February 14, 2013

CCC No. 81
c/o Catherine Brieger
CCC No. 81 President
370 Dominion Avenue
Ottawa, Ontario K2A 3X4

Via email: cbrieger@sympatico.ca

Re: CCC No. 81 - Window and Sliding Door Replacement Feasibility Study
370 Dominion, Ottawa, Ontario
exp Reference: OTT-00208613-B0

Dear Ms. Brieger,

Exp Services Inc. (**exp**) was retained by CCC No. 81 to provide a professional opinion on the condition of windows and sliding doors at 370 Dominion Avenue in Ottawa Ontario and their remaining service life.

Background

Exp performed a preliminary review of some of the windows and sliding doors at CCC No. 81. Based on the preliminary review, **exp** is of the opinion that the sliding doors should be replaced in the near term (0 to 3 years) and that further review of the windows and adjacent surfaces would be required to determine the estimated limited time frame in which the windows would have to be replaced.

As discussed and agreed upon by members at our meeting on October 17, 2012, the next step was to perform further review of the windows in order to obtain costs for;

- Replacement of the windows and sliding doors at different time periods; and,
- Replacement of the windows and sliding doors together at one time.

As part of the review, some exploratory openings were performed to review the anchoring of the windows to the structure and how well the windows were insulated around the perimeter.

Document Review

The following documents were provided for review:

- Door Schedule DS1 and Finish Schedules RFS 1 to RFS 6, by De Belle & Koffman Architects dated December 7, 1973.
- Architectural Assemblies A.1 to A.32, by De Belle & Koffman Architects. Some are dated May 1974.
- Stair Drawings S.1 to S.5, by De Belle & Koffman Architects dated December 7, 1973. Some revisions July 1974.
- Window and Exterior Door Drawings W 1 to W 8, U, N+P and M by De Belle & Koffman Architects dated December 7, 1973. Some revisions July 1974.
- Canopy Details A.33 to A.36, by De Belle & Koffman Architects dated November 29 and Decmeber 2, 1974.
- Barclay Window report – Status – 2012, dated August 28, 2012
- The Barclay's Aging Windows, report by Mike Hopkins dated July 13, 2012.
- Draft Only – Summary of Responses to June 24, 2012 Window/Door Survey.
- Window and Door sections of the Laviolette Reserve Fund Study of CCC 81 dated September 22, 2010. The tables were updated in 2012.

Laviolette Reserve Fund Study Report

In the Laviolette report and the updated 2012 tables it is indicated that window replacement is $1,275,000 and sliding door replacement is $360,000. Two scenarios were presented in 2012. For each scenario window and sliding door replacement occurred over 4 years, starting in 2015 (Scenario 1) and starting in 2020 (Scenario 2). In both cases a special assessment was required. In other words, a special assessment is required if windows are replaced soon or if windows are delayed for another 5 years. The special assessments are as follows:

	Scenario 1 (replacement starts in 2015)	Scenario 2 (replacement starts in 2020)
Special assessment each year for 4 years	$260,000/year	$215,000/year
Above assessment per suite owner	$2,796/suite	$2,312/suite
Above assessment per month	$232.97	$192.65

Survey of Owners

The owners at CCC No. 81 were surveyed in June 24, 2012 with regard to the performance of their windows and sliding doors. There were 66 responses to the survey out of 94. Following is our summary of the results followed by some comments:

- Failure of the insulated glazing units (fogging between the sealed glass panes) – 20% (windows) and 3% sliding doors. These failed seals should be replaced with new glazing units. The survey does not indicate how many sealed glazing unit failures or what size these glazing failure were within each suite that was surveyed. If it is decided that window and sliding door replacement will occur within the next three years, the condominium should wait to replace the failed glazing.

- Condensation – 35% (windows) and 3% sliding doors. Typically, a building of this age has significantly more air leakage than a new building, and this was confirmed by observations made by **exp** on site. In leakier buildings, there is a stack effect that results in infiltration of air on the bottom floors and exfiltration on the upper floors. At CCC 81, it is likely that there is a lower percentage of condensation on the sliding doors because the air leaks through quickly and the moisture does not have a chance to condense on the surfaces.

- Visible damage to glass or frame – 6% (windows) and 2% (sliding doors). Visibly the frames may appear to be in good condition; however, problems with the frames of windows and sliding doors of this age tend to be at the seals that are within the joints of the frame and are not readily visible.

