Building Condition Report

234 O'Connor Street
Ottawa, ON

JCAL Project Number: 16195
September 2016

Prepared By:

JOHN G. COOKE & ASSOCIATES LTD.
CONSULTING ENGINEERS

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EXECUTIVE SUMMARY

John G. Cooke & Associates Ltd (JCAL) was retained by the Heritage Section of Planning, Infrastructure and Economic Development Department of the City of Ottawa (the City) to review Consultants' reports on 234 O'Connor Street, complete a visual survey of the building and provide a second opinion on the building's state. The purpose of this report is to determine whether or not the building at 234 O'Connor should be demolished.

The building at 234 O'Connor falls within the Centretown Heritage District. It has stood vacant and unheated for approximately 15 years, following a fire. The current condition of portions of the building's masonry is poor.

The structure consists of stone masonry foundation walls and a balloon-framed, two-storey structure with exterior single-wythe brick masonry veneer. The roof is wood-framed and covered in asphalt shingles.

The building appears to have been constructed in two parts. The original building was built at the east end of the site and faces O'Connor Street; it has a western addition, constructed soon after the original building, built at the rear.

The building has some major defects:

- The foundation of the original building has signs of differential settlement at the north, east and south walls
- The mortar joints of the rubble-stone foundation walls are in poor condition
- There is fire damage localised at the south-west of the original building's second storey, original rafters have been sistered up with new lumber at this location
- The west wall's brick masonry veneer is buckling outwards and is in danger of collapsing
- The roofing of the west addition is in very poor condition and its roof deck is supporting part of a neighbouring tree

JCAL has concluded that the damage to the building is reasonably reparable. The cost of repairs should be weighed with the building's heritage value before demolition is considered.

1. INTRODUCTION

At the request of the Heritage Section of Planning, Infrastructure and Economic Development Department of the City of Ottawa (the City), John G. Cooke & Associates Ltd (JCAL) was contracted to assess the condition of the vacant property at 234 O'Connor Street. The current building owner is Gemstone Corporation (Gemstone).

2. TERMS OF REFERENCE

JCAL's terms of reference for the project are:

- Inspect foundation walls, footings, masonry, and visible/accessible structural components to assess their respective condition.
- Review the Structural Assessment and the Cultural Heritage Impact Statement prepared by other consultants and provided to the City by Gemstone
- Prepare and submit a report detailing the building's current condition.
- Provide an opinion of whether or not the building should be demolished based on an estimated cost of repairs.

3. METHODOLOGY

The property at 234 O'Connor Street was visually inspected by John Cooke, P. Eng. and Aleks Szulc, B. Eng. of JCAL on August 23, 2016. Domenico Ferrero of Gemstone was present to allow JCAL access to the building.

The building's exterior walls were inspected, damage was noted and photographs were taken. The interior faces of the foundation walls were also inspected. Visual inspection of the interiors of the ground floor and upper floor was done with the aid of flashlights.

This report contains the findings from the visit, along with our recommendations for repairs. A cost estimate is included.

4. DESCRIPTION

The building at 234 O'Connor is a two-storey, balloon-framed wood structure built on a rubble-stone foundation. The building has an approximate footprint of 100 square meters. The exterior is clad with a clay brick veneer. Based on fire insurance maps, it was constructed between 1888 and 1915. The rubble-stone foundation indicates that 234 O'Connor was likely constructed before 1910, when concrete foundations became common.

The foundation walls and framing show evidence that the original building was likely added onto twice at the rear (west); the first two-storey addition extended the original building and the second two-storey addition further extended the first.

The property has been vacant for over 15 years following a fire in the attic. As noted in previous reports, the fire started in a kitchen or bathroom of a second floor unit in the original section of the building and spread into the attic space above. The damage is limited to the upper floor and the attic as evidenced by extensive charring of the rafters. New 38x140 rafters have been sistered to the existing charred rafters to reinforce the compromised structure.

The windows and doors of 234 O'Connor have been removed and the openings have been covered over with plywood. In addition, all interior finishes and fixtures have been removed, with the exception of the plaster ceilings on the ground floor of the original

building. The building is in a rough-framing state with only parts of the original plumbing and electrical rough-ins remaining.
Dimensional, rough-sawn lumber is used for the framing of 234 O'Connor; this material is consistent with the era of construction. The roof of the building consists of 25mm thick plank sheathing supported by 50mm x 150mm rafters, spaced at approximately 815mm on centre and complete with collar ties and ceiling joists. There is no ridge beam or blocking between the rafters. The walls are sheathed on both the inside and outside with 25mm thick, horizontally oriented planks. The wall studs span the full height of the building and are 50mm x 100mm at approximately 815mm centre-to-centre. The joists are 50mm x 300mm and also spaced at 815mm. The ground floor joists are supported in the basement by a rough-hewn log summer beam.
The original lumber is old growth wood – an excellent quality material - which is denser (and thus stronger) than modern harvested lumber of the same species.

