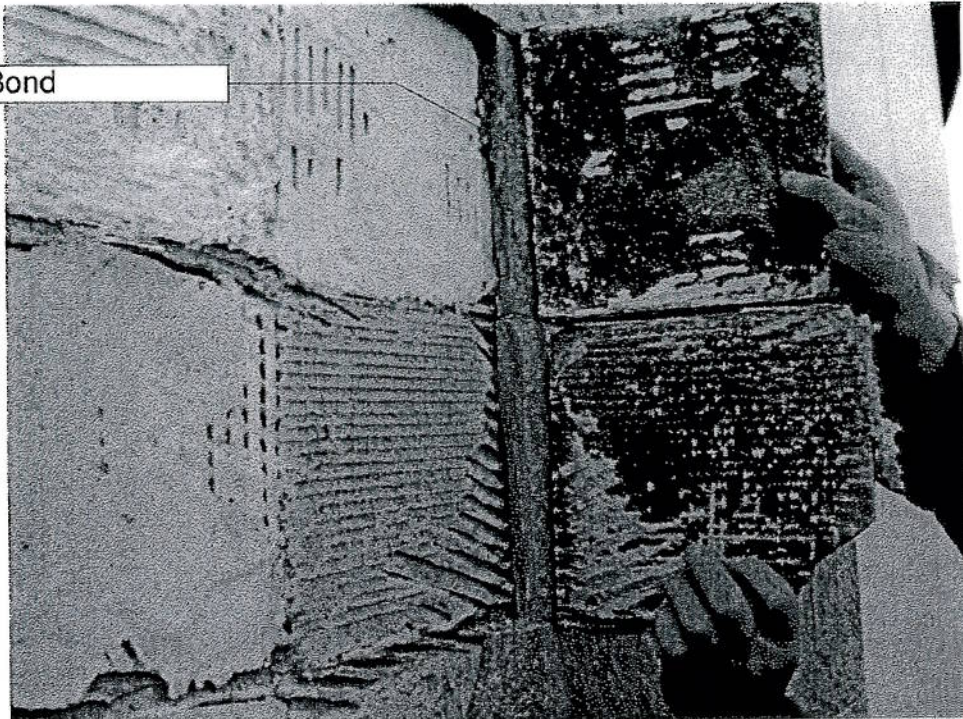


Photo 9

control joint
covered by
grout

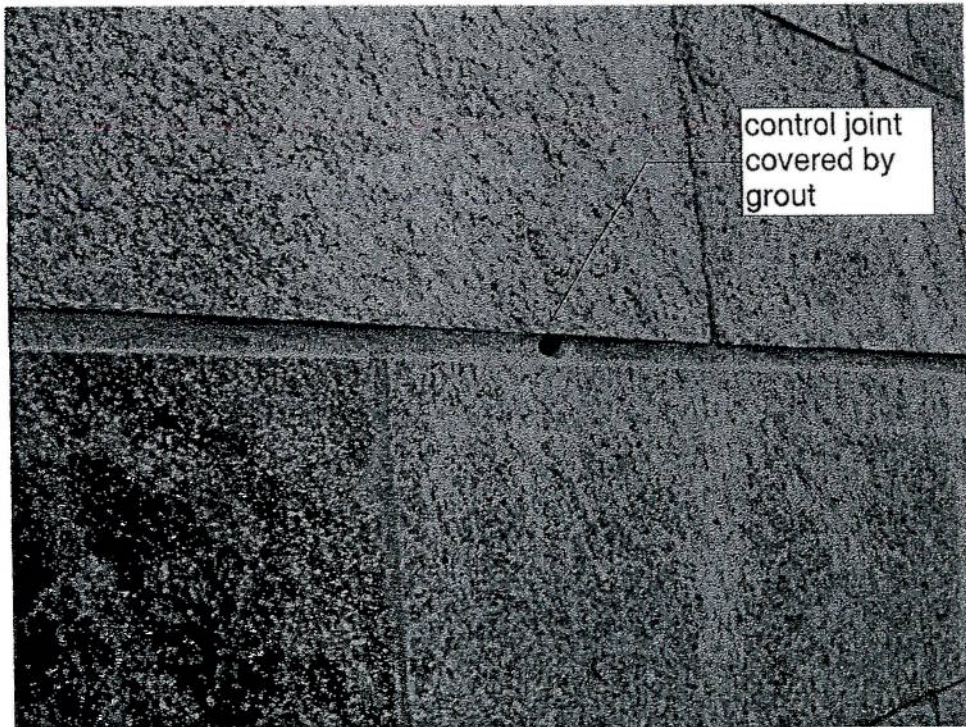


Photo 10

The Wave

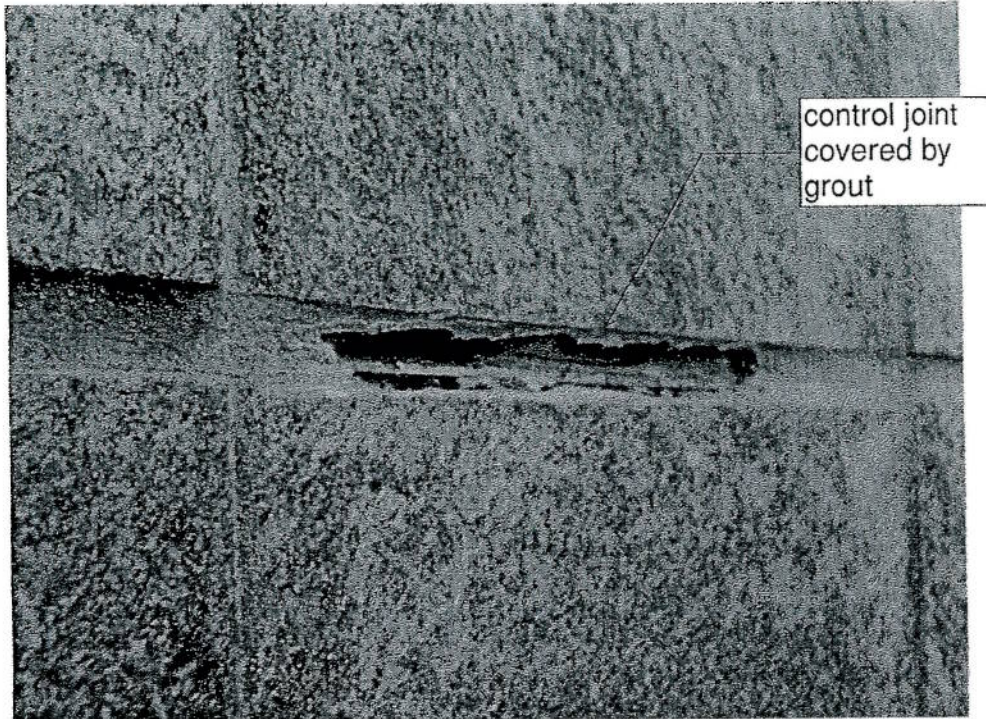


Photo 11

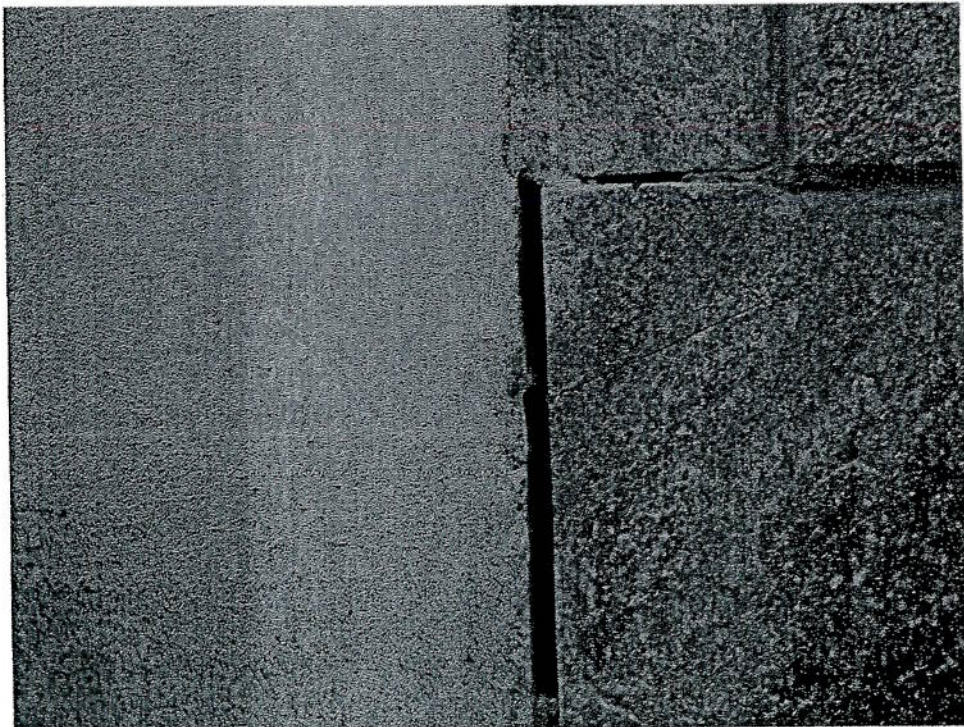


Photo 12

The Wave

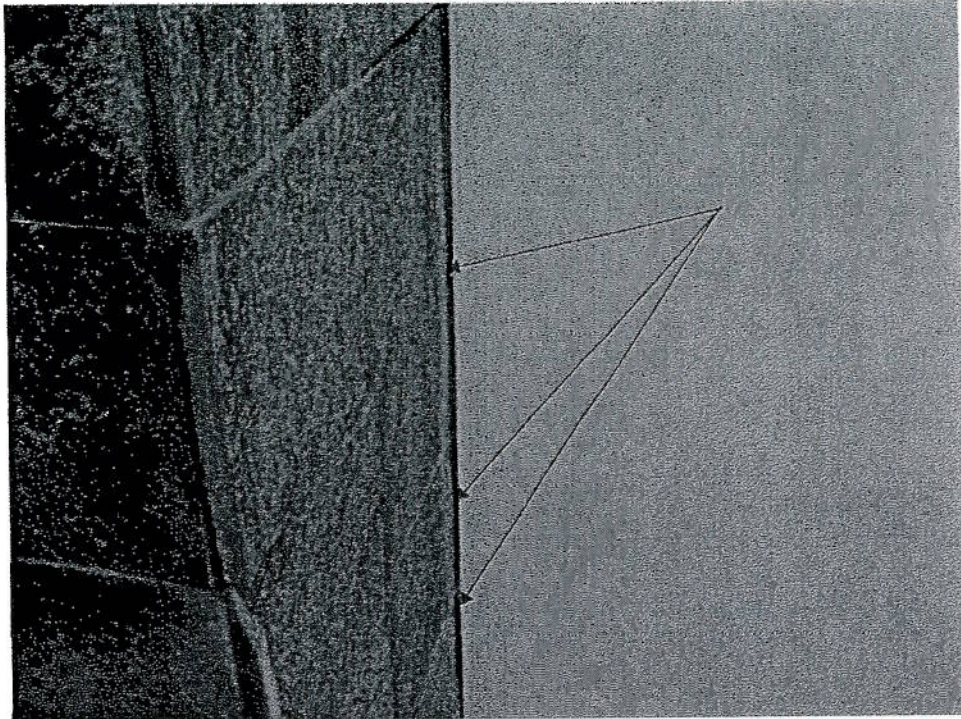


Photo 13

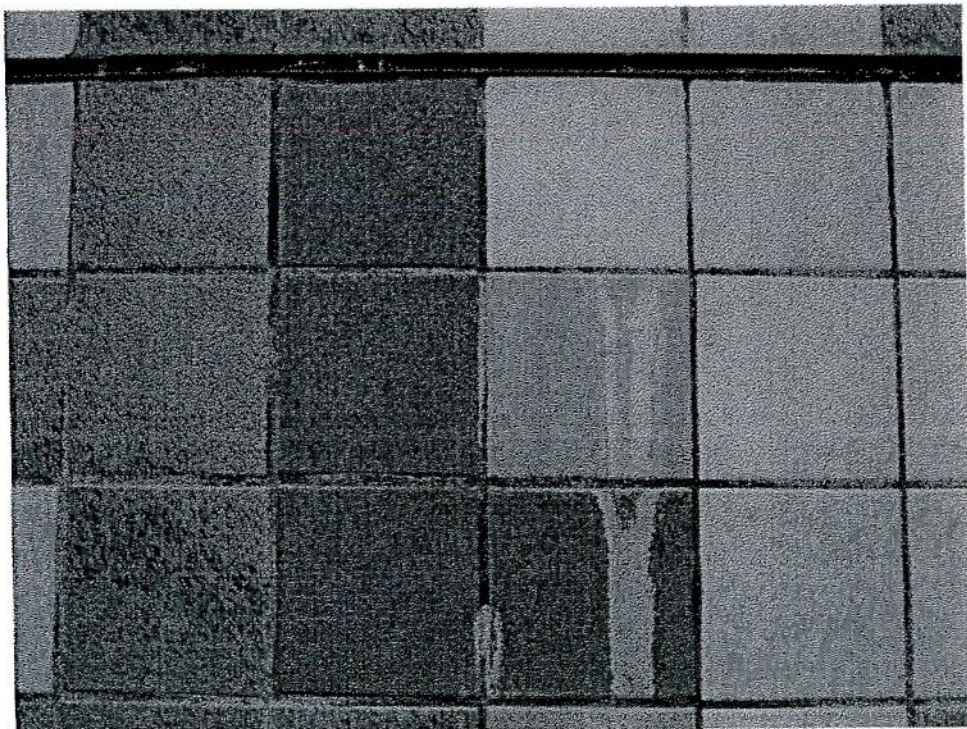


Photo 14

