878 KEEFER STREET

Saving and expanding an historic Strathcona home

Researched and written by Katie Filek, Vancouver Heritage Foundation

building at a glance

location	878 Keefer St
original size	1030 ft^2
new size	2300 ft^2
original building	1892
style	early vernacular
rehabilitation	2011
cost	approx. $600,000
heritage status	not registered

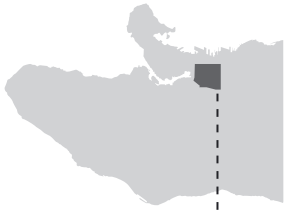
building team

owner	Brian Roche and Cheryl Knopp
contractor	Homeowner, Rendition Developments
structural engineer	Frank Nadalini, Bush Bohlman

"We were told it was a teardown, but we knew it was worth saving."

Brian Roche
homeowner

When Brian Roche and Cheryl Knopp came upon this wood-frame house located in the heart of Vancouver's oldest neighbourhood, they were told it was a teardown. The two-storey detached home, originally built in 1892, had been neglected over the years and was home to a leaking roof, poorly insulated walls and a living room blackened by years of residents using a pot belly wood stove as their heat source. While any other couple might have either moved on to other options or purchased with the intent of demolishing, Brian and Cheryl were able to see past the leaking roof and rotting porch to the hidden value of the house: elaborately carved cedar trim, high quality wooden framing and flooring, and unique layers of history that they knew they wouldn't likely find anywhere else. And while they were well aware that the rehabilitation process wouldn't be easy, the couple was looking forward to the challenge of transforming the deteriorating building into a contemporary, liveable and character-rich dwelling, with plans to extend the space via a well-integrated yet modern addition. The resulting project, aided by Brian's experience in the construction industry as a contractor, is an exploration of how much can be accomplished in working with an historic home. A focus throughout the rehabilitation process on re-using materials and maintaining heritage value, while simultaneously creating a modern, contemporarily designed home, makes the house a strong example of exploring the sustainable rehabilitation of Vancouver's older homes.



STRATHCONA

HISTORY

Brian and Cheryl's home is located in Strathcona, Vancouver's oldest neighbourhood. Originally known as the East End, Strathcona has a rich history that has evolved from its beginnings as a mere collection of shacks and cottages around Hastings Mill. Over the years it has been the "home of the working man"[1] and an entry point for immigrants from a broad range of nationalities. In the 1950's, the neighbourhood was deemed a slum by the City and narrowly escaped demolition. The residents of Strathcona have historically been bound together as a community, first through a shared feeling of alienation as new immigrants to Canada, and later by the shared struggle to save their neighbourhood from development and freeway plans in the 1960's. What has emerged today is a vibrant and thriving neighbourhood with a strong sense of identity.