5. AVAILABLE INFORMATION

JCAL used fire insurance maps to establish the age range of the building as having originally been constructed between 1888 and 1915. The rubble-stone foundation is confirmation that the building predates 1910, which is when poured concrete foundations became common.
The City has provided JCAL with a report by Cleland Jardine Engineering Ltd (CJEL), containing an assessment of the building's structural condition surveyed on November 6, 2015. An updated report from the same Consultant from a June 1, 2016 inspection was also made available.
JCAL also received two reports from the City, prepared by Commonwealth Resource Management (CRM). The first report is a Culture Heritage Impact Statement, including the history of the building and a summary of the City Heritage By-Laws that are relevant to 234 O'Connor. The second report consists of Site Inspection Notes and Budget Estimate for repairs required to the building.

6. EXISTING CONDITIONS

The classifications used were as follows:

Good: Is defined as: the component is mainly intact and is at minor risk of damage or deterioration due to normal service conditions (environment, loading) in the short term (1 to 5 years).

Fair: Is defined as: the component is compromised and is at considerable risk of damage or deterioration due to normal service conditions (environment, loading) in the short term (1 to 5 years).

Poor: Is defined as: the component is lost or is at considerable risk of loss due to normal service conditions (environment, loading) in the short term (1 to 5 years).

6.1 Foundation

The foundation walls consist of stone masonry wall construction, comprising two rubble-stone faces with a core of loose rubble and mortar. The thicknesses of the walls vary from approximately 760mm thick at the front of the building and 600mm thick at the rear addition. The bearing medium is what appears to be a silty-sand soil. The area in which the building is situated is known to have Leda clay deposits. The rubble-stone bears directly on the soil with no footings, which was standard construction practice for the era of the building.

The condition of the foundation varies depending on its location.

The foundation of the original building – from the east wall to the interior foundation wall is in poor condition. The walls show evidence of settlement and have also been pushed inward due to lateral earth pressure. The joints between the rubble-stones are often entirely void; the remainder are filled with loose sand, with the lime binder in the mortar having been washed out some time ago.

Photograph 1 – North wall with void joints, JCAL *(2016)*

The north foundation wall, seen in Photograph 1, is in the poorest condition, with evidence of settlement and inward deflection of the wall; many of the mortar joints are void or filled with only loose sand. The south foundation wall is in poor condition – a 250mm long screwdriver can be fully driven into it's mortar joints with only a small force. It has many void mortar joints and loose sand in the remainder. The east wall, although in better shape than the north or south walls, is also in poor condition. Some mortar joints in the east wall are filled with loose sand or entirely void. The west wall is in poor condition along its short section exposed to the exterior; the interior section of this wall is in fair condition.

The foundations of the two rear additions at the western end of the building are in fair condition. The walls of the foundations show no evidence of settlement or inward bowing due to lateral earth pressure. Furthermore, the mortar joints in these walls are generally intact, with only some mortar joints having had their lime washed out.

JCAL does not share CJEL's opinion that the original building's foundation must be entirely replaced with new cast-in-place concrete. The exterior walls of the original building can be carefully underpinned in 600mm sections in order to prevent further settlement. As the underpinning is completed, major raking out of mortar joints, removal of loose stone, rubble core reconsolidation and deep repointing by an experienced stone mason can be performed. The work on the foundation walls should be first completed from the interior, followed by the excavation of the full depth of the wall in defined vertical sections and repeating the process.

However, the foundations of the rear additions require a smaller intervention - only the repointing of the mortar joints is needed.

6.2 Exterior Veneer Masonry

The exterior veneer brick masonry consists of historic clay brick with a high water absorptivity and soft, lime-based mortar. The brick has existed for at least 110 years and is in generally fair-to-good condition with localised areas in poor condition. JCAL does not share CRM's opinion that this type of brick is particularly susceptible to frost damage. Areas of spalled brick on the façade of 234 O'Connor coincide with areas where moisture is trapped within the masonry. Controlling water ingress by limiting splash-back and lowering the high grade level will prevent brick spalling. The grade must be lower than the bottom course of brick and slope away from the foundation in order to prevent moisture-related maintenance issues.

Although not visually confirmed, veneer brick of this vintage is typically anchored to the balloon framing with square-cut nails embedded in the mortar of the bed joints and nailed into the studs of the balloon-framed wall, as illustrated in Figure 2. Based on JCAL's experience, the nails are most likely spaced at 850mm both horizontally and vertically. These nails act in the same way as modern brick ties – they brace the veneer brick against wind loading and support it laterally to avoid a slender buckling failure due to the brick's self weight.