- Moisture damage/moisture entry into suites – 8/8% (windows) and 6/12% (sliding doors). This is a low percentage because all the windows and sliding doors are quite sheltered. The only windows or sliding doors that may have a problem with some moisture entry would be the suites that are exposed to the prevailing winds and particularly the suites on the upper level. As a result, the survey results are not a good indication of the window or sliding door performance because most units are rarely exposed to rain.

- Drafts – 48% (windows) and 44% (sliding doors). It is expected that drafts would be more prevalent on the lower floors because of stack effects (air sucking in on the lower floors and leaking out on upper floors). Some upper floor suites may feel these drafts during windy days. Based on **exp**'s review of the sliding doors, it is clear that there is likely a significant amount of air infiltration and exfiltration through these sliding doors. To confirm the amount of air leakage through the windows, **exp** could perform an air leakage test and compare the results of the air leakage through the windows at CCC No. 81 with the required air tightness of new window installation as per CSA.

- Operation (locks work/sliders move easily) – 80/79% (windows) and 82/65% (sliding doors). It appears there are a large percentage of windows and sliding doors with locks that work well and that can move easily. In the sliding doors **exp** reviewed, we found that the sliding

doors were not moving easily within their frames; however there may be several that are still moving well.

Review of Window and Sliding Doors by Owner of CCC No.81 (August and July 2012)

Following is our summary of the reports followed by some comments:

- The most persistent complaint was of drafts and some water penetration around the operable windows within the bedrooms. Some of the frame elements have distorted inward because of water freezing within the frame and expanding causing the aluminium to buckle inward. Some sliding windows have been replaced with sliding window inserts within the fixed frame assembly and these have proven to have satisfactory results.

- The second major source of complaint was the drafts around the sliding doors and their difficulty in operation. It was reported that several of the sliding doors are not square within the framed opening (when closing it can be seen that there is a relatively large crack at the top or bottom of the closed door). On some upper suites, snow or water has penetrated into the suites through the sliding doors. It has also been found that, in many cases, the rollers can no longer be adjusted because the screws have been stripped.

- The weather stripping on the sliding doors is badly worn, is out of position, or is non-existent.

- Most of the large insulated glazing units within the fixed windows are stamped 1974 (close to 40 years old). This is beyond the serviceable life of glazing seals. It was also noted that there are drafts around these windows.

- The most complaints of, and damage to, the windows and sliding doors were from the upper west side of the building because of weather exposure.

- There is some discussion that the windows/sliding doors at CCC No. 81 have a low R-value and that windows/sliding doors fabricated today have a much higher R-value with glazing that has Low-E and argon filled. There is some discussion of replacing just the glazing within the framed units. The merit of replacing just the glazing will be discussed later in this report.

- The caulking around the window and sliding door frames and at the glazing-to-frame connections has become hard and brittle.

- On the exterior, there is cast in place concrete below the windows and sliding doors. In some areas, the sloped ledge of the concrete has hairline cracks and in some cases it is delaminating.

Observations

Chantal Wegner, P.Eng. of **exp** visited CCC No. 81 on September 25, 2012 and January 14, 2013 to perform a visual review of the windows and sliding doors and January 24, 2013, to review interior exploratory openings through the exterior wall adjacent to windows.

September 25, 2012 and January 14, 2013 – Visual Site Review

On September 25, 2012 the windows and sliding doors in suites 407, 1201 and the swimming pool area were reviewed. The following was observed:

- Suite 407 faces southwest. The owner of suite 407 indicated that they do not have a problem within air leakage or water penetration however they indicated that their sliding door does not slide well and that their sliding door does not lock.
- During our review at suite 407 we noted the following:
    - The weather stripping around the sliding doors was old and worn.
    - The operable sliding door was out of square in relation to the frame. When the sliding door is in the closed position there is a gap at the top of the opening in comparison to the bottom.
    - The track for the sliding door is completely worn down.
    - The section of sliding door where the track is continuous consists of one operable section and two fixed glazed sections.
    - An additional heel bead sealant was added at the glazing-to-frame junctions. In most cases this heel bead sealant has failed (Photograph 1).
    - The glazing reviewed was all stamped 1974 (original to construction).
    - The joints in the aluminum framing have opened up and the seals within the joints appear to have failed (Photographs 2 and 3).
    - A crack in the aluminum was noted at the bedroom operable unit (Photograph 4).
    - The frame for the bedroom operable window is bowed inward (Photograph 5).
    - The sealant at the frame-to-wall connection is brittle and cracked (Photograph 6).
- Suite 1201 faces west. The owner of suite 1201 indicated that during wind driven rains they get water penetration through their sliding door and bedroom operable windows. The owner also indicated that during the winter when it is windy they feel drafts at the master bedroom windows and there is condensation and ice build-up on the windows.