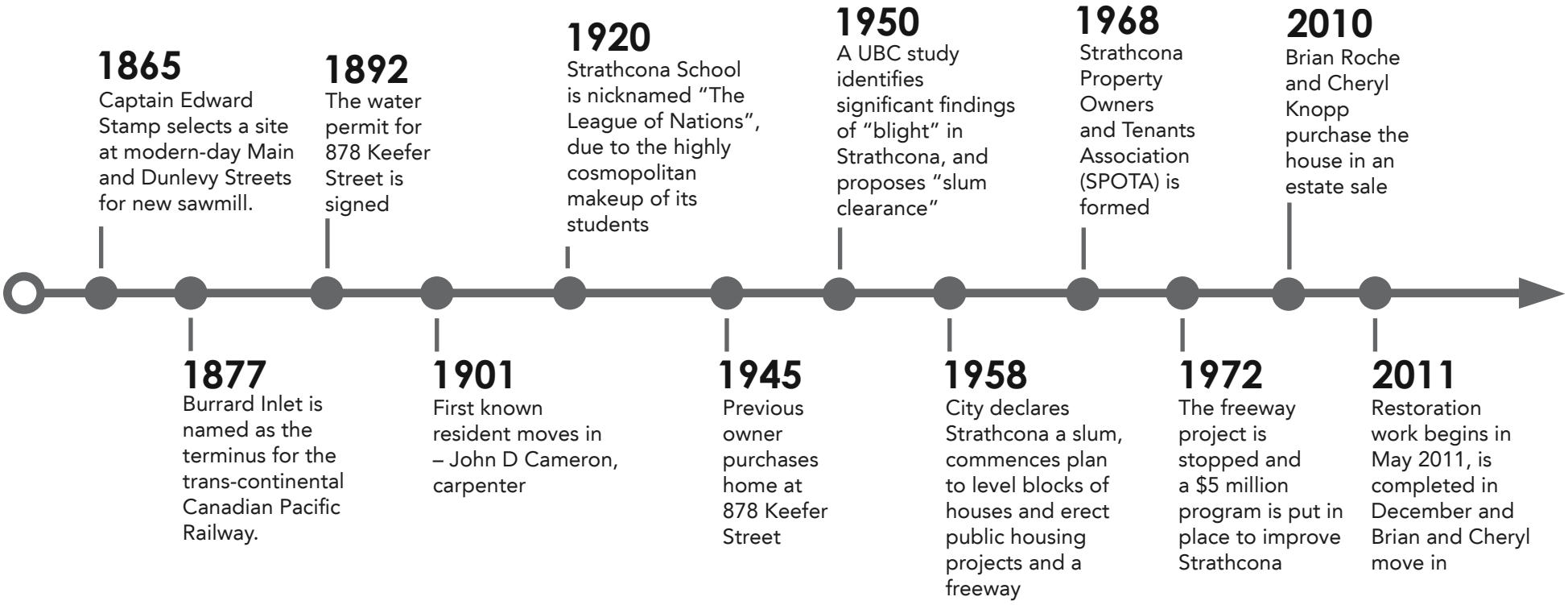
Looking west from Dunlevy and Main,1894
VPL Special Collections, Ref. 52

Strathcona School,1907
VPL Special Collections, Ref. 5000

Redevelopment of Maclean Park,1968
VPL Special Collections, Ref. 3553

[1]Atkin, John. Strathcona: Vancouver's First Neighbourhood. North Vancouver, BC: Whitecap Books, 1994. p.1.

timeline



While the neighbourhood started out in the late 1800's as a series of small board-and-batten "bachelor shacks"[1], 100 years later, Strathcona's diverse and eclectic building stock was made up of detached homes, rowhouses, apartment buildings, bakeries, auto-repair garages and small factories.[2] The detached single family home can be found throughout Strathcona, most often on a narrow 25' x 122' lot.

The water permit for this specific home indicates that it was built in 1892, while the first known occupant – John D. Cameron, a carpenter – took residence in 1901. The house was built in the Early Vernacular style, and is typical of its time period and location within Vancouver in being two-storeys tall, with a full length gable roof running perpendicular to the street and a covered front porch. The building's massing and setbacks from the street, combined with important architectural details such as carved cedar window blocks and drop siding, contribute to the home's overall character and relate it to a larger historical context within Strathcona. A look at the building's occupant history reveals it is culturally significant in indicating the neighbourhood's immigrant past: the house changed hands every few years, hosting diverse nationalities from British to Italians to Chinese to Japanese, before the previous resident moved in in 1945. She would stay for the next fifty years.

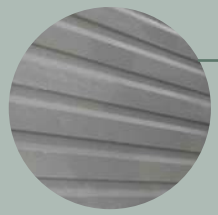
[1] Atkin, 17

[2] Kluckner, Michael. Vancouver the Way It Was. North Vancouver, BC: Whitecap Books, 1984. p. 109