RDH Building Engineering Ltd

The Wave

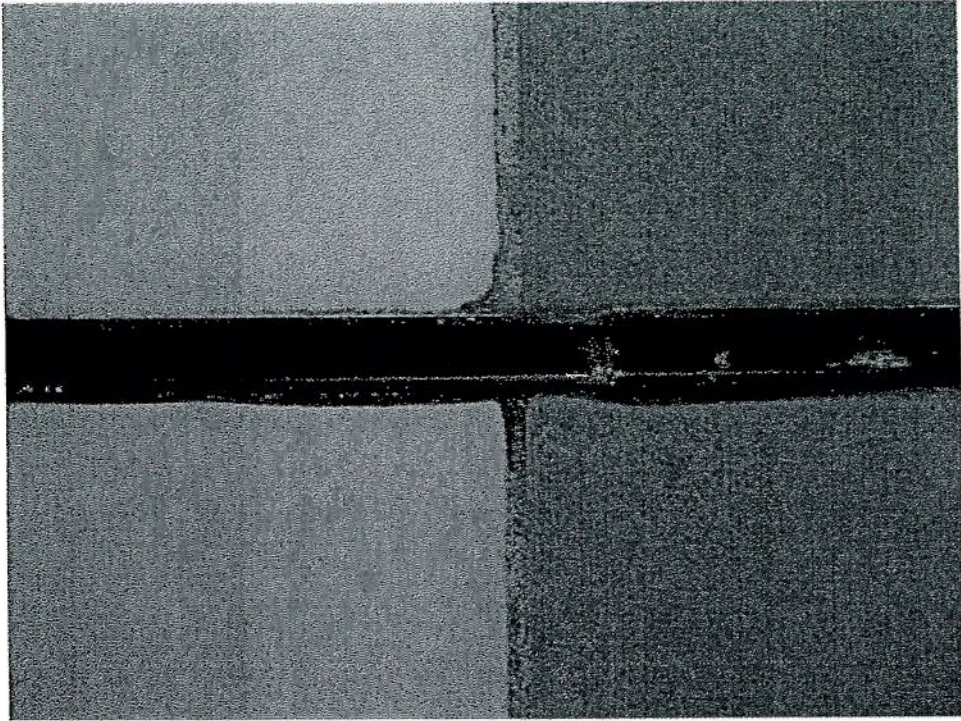


Photo 15

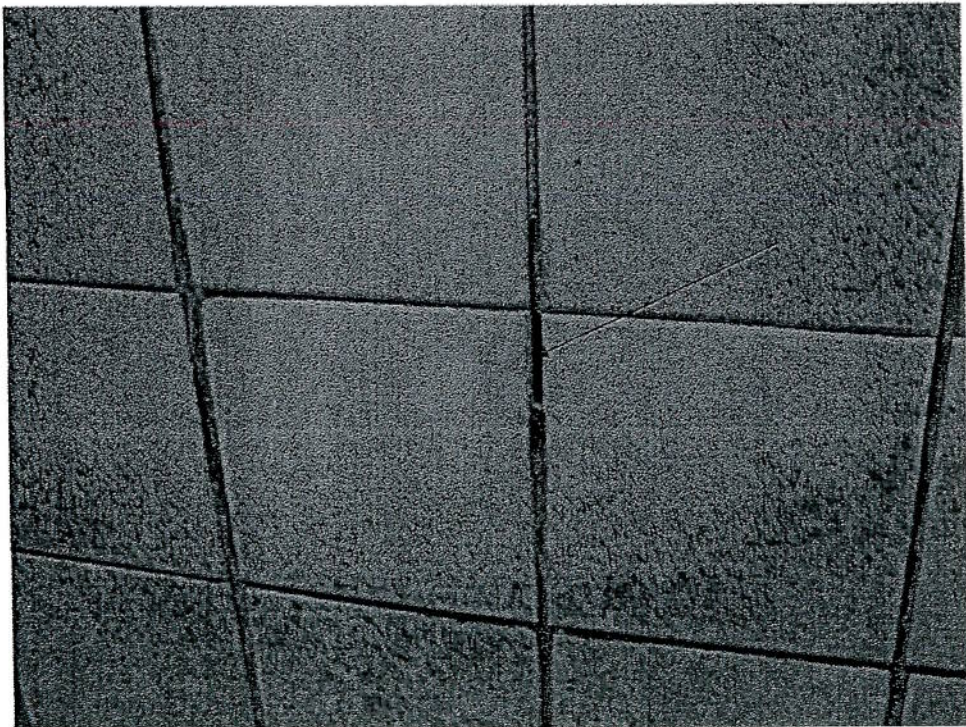


Photo 16

RDH Building Engineering Ltd

The Wave

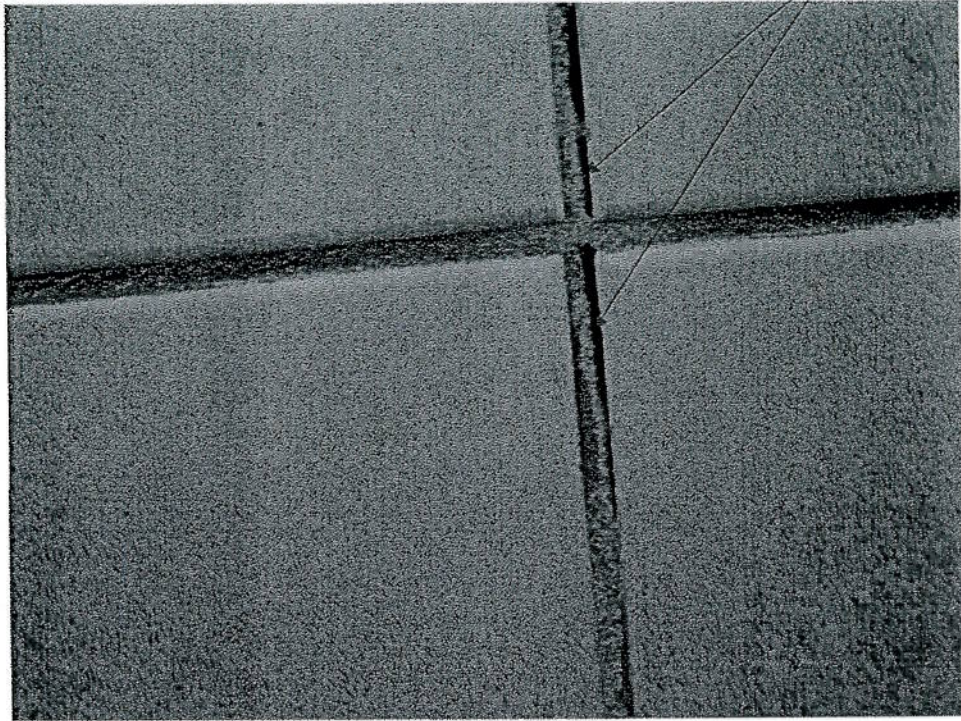


Photo 17

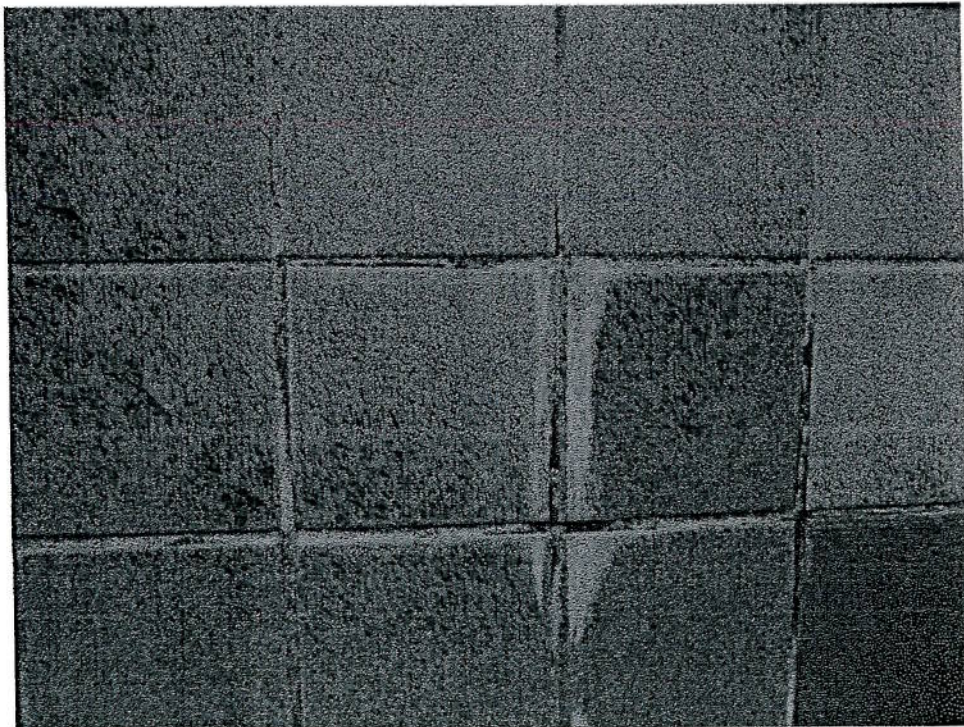


Photo 18

RDH Building Engineering Ltd

The Wave



Photo 19

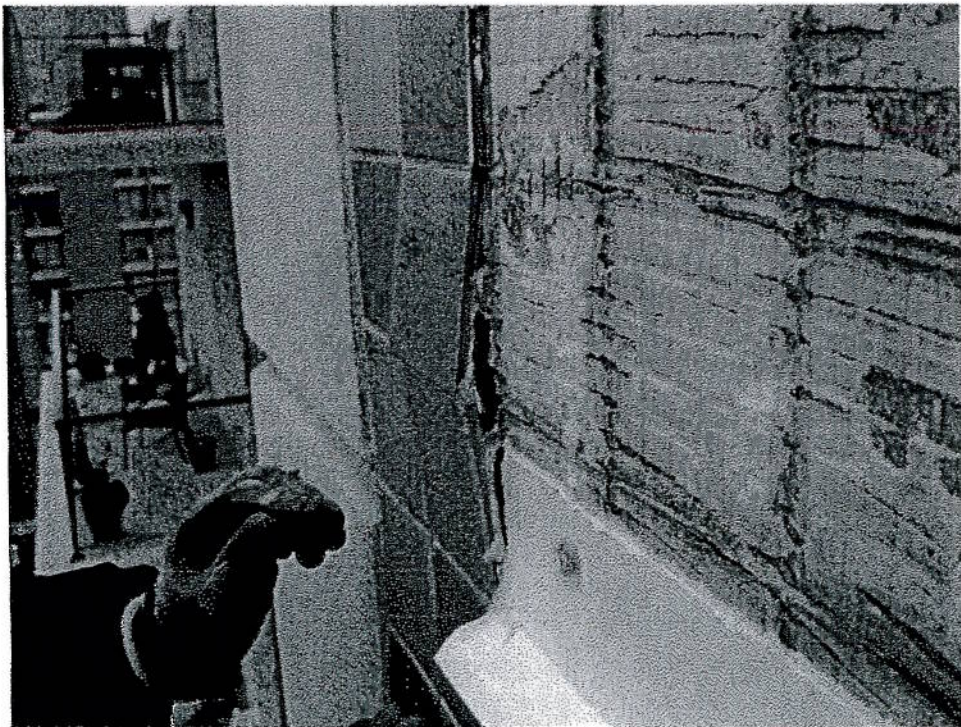