- During our review at suite 1201 we noted the following:
    - Rollers for the sliding door have been replaced.
    - The weather stripping around the sliding doors was old and worn.
    - The operable sliding door was out of square in relation with the frame. When the sliding door is in the closed position there is a gap at the bottom of the opening in comparison to the bottom (Photograph 7).
    - An additional heel bead sealant was added at the glazing to frame junctions. In most cases this heel bead sealant has failed (Photograph 8).
    - The glazing reviewed was all stamped 1974 (original to construction).
    - The joints in the aluminum framing have opened up and there has been an attempt to seal these areas with sealant on the exterior (Photograph 9).
    - The frame for the bedroom operable window is bowed inward (Photograph 10).
    - The sealant at the frame-to-wall connection is brittle and cracked (Photograph 11). It appears that several layers of sealant have been added over the years in an attempt to stop the drafts and water leakage.
    - The concrete sills were cracking and delaminating and, as a result, they were covered with aluminium flashing (Photograph 12).
- The pool windows were also reviewed from the interior. These fixed windows are similar to the fixed windows throughout the building. The interior stop that supports the glazing was removed in one location. The following was noted when removing the stop:
    - The thermal break was interior of the glazing (Photograph 13); therefore, during the winter, the glazing is on the cold side of the thermal break making the window much colder. Typically in new window fabrication the glazing is aligned with the thermal break.
    - Daylight could be seen at the frame-to-glass junction (Photograph 14).
- A follow-up review was performed on January 14 to collect information in order to better assess the cost for window and sliding door replacement. On this date, access was provided to the party room, swimming pool, and suites 101, 501, 702 and PH 3. The following was noted:
    - There are 13 sliding doors that consist of one slider and one fixed section, the remaining sliding doors consist of one operable and two fixed sections.
    - It was confirmed that the sliding door sections (one operable and two fixed and one operable and one fixed) can be removed and replaced while leaving the adjacent fixed windows in place.
    - It appears that the sliding door is anchored at top and bottom by a fastener through the frame into concrete (Photograph 15).

- The head of sliding door frames and the window frames are tight against the underside of the concrete floor slab.
- The sill of the sliding door is resting directly on the concrete curb above the balcony (Photograph 16).
- The existing fixed window frames are 3 inches wide. The minimum frame width constructed today is 4 inches and this is the width that is recommended at the time of replacement.
- At the head of the fixed windows there are anchor clips to fasten the window (Photograph 17). During installation in circa 1974, the anchoring clips were first fastened to the window frame, the window was installed, and then the anchoring clip extension was fastened to the underside of the concrete floor slab. These anchor clips are partially covered with the wood valances above the windows. It appears that a portion of the wood valances will have to be removed in order to remove the old windows and to install new wider-framed windows.
- It is unclear how the fixed window frames are fastened at the sills and at the jambs. The fasteners are concealed by interior finishes. Openings are required to determine how the windows are fixed at the sills and jamb.
- It was noted that some of the exterior concrete sills below the windows are delaminated. It appears that supported metal flashing can be added over the sills without the requirement of concrete repairs.
- The penthouse suites have higher floor-to-ceiling height and therefore have larger window sections.
- At the jambs, it appears that the metal track supporting the wall gypsum board is screwed directly to the window frame stop (Photograph 18). If the glazing seal were to fail at these windows directly adjacent to the walls a portion of the gypsum board would have to be removed in order to remove the interior glazing stop that supports the glazing.