THE REHABILITATION

ARCHITECTURAL DETAILS

decorative fish-scale shingles in gable



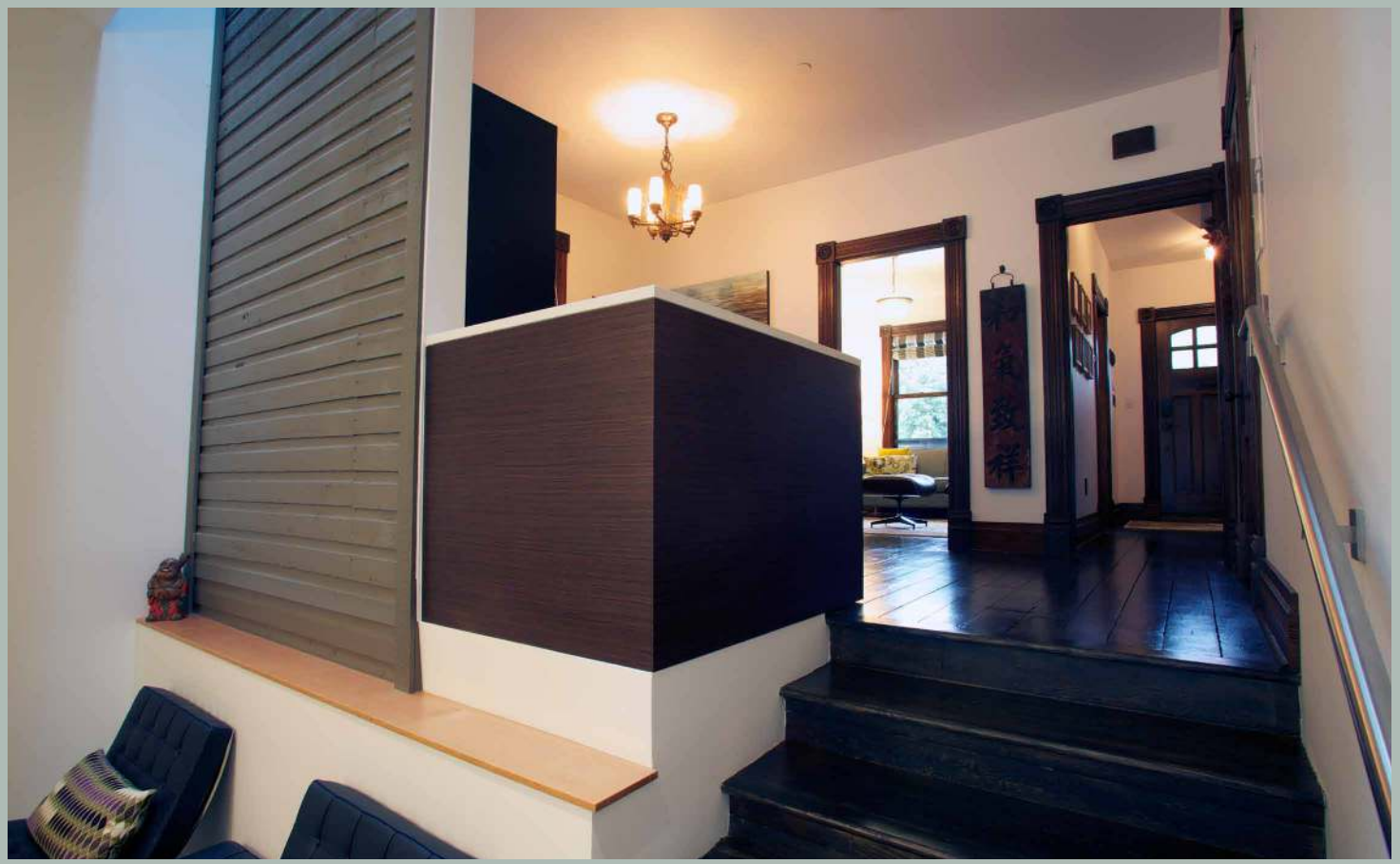
original cedar drop siding

cedar flooring and original staircase with winders

Although not visible upon the purchase of the house, many original details of the home were revealed to be in good condition. A material connection to the home's origins is maintained through their retention.