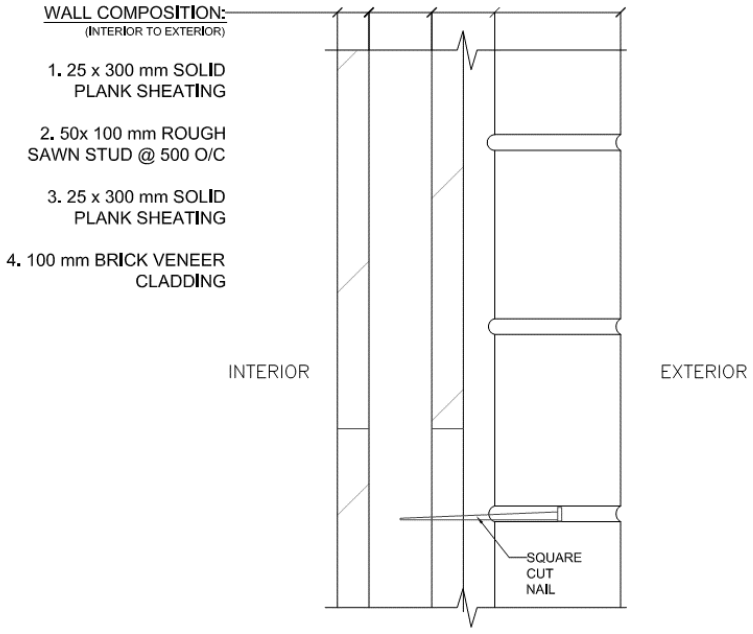

Figure 2 – Typical Wall Composition JCAL, *(2016)*

JCAL believes that the square-cut nails in the rearmost (west) wall have withdrawn from the mortar leading to the large, mid-height outward deflection (bowing) of this wall. This was likely caused by a combination of the weakening of the lime-based mortar and the drying-out of the wood studs, pulling the nails out of the backside of the mortar joints. The west wall is at risk of imminent collapse and should be shored and dismantled as soon as possible.

Generally, the brick veneer at grade is heavily spalled and in poor condition. This is due to the raising of the grade around the building over its lifetime. The earth fill piled against the absorptive brick introduces and traps moisture in the wall. In the winter, this moisture freezes and causes the brick to spall. Unlike modern brick, historic brick has relatively

high porosity levels and low compressive strength (less than 20MPa) arising from historic manufacturing practices.

Photograph 3 – Spalled North Wall at Grade, JCAL *(2016)*

JCAL does not share CJEL's opinion that the brick is crumbling at the base of the wall, as seen in Photograph 3. It is JCAL's opinion that the brick is spalling due to environmental loading (freezing of the moisture saturating the brick) and not due to compressive failure.
The failed, historic brick can be replaced with a heritage brick, such as Ibstock Brick, which is more compatible to the original than modern brick. The heritage brick's strength is higher (35MPa) and has a lower porosity, but will match the original size.
The second floor veneer brick at the original building's rear wall (west) is supported on a 50mm x 150mm wooden rafter only, as seen in Photograph 4. Although common practice at the time of the building's construction, this brick veneer should be supported on a steel lintel.

Photograph 4 – Brick supported on wood framing, JCAL *(2016)*

The east and north walls are generally in fair condition. These walls require some repointing along with localised repair and brick replacement at grade.
The south wall is in somewhat poor condition. It has breaks in the running bond pattern, pictured in Photograph 5, between the two additions. The running bond in this area will need to be rebuilt.
The brick in the first 1000mm of wall above grade is generally spalled and will require replacement. Numerous localised repairs of the south wall will also be required.

Photograph 5 - Break in running bond pattern between rear additions and spalling of painted brick, JCAL *(2016)*

JCAL noted that paint has been applied to the veneer brick, most likely to cover up defacement due to vandalism. This cosmetic treatment is not recommended for historic masonry, as the paint blocks moisture from leaving the brick façade. The trapped moisture leads to face spalling of the brick during freezing weather.

6.3 Wood Structure

As noted in the CRM report, the spacing of wood framing elements in the structure is generally not up to current codes. However, JCAL notes that the lumber used is old growth and not modern, harvested lumber. The material strengths of denser, historic lumber are considerably higher than those of new lumber. A design check of joist spans and stud unsupported heights would have to be conducted, bearing in mind the higher strengths of the historic lumber, in order to completely assess the capacity of these elements to resist loading. Since the framing is currently exposed, strengthening the existing construction does not require the costly removal and reinstatement of finishes.

Photograph 6 – Steel tele-post bearing on soil, *JCAL (2016)*

The fire-damaged structural elements have either been replaced or have been sistered-up with similarly-dimensioned lumber. JCAL does not share CRM or CJEL reservations about the post-fire framing repairs.