January 24, 2013 – Exploratory Openings

To confirm the wall construction around the windows and sliding doors and to confirm how the window sills and jamb are fastened, exploratory openings were made in suite 605. Openings were made below and adjacent to a sliding door, below a window and adjacent to a window where the window meets a shear wall. The wall construction consists of the following:

½" gypsum board
Polyethylene (very thin) (Photograph 19)
1 ½" Expanded Polystyrene Insulation (beadboard)
6½" Concrete (Photograph 20)

The following was observed at the wall openings:

- There is less insulation in the exterior walls than what was indicated on the drawings (drawings indicate 2" of rigid insulation). The insulation in the wall is glued to the back side of the exterior concrete.
- There is electrical conduit within the area of the insulation at the base of the insulation (see Photograph 20).
- The gypsum board metal cap was fastened directly to the frame of the window at the sill.
- Below the sliding doors, between the sliding door and concrete curb, and adjacent to the sliding door, there is almost no insulation and no measures to make the sliding door air tight to the wall (Photographs 21 and 22).
- It was confirmed that the sliding door is fastened directly to the concrete curb through the sill of the sliding door.
- Below the fixed window frame there is a nominal 2" by 4" wood stud (actual size 1½" by 3½") (Photograph 23). This wood stud is fastened directly to the exterior concrete. Anchor clips are used to fasten the window frame to the wood stud.
- There is some fibreglass insulation pushed between the window frame and the exterior concrete (Photograph 24). The only element that made the connection air tight from the concrete sill to the window frame was the exterior sealant (which was in poor condition). Air could be felt coming through.
- At the window jam adjacent to the building concrete shear walls, the concrete needed to be chipped out in order to accommodate the window (Photograph 25).
- The window jamb was fastened with an anchor clip to the concrete shear wall behind the drywall.
- There was fibreglass insulation pushed between the jamb of the window frame and the concrete shear wall. The only element that made the connection air tight from the shear wall to the window jamb was the exterior sealant (which was in poor condition). Air could be felt coming through.
- Air could be felt coming into the interior at the base of the wall. No means were taken to attempt to make the base of the wall air tight.

Costing and Window and Sliding Door Installation

Based on our review and the exploratory openings made, it was found that metal trim at the edge of the gypsum board where it meet the windows and sliding doors will have to be removed in order to remove the windows, since they are fastened directly to the window frames. This will likely cause some damage to the gypsum board. It is recommended that a wood trim molding be added around the windows and sliding doors during window replacement. Since this gypsum board at the window

perimeter will be covered with molding, a membrane can be added below the molding to the drywall improve the airtightness around the windows and walls.

We also observed that the existing window anchoring clips can be cut and left behind the drywall. New anchoring clips can then be installed.

At the head of the window, the wood valance will have to be trimmed in order to accommodate the new wider window frame. The remaining wood valance can stay in place during window replacement.

Since there is very limited insulation within the exterior walls, the condominium may want to consider adding insulation to walls during window replacement. This cost to add insulation is not included in the costs for window and sliding door replacement below.

The costing has been separated into replacing the windows and sliding doors at separate time periods, and replacing everything at one time. All costs are in 2013 dollars.

Replacing windows and sliding doors in separate years

Windows	$ 577,000
Sliding Doors	$1,996,000
Total	$2,573,000

Replacing windows and sliding doors in one phase

Total	$2,432,000

Discussion and Recommendations

Sliding Doors

Based on our review, **exp** is of the opinion that the sliding doors are in need of replacement within the next 2 years. These sliding doors have more than exceeded their serviceable life expectancy. The large operable sections have become out of square and the weather stripping is worn and flattened, allowing air leakage to occur (approximately half of the suite owners complained of air leakage - it will be more noticeable on the bottom floors than on the upper floors because on the upper floor there will be stack effect causing air leakage outward instead of inward except on windy days). There have also been some complaints that the sliding section is difficult to open (given their age, this will likely increase in number soon).

Operable Windows

Similar to the sliding doors, **exp** is of the opinion that the operable sliding windows are in need of replacement within the next 2 years. These operable windows have more than exceeded their serviceable life expectancy. Some of the frame elements are bowing inward and the weather stripping is worn and flattened allowing air leakage to occur (approximately half of the suite owners complained of air leakage - it will be more noticeable on the bottom floors than on the upper floors because on the upper floor there will be stack effect causing air leakage outward instead of inward except on windy days). There have also been some complaints that the sliding section is difficult to open (given their age, this will likely increase in number soon).