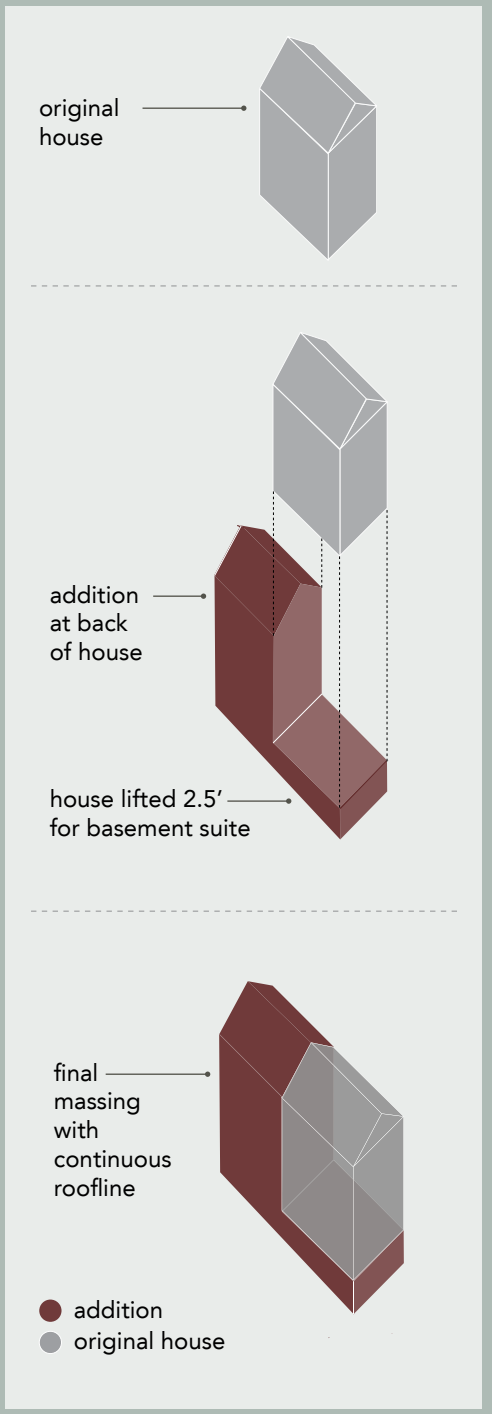
In recent decades, the maintenance of the house appears to have been neglected. After 1996, the house was left vacant and fell into a state of extreme neglect until its purchase in a 2010 estate sale by Brian and Cheryl. A degree of "modernization" carried out in the 1960's had left the house covered in a coat of stucco, with aluminum windows and a rickety backyard addition that contained a kitchen. All of these were removed in the rehabilitation.

Several significant and character-defining elements of the home were, however, still intact: the original cedar flooring had been preserved under vinyl area rugs; the exterior drop siding and fish-scale shingles in the front gable were in excellent condition beneath the stucco; the old growth cedar trim of the interiors was highly salvageable; and the wooden staircase between the first and second floors was sturdy and in good repair. Knowing that it is such details that contribute to the historical and architectural significance of the house, Brian and Cheryl made the decision to carefully and deliberately save these elements. This preservation of as much of the original fabric as possible (including the home's front façade, its massing and its setback from the street) allowed for the retention of an integral piece of Strathcona's architectural character. And although their rehabilitation included the construction of an entirely modern, 1300 ft^2 addition, the two-storey extension was built at the rear of the house, partially hidden yet visually continuous from street level. New siding was milled to match the original, creating



continuity. Even the raising of the house by 2½ feet to create room for a basement suite was done with care: the suite's entrance was placed off of the side yard, further preserving the character of the home's façade and its relationship to the surrounding streetscape. Each decision throughout the rehabilitation process was made with consideration of heritage value. As such, this house was able to relate to its neighbourhood and retain ties to its physical, geographical and social history.

The interior transition from the original home to the modern addition. Much original material is visble, including the interior feature wall with its retained siding.