Photo 20

RDH Building Engineering Ltd

The Wave



Photo 21

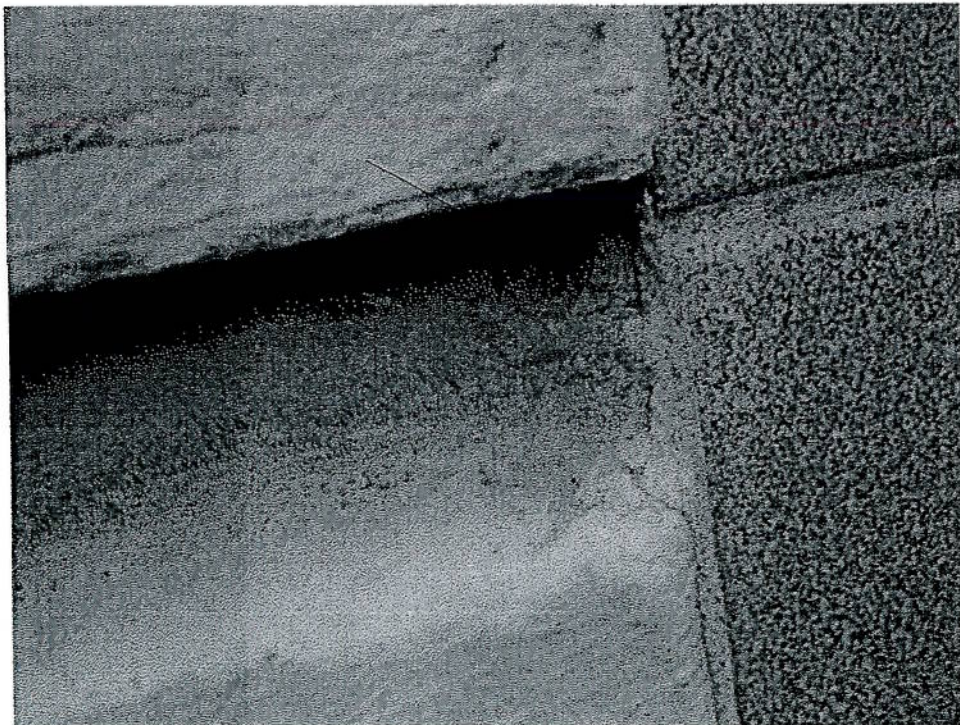


Photo 22

RDH Building Engineering Ltd

The Wave

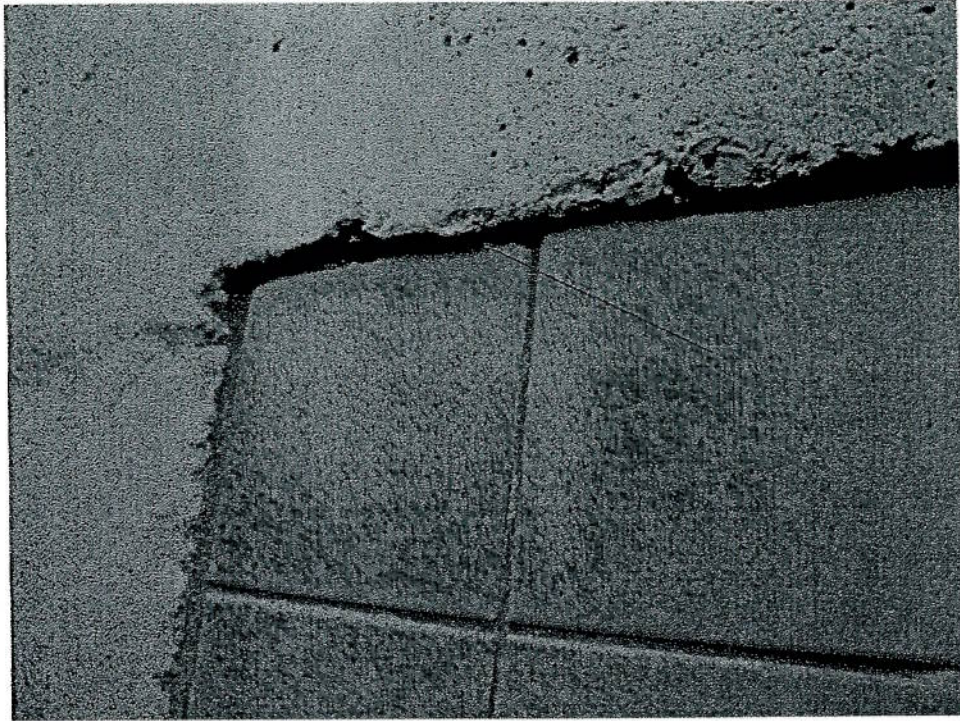


Photo 23

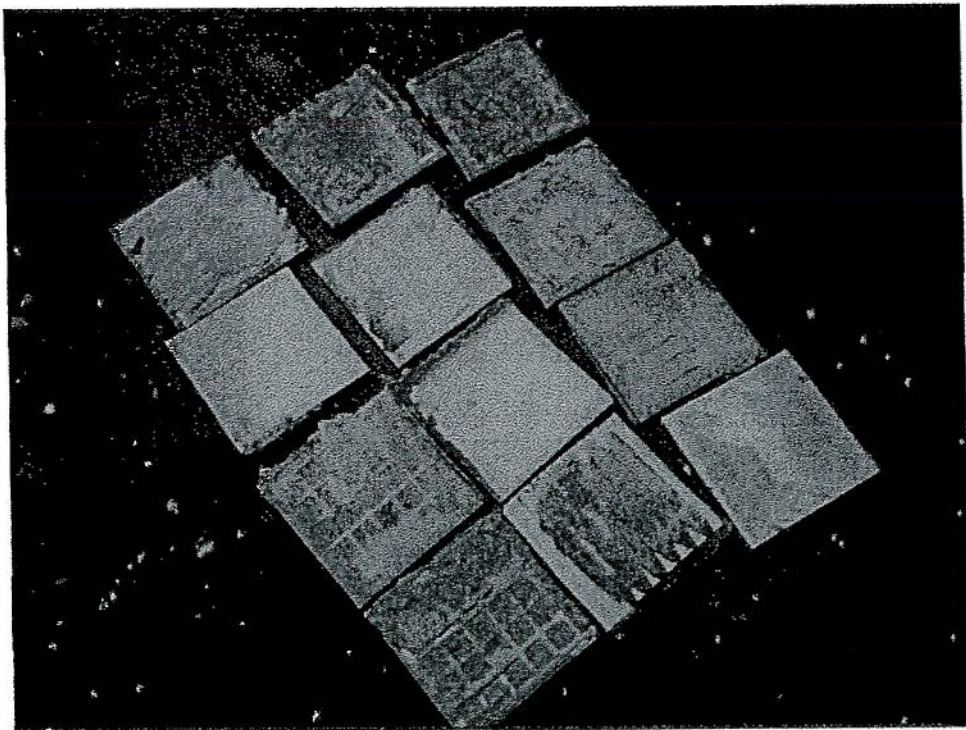


Photo 24

RDH Building Engineering Ltd

RDH

Design Report
The Wave
845 Yates Street, Victoria

→ Mike Wilson
→ Grant Laing