The joists and summer beam that constitute the ground floor framing show a small degree of wood decay where they bear on rubble-stone. Given the condition of the stone masonry walls, all wood bearing on the foundation should be checked for decay.

The basement summer beam has had redundant supports, in the form of steel tele-posts, installed. These posts, seen in Photograph 6, bear directly on the soil and will require proper reinforced concrete pad footings.

The stud cavities of the building's walls are continuously open from the basement to the attic due to the balloon framing construction. In the event of a fire, flames may rapidly spread from the ground level, to the attic through the stud bays. JCAL recommends adding fire blocking between the studs at each floor level in order to create a fire stop and to prevent the potential spread of a fire between floor levels.
The building is sheathed in wooden planks nailed at right angles to the framing. Modern codes do not permit this type of sheathing installation due to its low in-plane rigidity. Depending on the requirements of the City's Building Code Services, these deficiencies may be considered as existing, non-conforming. If required, let-in diagonal braces could be added to the wall framing and cross bracing could be nailed to the underside of joists and rafters to provide the building with better resistance to lateral loads.
JCAL does not share CJEL's assessment of the framing as being in poor condition. Wood decay is localised to only a few areas and the remainder of the lumber is in good condition. Although framing upgrades are required, they are additive in nature and retrofitting is made easier by a lack of finishes.

6.4 Roof

The roofing of the original building consists of 3-tab asphalt shingles that are in good condition. The shingles were recently replaced, probably as part of the repairs done after the fire. This roof's fascia and soffit are also in fair-to-good condition.

Photograph 7 – Daylight seen through holes in rear addition roof, *JCAL (2016)*

The roofing of the two rear additions has exceeded its useful life and is in poor condition. Although the roof sheathing in these areas shows no signs of decay from the inside, daylight is visible from the attic. In addition, there are poorly patched openings in the roof that are open to the elements, as seen in Photograph 7. The roofing in this area should be replaced as soon as possible to keep moisture out of the building, preventing wood decay. The fascia and soffit of the additions, shown in Photograph 8, will require replacement as both are heavily decayed.

A tree has fallen on the north slope of the rear roof and should be removed as it is imposing an additional load on the roof.

Photograph 8 – Roof of rear additions, *JCAL (2016)*

7. RECOMMENDATIONS

7.1 Original Building

The original building's rubble-stone foundation, as noted earlier, requires extensive masonry work. This will be required at the east, north and south walls. It appears that the north and south walls have exceeded the soil's bearing capacity and will require underpinning, installed 600mm at a time.

The posts supporting the summer beam will require new reinforced concrete pad footings.

The framing in the basement may be partially decayed and will have to be evaluated during any foundation work.

The brick masonry for the original building requires localised brick replacement and reconstruction where ground-level spalling occurs. Furthermore, helical ties should be driven through the mortar of the bed joints and into the wood sheathing. The ties should be spaced at 600mm centre-to-centre, both horizontally and vertically and will address the potentially weakened connection of the original square-headed nails.

Area of debonded brick mortar will need to be repointed. Where step cracks occur, as in Photograph 9, brick will have to be removed on either side of the crack and the area rebuilt, taking care to adjust brick spacing in order to hide any potentially wider mortar joints.

The mortar recommended for all masonry work at 234 O'Connor is King MasonCare 300 (or similar), which is a recognised type O mortar consisting of 1 part Portland cement: 2 parts type SA hydrated lime: 9 parts masonry sand (1:2:9). This mortar is preferred due to the air entrainment in the hydrated lime, which provides freeze-thaw protection, flexibility and breathability.

JCAL recommends that areas with paint should be media blasted in order to allow for the exit of moisture from the brick and to prevent more spalling.

Photograph 9 - Step cracking above opening in west end of south wall, *JCAL (2016)*

The framing of the original building may require upgrades as determined by a structural survey. At a minimum, upgrades will consist of adding fire blocking within the stud wall cavities, providing let-in braces in the wall and cross bracing the floors and roof. A provision for more framing members, in order to reduce member spacing from the current 815 mm to approximately 406 mm centre-to-centre may be required.

7.2 Rear Additions

The foundations of the rear additions are in better shape than that of the original building. A deep repointing of this foundation will be required. Similarly, to the historic brick, Type O mortar containing a higher ratio of hydrated lime to Portland cement is recommended for this work.
The installation of exterior-applied waterproofing and drainage board is recommended after foundation walls have been repointed.
The brick masonry of the rear (west) wall will have to be immediately dismantled and rebuilt. Due to the slender buckling instability of this wall, it will have to be shored and work should be performed from a boom lift in order to guard against the wall tipping over and knocking into scaffolding. This wall can then be rebuilt using either historic or modern brick as a rain-screen wall, complete with proper masonry ties into the wood framing.
The roofing of the addition requires immediate replacement.