Housing Form Development

VANCOUVER HERITAGE FOUNDATION

retrofitting for energy efficiency

TERMINOLOGY

R-Value

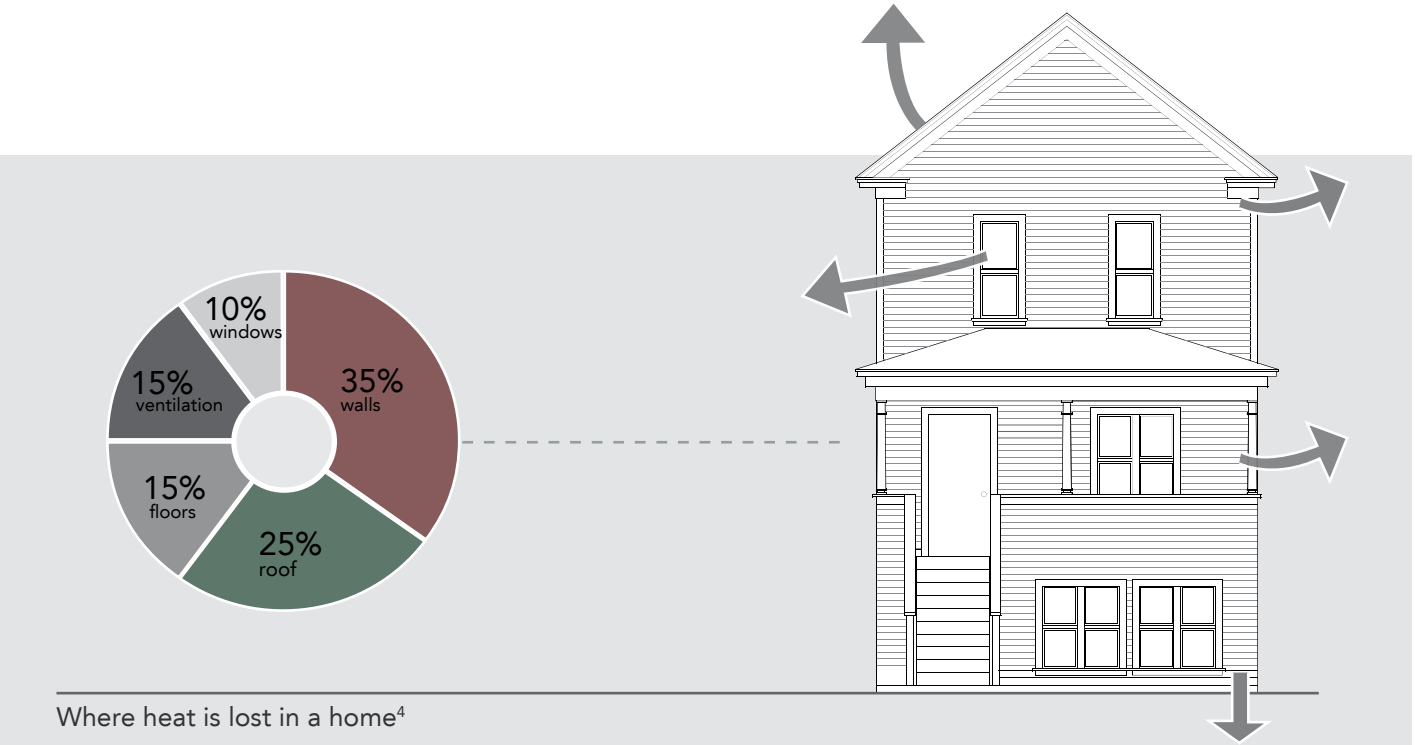
a measurement of an insulating material's resistance to heat transfer. The higher the R-value, the better the insulation's ability to resist the flow of heat.[1]

air changes per hour (ACH)

the number of times in one hour the entire volume of air in a house or room is replaced with outdoor air.[2]

air infiltration

The unintentional or accidental introduction of outside air into a building, typically through cracks in the building envelope and through use of doors for passage.[3]



Where heat is lost in a home[4]

Old houses such as 878 Keefer St. (before the renovation) have a reputation for being "drafty" – and rightly so. Houses built up until the middle of the twentieth century were usually constructed without insulation, meaning that air can flow virtually unimpeded through the walls. Although this means a house can breathe and air out, it can also lead to uncomfortably chilly interiors and make it both difficult and expensive to heat interior spaces.