July 18, 2013



RDH


www.rdhbe.com

Agenda

→ Background
→ Design Options
→ Next Steps
→ Questions and discussion



→ Background

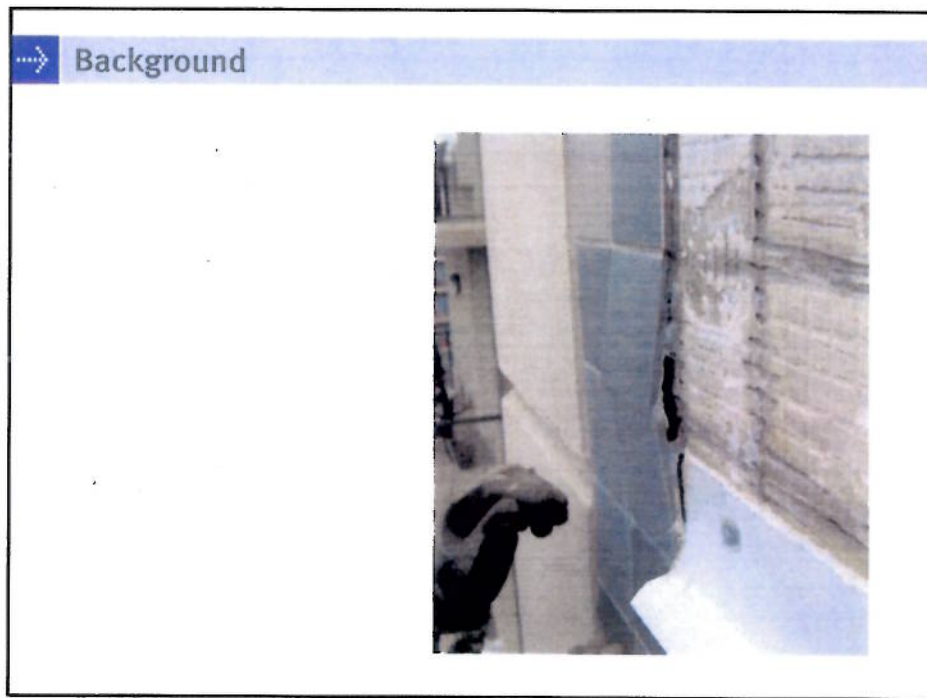
- The building was built on 2006
- The concrete stair enclosure at the east face of the building was finished in a tile mosaic of a wave and thin stone.
- Some time after installation, tiles were found to have fallen from the building
- In December of 2011 the Strata retained RDH to review the condition of the tile and adhered thin stone on the east exterior concrete wall




→ Background


- In the same month RDH examined the tile and thin stone from a swing stage






 **Background**

- In January of 2012, RDH issued a Performance Review of the adhered stone and tile with the following recommendations:
 - Remove the existing tile and thin stone
 - Avoid installation of exterior tile or adhered thin stone directly to the existing concrete substrate
 - Install a different assembly for reinstatement of the “mosaic-like” wave image
- In May of 2013, RDH was retained by the Strata to develop Design Options for the replacement of the thin stone and tile.