8. ESTIMATE OF PROBABLE COST

Based on the extent of the damage noted in this report, JCAL believes that an order-of-magnitude estimate for the masonry portion of the repair costs will be in the range of $150,000-200,000. This estimate covers the repairs and rebuilding of the brick veneer as well as the repairs and rebuilding (as required) of the foundation walls. Repairing the wood framing and replacing the rear addition's roofing, should cost no more than $50,000.
The estimate is only for the required structural repairs noted in the report. It does not include finishes, mechanical, electrical and other systems (which would have been necessary regardless of the building's other deficiencies). Ultimately, the cost of the repairs should be weighed against the building's value as a heritage asset. This decision cannot be made by JCAL.

9. DISCLAIMER AND LIMITATIONS

This report is based on and limited to verbal information supplied to John G. Cooke & Associates Ltd. by the representatives of the City of Ottawa Planning and Development Department and by observations made during walk-through inspections of 234 O'Connor Street, Ottawa. Only those items that are capable of being observed and are reasonably obvious to John G. Cooke & Associates Ltd. or have been otherwise identified by other parties and detailed during this investigation can be reported.

The work reflects the Consultants' best judgement in light of the information reviewed by them at the time of preparation. There is no warranty expressed or implied by John G. Cooke & Associates Ltd. that this investigation will uncover all potential deficiencies and risks of liabilities associated with the subject property. John G. Cooke & Associates Ltd. believes, however, that the level of detail carried out in this investigation is appropriate to meet the objectives as outlined in the Terms of Reference. We cannot guarantee the completeness or accuracy of information supplied by any third party.

John G. Cooke & Associates Ltd. is not investigating or providing advice about pollutants, contaminants or hazardous materials.

Budget figures provided are based on a probable current dollar value for similar work completed under our review in the past number of years, and are provided for approximate budget purposes only. Accurate figures can only be obtained by establishing a scope of work and receiving quotes from suitable contractors.

This report has been produced for the sole use of City of Ottawa Planning and Development department and cannot be reproduced or otherwise used by any third party unless approval is obtained from John G. Cooke & Associates Ltd. No portion of this report may be used as a separate entity; it is written to be read in its entirety.

We trust that this report covers the scope of work as outlined in our Terms of Reference. Should there be any questions regarding this report, or if we can be of any further assistance to you, please contact us.

Please contact the undersigned if there are any questions. I remain,

Yours truly,

JOHN G. COOKE & ASSOCIATES LTD.

John Cooke, P.Eng., FCSC RSW Aleks Szulc, B. Eng, B. Math

10. APPENDIX

June 9, 2016

Gemstone Apartments Ltd.
851 Industrial Avenue, 2nd Floor
Ottawa, Ontario
K1G 4L3

Attention: Mr. Neil Zaret

Dear Sir:

Re: 234 O'Connor Street, Ottawa
Structural Review
Our Reference Number: 15-1415

As requested, Cleland Jardine Engineering Ltd. has updated our previous report of November 6, 2015, regarding the condition of the structural components of the two storey house located at 234 O'Connor Street, Ottawa.

234 O'Connor – East Elevation Viewed From O'Connor Street

The site was re-visited on June 1, 2016, and the following is a summary of our updated observations and recommendations.

General Description

- The building is a two storey structure that was constructed in two phases. The age of the building is unknown, however, the original house along O'Connor Street dates back over 100 years.

- At the time of our site visit, the house was unoccupied and it is readily apparent from the extensive deterioration of the interior finishes that it has been abandoned and unheated for many years.

- The main structure is wood framing supported on rubble stone foundation walls.

- The building is clad with a masonry brick veneer.

Condition of Structural Components

- The wood framing is in fair to poor condition. There had been a previous fire in the attic space of the original house and extensive charring was evident on the rafters. Supplemental wood framing has been installed beside the damaged members (See Photo One).

Photo One – Fire Damaged Roof Framing

- Areas of dry rot are present in the basement, primarily where the floor joists are embedded in the rubble stone walls (See Photo Two).

Photo Two – Dry Rot on Wood Framing

- The foundation walls are constructed of rubble stone and are in poor condition. There has been no significant change since our November 2015 inspection in that the mortar joints are very soft and easily scraped away with a screwdriver to the full depth of the walls (See Photos Three and Four).

Photo Three – Rubble Stone Wall

Photo Four – Deteriorated Mortar

- The brick cladding is in very poor condition. The deterioration appears to have advanced significantly since our November 2015 inspection and it is our professional opinion that an appreciable risk to public safety now exists.

  The brick at the rear (west elevation) is significantly cracked and bulging outward and is in imminent danger of collapse (See Photos Five and Six).