Fixed Windows

Exp is of the opinion that the fixed windows should also be replaced in the near term however, they are not as critical as the sliding doors and operable windows because they do not have moving parts. Replacement of the fixed windows could be delayed another 5 to 8 years if some maintenance repairs are done in the near term including the replacement of sealant (caulking). Following are some of the issues with delaying the replacement of the fixed windows when the sliding doors and operable windows should be replaced within the next 2 years:

- If fixed windows replacement is delayed there is still a need for a special assessment (see Document Review section within this report). The Condominium Act requires that any special assessments be complete by 2017 (even for future spending).
- There will be a period of time where there will be old windows directly adjacent to the new sliding doors.
- The condominium owners will be interrupted over two separate periods (first for the sliding door replacement and then for the fixed window replacement).
- The new operable windows within the old fixed frame assemblies cannot be reused when the fixed frames are eventually replaced.
- If fixed framed windows are not replaced there will be a need to replace the sealant around these elements. The reserve fund indicates that sealant replacement is $4,000 however for a full removal and replacement, the cost is much higher. If windows are replaced, the sealant will be replaced with them.

Fixed Windows – Air Leakage

To better assess the performance of the fixed windows and to determine how much air is leaking through them, we recommend that an air leakage test be performed. The results of the test can be compared to the required allowable air leakage of fixed windows today to determine the magnitude of the difference in air leakage from new windows to old windows.

Pay Back

Replacing all windows and sliding doors will reduce the energy consumption within the building. Not only will the windows and sliding doors be more air tight and thermally efficient, their connection to the building will be improved (better insulation and air tightness connection from the windows and sliding doors to the wall elements). Typically buildings of this age that have their windows and doors replaced get a pay back in energy cost within eight to ten years following their replacement.

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We trust this letter provides the information you require. If you have any questions, or wish to discuss the matter further, please do not hesitate to contact us at 613.688.1899. We thank you for this opportunity to be of service.

Sincerely,
exp Services Inc.

Chantal Wegner, M.A.Sc., P.Eng.
Division Manager
Building Engineering Services

Peter Elliott, D.Arch. Tech.
Project Manager
Building Engineering Services

CW/PE:kmr

Attachments: Appendix A – Photographs

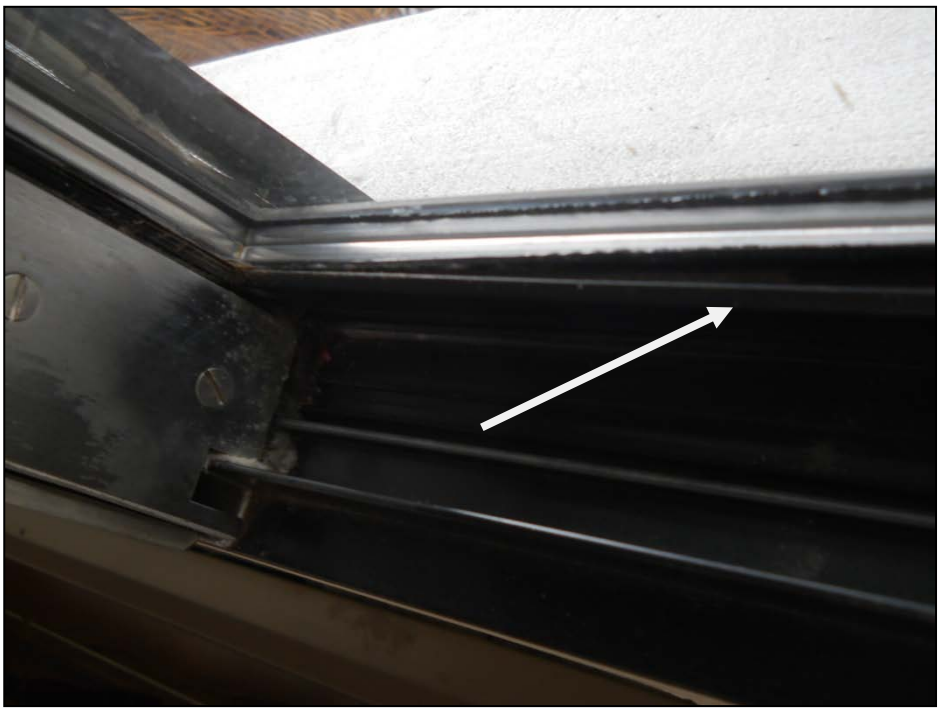
Appendix A: Photographs

Photograph No. 1: Failed heel bead sealant at glazing-to-frame junction - Suite 407