 **Design Options**

- Original Design
- Option 1: New Mosaic Tile and Stone Cladding
- Option 2: Painted Mural and Stone Cladding
- Option 3: Painted Mural and Painted Concrete

→ Original Design

Existing, Development Permit approved configuration

Wave mosaic made up of
100mm x 100mm (4" x 4")
through coloured clay tiles

200mm x 200mm or 400mm
x 15mm (8" x 8" or 16" x
5/8") thin stone



→ Option 1 – New Tile Mosaic and Stone Cladding

- Based on existing materials and form
- Will require a only a Minor Amendment to the existing Development Permit
 - Shorter approval process than a full Development Permit
 - Less expensive approval process than a Development Permit
- Highest construction costs of all options
- Least risk in the Approval Process



→ Option 1 – New Tile Mosaic and Stone Cladding



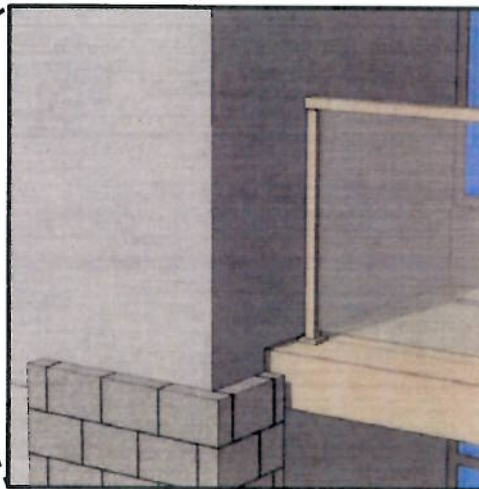
→ Most costly and complex option



→ Option 1 – New Tile Mosaic and Stone Cladding



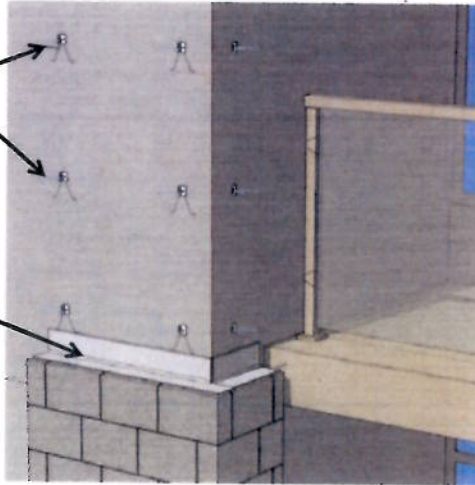
4" thick stone requires support



→ Option 1 – New Tile Mosaic and Stone Cladding

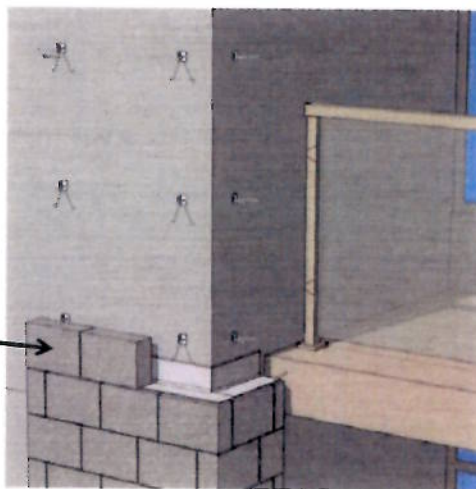
Masonry ties keep stone
from tipping over

Steel ledgers support
weight of stone



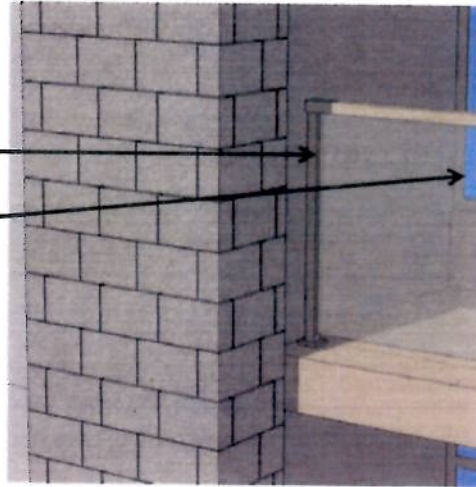
→ Option 1 – New Tile Mosaic and Stone Cladding

Stone then laid in
courses



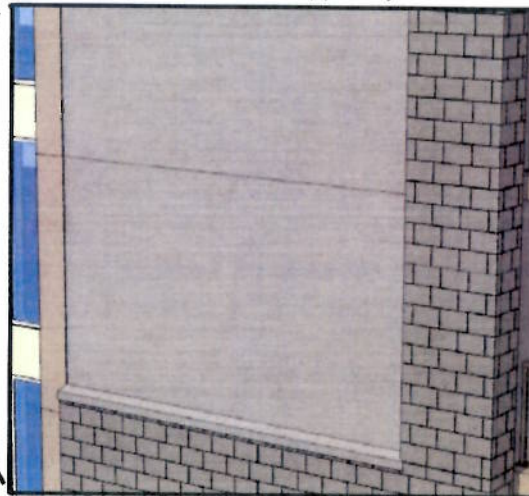
→ Option 1 – New Tile Mosaic and Stone Cladding