Photo Five – West Elevation Brick

Photo Six – Significant Brick Bulging

The brick on the north and south elevations is also in an advanced state of deterioration. Extensive crumbling is evident at the base of both walls (See Photos Seven and Eight)

Photo Seven – South Elevation

Photo Eight – North Elevation

Significant outward bulging of the brick is evident on the south elevation, near the steel stairs, and on the entire north elevation.

SUMMARY

It is our professional opinion and recommendation that the property should be demolished for the following reasons:

1. Extensive repairs are required to the wood framing.

2. The foundation deterioration has progressed to a point that complete removal and reconstruction is required.

3. Deterioration of the brick cladding has progressed to the point that it now poses a significant risk to public safety.

We trust the preceding is satisfactory. If you have any questions, please contact the undersigned.

Yours truly,

CLELAND JARDINE ENGINEERING LIMITED

Robert Jardine, P. Eng.

COMMONWEALTH
HISTORIC RESOURCE MANAGEMENT

PROJECT: 234 O'Connor St. Ottawa

DATE: August 4, 2016

Re: Condition & Cost Estimate

Structure, Foundations, Exterior Brickwork, and Cost Estimate:

The inspection of the building was undertaken July 28 2016. Representatives included Commonwealth, the City, councilor's representatives and members of the Centretown Community Association. The owner of the property Mr. Neil Zaret was also on-site to answer questions. He indicated that his company Gemstone Corporation had owned the building for ten months and originally planned to renovate the property as their headquarters. . The purpose of the inspection was to allow participants to view the interior and discuss the condition of the rubble limestone foundation walls, the exterior brickwork, and the general condition of the interior and exterior.

The building has been vacant for an extended period of time after a fire (approximately 15 years). The fire would appear to have started in the kitchen of a second floor unit in the rear wing of the building and spread into the attic space of the front portion of the building (Figure 1). Damage was limited to the upper floor and the attic.

Figure 1: View from the second floor to the rear wing of the building where the fire would appear to have started.

General Building Description:
The building was constructed between 1878 and 1888 and duplexed or triplexed sometime in the early 20th century. The most westerly portion of the rear wing would appear to have been constructed as an addition to the original building. There is no corresponding vertical line in the brickwork on the north elevation suggesting this might have been a door or window.

Figure 2: View of the interior stair. Note the horizontal board sheathing applied to the interior walls.

The building has a small footprint (1,126 sq.ft.) with no windows on the north and south side of the front portion of the building. The interior detailing specifically the remaining stair is simple in detail (Figure 2). A garage abutted the north side of the building as is evident by the ghosting of the roof on the brickwork. It would also appear that another structure possibly a porch abutted the south wall of the rear portion of the building as evidenced by the second storey doors and the lack of windows along the south façade other than a window in the foundation wall (Figure 3).

The original windows and doors have been removed and replaced with plywood. A porch that fronted onto O'Conner St. has also been removed as well as the roof trim on the rear portions of the building.

Figure 3: View of the south wall of the main building and rear wing. Note the lack of windows in the south wall.

Exterior Walls and Floor Structures:

The exterior walls are balloon frame construction and consist of 1" board sheathing applied to both sides of the 2" x 4" studs with a brick veneer applied to the exterior. The cavities in the walls are filled with sawdust. The framing in the exterior walls consists of 2" X 4" studs at 2'-8" on-centre supporting 2" x 8" floor joists supporting the second floor both of which do not meet current building code requirements (Figure 4). The joists of the first floor level are set into the limestone foundation walls on the east and west interior walls of the front portion of the building, as well as the south and north sides of the rear wing. The framing in the building including exterior walls, floors, and roof structure will require a substantial upgrade to meet current building code requirements.

Figure 4: View of the balloon frame construction with second floor joists in the rear wing supported on 2" x 4" studs which are visible at the bottom of the photograph.

Recommendations:
Upgrade the wall, floor, and framing to meet current building code requirements.

Masonry Foundation Walls:
The foundation walls are coursed rubble limestone units that vary in thickness and condition. The height of grade around the perimeter of the building would have been raised by a foot or more for no apparent reason. The dirt floor in the basement was damp at the time of inspection indicating that runoff from the adjacent paved surfaces is leaking into the basement through the exterior foundation walls.

The foundation walls on the main portion of the building are poorly constructed when the building was built as is evident in the stone coursing. The foundation wall at the stairs to the basement has been pushed into the interior of the building (Figure 5). A secondary coursed limestone foundation wall built up at the base of the walls on the interior side of the foundation appear to be due to the upper portions of the walls being pushed inward by earth pressure from the exterior in combination with the poor quality of the materials and workmanship.

Figure 5: View down the stair to the basement. Note the displaced foundation wall which has been pushed into the building and the floor boards which have rotated upward.

Figure 6: View of the foundation wall in the basement. Note the secondary stone wall at the base of the upper wall. This is a typical condition for foundation walls in front half of the building.