Photograph No. 2: Failed sealed joints within aluminum frame - Suite 407

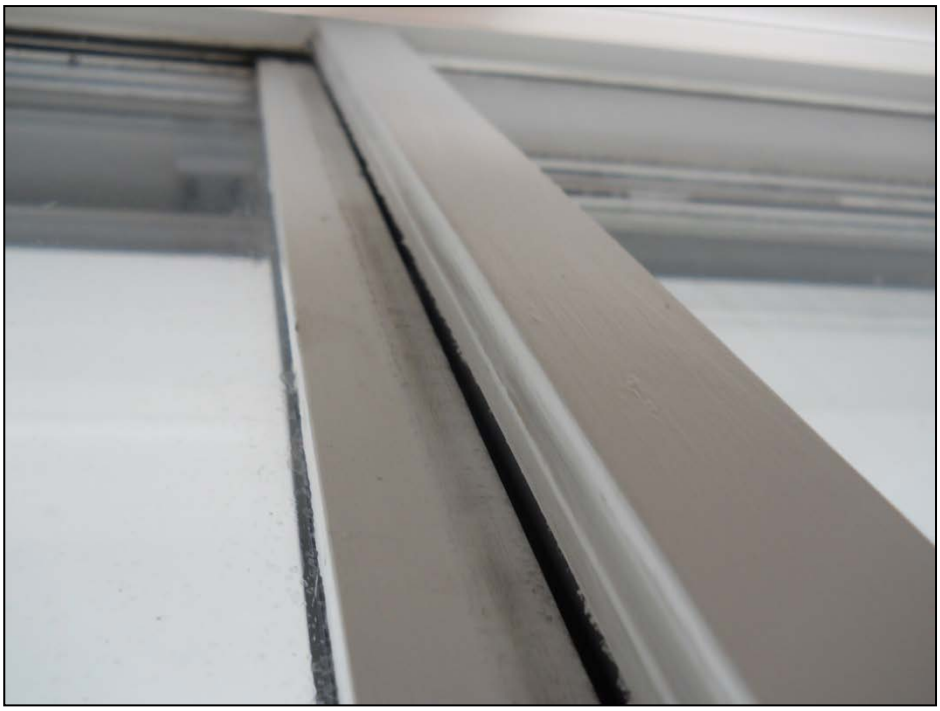
Photograph No. 3: Failed sealed joints within aluminum frame - Suite 407

Photograph No. 4: Crack in aluminum frame in operable section - Suite 407



Photograph No. 5: Aluminum frame in bedroom bowed inward - Suite 407

Photograph No. 6: Sealant at frame-to-wall connection brittle & cracked - Suite 407



Photograph No. 7: Operable sliding door out of square – Suite 1201

Photograph No. 8: Added heel bead sealant failing - Suite 1201

Photograph No. 9: Attempt to seal exterior joints in aluminum frame - Suite 1201

Photograph No. 10: Bedroom window frame bowed inward - Suite 1201

Photograph No. 11: Sealant at frame-to-wall connection brittle & cracked - Suite 1201

Photograph No. 12: Aluminum flashing added where there was a cracked concrete sill – Suite 1201

Photograph No. 13: Thermal break located at the interior of glazing

Photograph No. 14: Daylight visible through frame-to-glass junction - Pool

Photograph No. 15: Sliding door anchored into concrete slab

Photograph No. 16: Balcony sliding door frame sits directly on concrete curb

Photograph No. 17: Anchor clips fastening at fixed windows

Photograph No. 18: Gypsum metal track fastened into window frame stop

Photograph No. 19: Polyethylene Vapour Retarder (very thin)

Photograph No. 20: Exposed 6½″ concrete & electrical conduit

Photograph No. 21: Limited insulation present between sliding door sill & concrete curb

Photograph No. 22: No insulation present between sliding door frame & concrete

Photograph No. 23: 2" x 4" wood stud below fixed window frame

Photograph No. 24: Fibreglass insulation pushed between window frame & exterior concrete

Photograph No. 25: Concrete chipped out to accommodate for window frame