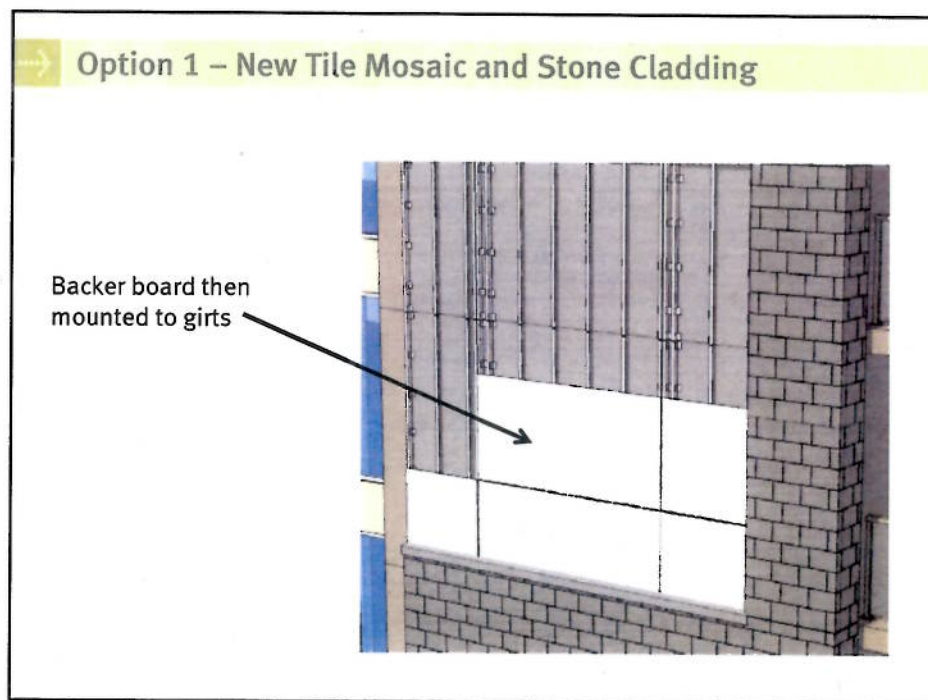
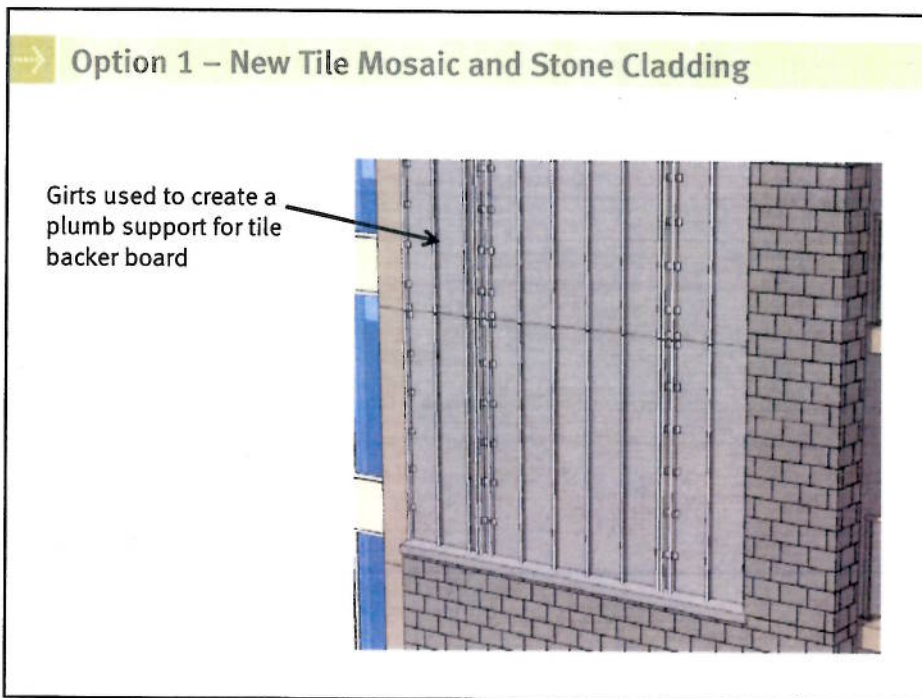
Stone must stop short of
balconies to avoid
modifications to
balcony guard
and
window



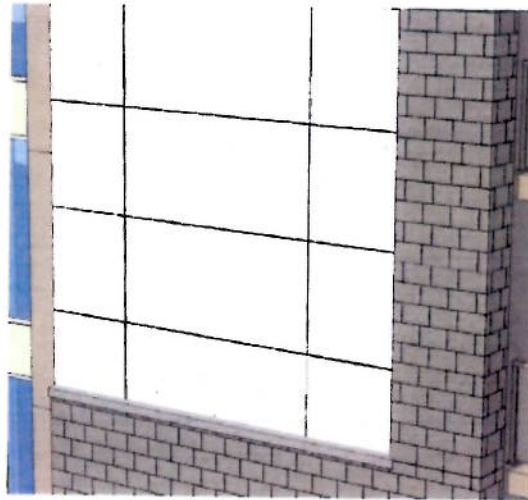
→ Option 1 – New Tile Mosaic and Stone Cladding

Tile requires uniform support system





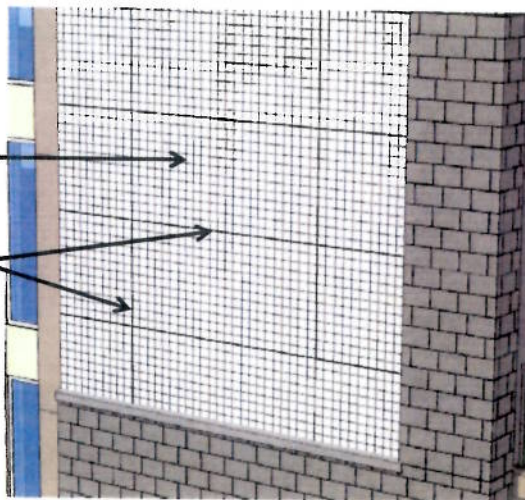
→ Option 1 – New Tile Mosaic and Stone Cladding



→ Option 1 – New Tile Mosaic and Stone Cladding

Tile grouted to surface of
backer board

Joints between panels
allow for expansion and
contraction as wall warms
and cools



→ Option 2 – Painted Mural and Stone

- Material change: tile to paint
- Painted in a grid to replicate tile
- Requires a full Development Permit
 - Longer, more involved approval process - 3 to 6 months
 - Higher application fees and more consultant involvement (costs)
- More risk in approval process than Option 1




→ Option 3 – Painted Mural and Painted Concrete

- Material changes: tile & stone to paint
- Painted in a gridded pattern to replicate tile
- Will require a full Development Permit
 - Longer, more involved approval process - City states 3 to 6 months
 - Higher application fees and more consultant involvement (costs)
- Most uncertainty in municipal approval process



→ Summary



OPTION 1

- Least risk in being approved by City
- Shortest approval process

OPTION 2

- More risk in being approved by City
- Will require full Development Permit

OPTION 3

- Most risk in being approved by City
- Will require full Development Permit

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Questions / Discussion