Site constraints are a complicating factor in any work that is undertaken on the foundations. The building is located within two feet of the north property line which precludes lifting the building as the piers would be located on the adjacent lot. The small footprint of the building also precludes supporting the building with piers in the basement as it would limit and impede the excavation and the placement of shoring and the concrete for the footing and foundation walls. The lot is too small to temporarily relocate the building while new foundations are installed.

Recommendations:
The deteriorated foundation walls could be sequentially underpinned, which involves supporting the interior framing, removing short sections (5 feet) of the stone foundation, excavating for a footing, and sequentially pouring new footing and foundation wall sections. The process would be repeated until the deteriorated wall sections have been replaced with a new concrete footing and foundation wall. The work would be labor intensive and therefore, expensive. The north side of the foundation would also have to be shored, and the work would encroach on the neighbour's driveway and property.

A cost estimate from Bassi Construction Ltd based on the above approach is appended to this report and is included as a line item in the construction budget estimate prepared by Gemstone Corporation, which is also appended to this report. The estimate for replacing the foundation by the sequential underpinning method is in the order of $170,000.

Brick Veneer:
The brick veneer consists of soft porous clay masonry units that are susceptible to frost damage as is evident by the spalled brickwork at the base of the wall. The spalling of the brickwork tends to be at grade and in exposed locations, i.e. at external corners. Sections of the brick veneer have been removed and replaced on the upper north-west corner of the rear wing. Previous owners painted the brick in an attempt to minimize the spalling.

The brick siding has become detached from the frame wall in a number of areas. The brick is detached and bowing outward below the two windows at the second-floor level of the east elevation fronting on O'Connor, as well as the west elevation where a structural crack extends from the foundation to the roof level. The brick veneer is also detached on portions of the north elevation below a window (Figures 7, & 8).

The brick courses at the base of the wall on the north elevation have also been displaced along with the supporting foundation wall which has been pushed laterally into the interior of the building.

The only solution to the problems with the brick veneer is to dismantle the brickwork and reapply it after the foundation walls have been replaced, and the interior frame has been rebuilt to meet code. There is some potential to salvage bricks and re-use them on the exterior as there are substantial portions of the brick veneer that have not been painted and appear to be in sound condition; however, our experience with similar projects is that modern brick units available from commercial suppliers are not a good match to the size of the older bricks.

Recommendations:
Remove and replace the brick veneer. The cost estimate for the replacement of the brick is in the order of $80,000 based on trade pricing from another project. The cost has been included in the

construction budget estimate prepared by Gemstone Corporation, which is appended to this report.

Figure 7: View of deteriorated brick at the base of the wall at the south-west corner of the front half of the building. Note the raised grade above the level of the stone foundation, and the buried brick headers at the top of a basement window.

Figure 8: View of the west wall of rear wing illustrating the detached brick veneer.

Estimated Project Budget:

Gemstone Corporation which has extensive experience in the rehabilitation of older buildings for residential uses has developed a construction estimate for the rehabilitation. The condition of the building, site constraints (lot size, and proximity of property lines) are a major contributing factor to the cost. The total cost to undertake rehabilitation of 234 O'Connor Street is $ **1,377,779.00.**

The breakdown of the estimate follows:

Cost Item Code	Cost Item Description	Cost Type Description	Unit of Measure	Units	Unit Cost	Cost
01 11 11	Miscelaneous Materials	Materials	LS	1.00	10,000.00	10,000.00
01 30 00	Administrative Requirement	Subcontract	LS	1.00	7,500.00	7,500.00
01 31 00	Project Management	Labour	LS	1.00	75,000.00	75,000.00
01 31 13	Project Coordination	Subcontract	LS	1.00	45,000.00	45,000.00
01 31 14	Architect	Subcontract	LS	1.00	25,000.00	25,000.00
01 31 15	Engineer	Subcontract	LS	1.00	12,500.00	12,500.00
01 31 16	Consultant Other	Subcontract	LS	1.00	18,000.00	18,000.00
01 41 00	Regulatory Requirements	Subcontract	LS	1.00	21,500.00	21,500.00
01 41 26	Permit Requirements	Other Expenses	LS	1.00	40,000.00	40,000.00
01 55 00	Vehicular Access and Parking	Other Expenses	LS	12.00	2,500.00	30,000.00
01 56 00	Temporary Fencing	Other Expenses	LS	12.00	1,100.00	13,200.00
01 74 01	Waste Management	Subcontract	LS	40.00	800.00	32,000.00
02 00 00	Existing Conditions	Subcontract	LS	0.00	0.00	0.00
02 21 00	Surveys	Subcontract	LS	1.00	2,500.00	2,500.00
02 22 00	Existing Conditions Assessment	Subcontract	LS	1.00	2,500.00	2,500.00
02 40 00	Demolition and Structure Moving	Subcontract	LS	1.00	80,000.00	80,000.00
02 50 00	Site Remediation	Subcontract	LS	0.00	0.00	0.00
02 58 00	Snow Control	Subcontract	LS	6.00	450.00	2,700.00
03 30 00	Cast-in-Place Concrete	Subcontract	LS	1.00	166,554.00	166,554.00
04 00 00	Masonry Brick Veneer Replacement	Subcontract	LS	1.00	80,000.00	80,000.00
04 22 00	Lintels	Subcontract	LS	22.00	500.00	11,000.00
05 10 00	Structural Metal Framing	Subcontract	LS	1.00	5,000.00	5,000.00
06 01 11	Lumber	Subcontract	LS	2,250.00	12.50	28,125.00
06 01 12	Floor joists	Subcontract	LS	1.00	14,000.00	14,000.00
06 01 13	Roof trusses	Subcontract	LS	1.00	8,000.00	8,000.00
06 10 00	Rough Carpentry	Subcontract	LS	1.00	65,000.00	65,000.00
06 11 00	Wood Framing Code upgrade	Subcontract	LS	1.00	8,000.00	8,000.00
06 15 00	Wood Decking	Subcontract	LS	0.00	0.00	0.00
Cost Item	Cost Item Description	Cost Type	Unit of	Units	Unit Cost	Cost

Code		Description	Measure			
06 16 00	Sheathing	Subcontract	LS	0.00	0.00	0.00
06 20 00	Finish Carpentry	Subcontract	LS	1.00	25,000.00	25,000.00
06 22 00	Millwork	Subcontract	LS	1.00	15,000.00	15,000.00
06 43 00	Stairs	Subcontract	LS	1.00	18,000.00	18,000.00
06 43 16	Railings	Subcontract	LS	1.00	5,000.00	5,000.00
06 46 00	Wood Trim	Subcontract	LS	1.00	8,500.00	8,500.00
06 48 00	Wood Frames and Doors	Subcontract	LS	1.00	12,500.00	12,500.00
07 20 00	Spray Foam	Subcontract	LS	1.00	25,000.00	25,000.00
07 21 00	Insulation	Subcontract	LS	1.00	12,000.00	12,000.00
07 30 00	Roofing	Subcontract	LS	1.00	18,000.00	18,000.00
07 80 00	Fire and Smoke Protection	Subcontract	LS	1.00	7,500.00	7,500.00
07 90 00	Joint Protection	Subcontract	LS	1.00	5,500.00	5,500.00
08 00 00	Openings	Subcontract	LS	0.00	0.00	0.00
08 10 00	Doors and Frames	Subcontract	LS	1.00	14,000.00	14,000.00
08 50 00	Windows	Material	LS	20.00	800.00	16,000.00
08 50 01	Window Installation	Subcontract	LS	20.00	250.00	5,000.00
08 60 00	Roof Windows and Skylights	Subcontract	LS	0.00	0.00	0.00
09 20 00	Plaster and Gypsum Board	Subcontract	LS	1.00	48,000.00	48,000.00
09 30 00	Tiling	Subcontract	LS	1.00	10,000.00	10,000.00
09 30 01	Tile Install	Subcontract	LS	1.00	8,000.00	8,000.00
09 64 00	Wood Flooring	Subcontract	LS	2,500.00	10.00	25,000.00
09 64 01	Wood Flooring Install	Subcontract	LS	2,500.00	3.50	8,750.00
09 90 00	Painting and Coating	Subcontract	LS	2,500.00	12.00	30,000.00
12 36 00	Countertops	Subcontract	LS	3.00	7,500.00	22,500.00
14 80 00	Scaffolding	Subcontract	LS	1.00	17,500.00	17,500.00
22 30 00	Plumbing Install	Subcontract	LS	1.00	14,000.00	14,000.00
22 40 00	Plumbing Fixtures	Subcontract	LS	1.00	25,000.00	25,000.00
23 00 00	HVAC	Subcontract	LS	1.00	42,000.00	42,000.00
26 00 00	Electrical	Subcontract	LS	1.00	28,000.00	28,000.00
26 00 01	Electrical Fixtures	Subcontract	LS	1.00	22,450.00	22,450.00
28 00 00	Electronic Safety and Security	Subcontract	LS	1.00	15,000.00	15,000.00
31 10 00	Site Clearing	Subcontract	LS	1.00	1,500.00	1,500.00
31 50 00	Excavation	Subcontract	LS	1.00	2,000.00	2,000.00
31 50 01	Services	Subcontract	LS	1.00	55,000.00	55,000.00
32 10 00	Landscaping	Subcontract	LS	1.00	8,000.00	8,000.00
32 10 01	Interlock	Subcontract	LS	1.00	5,000.00	5,000.00

Total Cost						**1,377,779.00**