Rehabilitating a heritage home offers the opportunity to improve its energy efficiency in a major way. Insulating walls, roofs and foundations is an effective method of reducing heat loss through a home's thermal boundaries, improving its energy efficiency and making it more affordable to heat. On average, space heating accounts for 63% of a Canadian home's energy consumption (NRCan 2008). In 878 Keefer St., much of the energy expended would have been quickly lost through uninsulated surfaces. Adding insulation was therefore a logical and necessary step in bringing the house up to current energy standards.

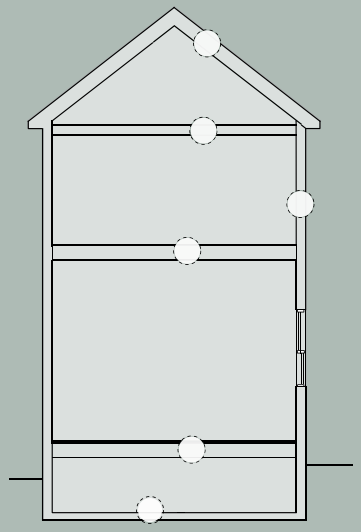
As the project included removing the interior plaster and lath, which was degraded beyond repair, the walls were stripped to the studs. This allowed for the use of spray foam insulation to fully insulate the walls. The

[1] Johnston, David and Kim Master. Green Remodeling: Changing the World One Room at a Time. Gabriola Island, BC: New Society Publishers, 2004. p. 357

[2] Ibid, 345

[3] Building Energy Codes. "Air Leakage Guide". US Department of Energy. September 2011.

[4] NRCan 2008. Energy Use Data Handbook, 1990 to 2008. Government of Canada, 2011. Web.



where insulation was installed in 878 Keefer Street - walls, ceilings, floors, roof, foundations

flooring was left in place and worked from the exposed underside. In a less extensive renovation in which the studs remain covered, other methods can be used. Loose fill cellulose, for example, may be blown into covered wall cavities with specialized equipment. Different approaches to insulation do, of course, have both advantages and disadvantages, and the choice of which to use must be made on a case-by-case basis.

Although heat loss through walls accounts for 35% of total heat loss in a home, foundations and roofs can also be responsible for a large amount of heat escaping a dwelling – 25% and 15% respectively[1]. It therefore made sense in this situation to insulate not only the walls, but the ceilings and foundations as well. Once again, the extent of the renovation gave the capacity to do so. An air blower test was carried out before and after the renovation, showing an improvement from 48 air changes per hour to less than 2 changes per hour.

[1] NRCan 2008.

CHOOSING INSULATION

While Brian and Cheryl made the decision to use spray foam in their walls, there are other alternatives when considering insulating an existing building.

Other options suitable for use in retrofitting a home include cellulose fill insulation and rigid or board-stock insulation. The advantages and disadvantages of each are listed here.

SPRAY FOAM

Applied to surfaces to block the transfer of heat and cold. Can be either closed-cell or open-cell.

advantages:

- closed-cell spray foam insulation has a high R-value of 5.5 - 6
- well-suited for tight spaces and unvented attics due to high R-value per inch
- can be used in many applications

disadvantages:

- high cost per square foot ($3 to $4.50)
- flammable, so not ideal for installation near furnace, water tank or fireplace
- may contain CFC's

CELLULOSE FILL

Loose cellulose or fibreglass is blown into a wall cavity or attic. Best for retrofitting walls or attics.

advantages:

- R-value of 3 - 3.7
- inexpensive and relatively easy to have installed
- can be blown in through holes drilled into exterior of a home with lath and plaster interiors
- can reduce air leakage by 20% to 33%[2]

disadvantages:

- requires specialized equipment
- moisture cuts the insulating properties of cellulose fiber

RIGID/BOARD-STOCK

Rigid boards of foam, mineral fibre or fibreglass. Best for exteriors, beneath siding or below ground.

advantages:

- highest R-value per inch at 3.6 - 6.7
- works well in wet conditions as fiberglass and mineral fibre products drain moisture away

disadvantages:

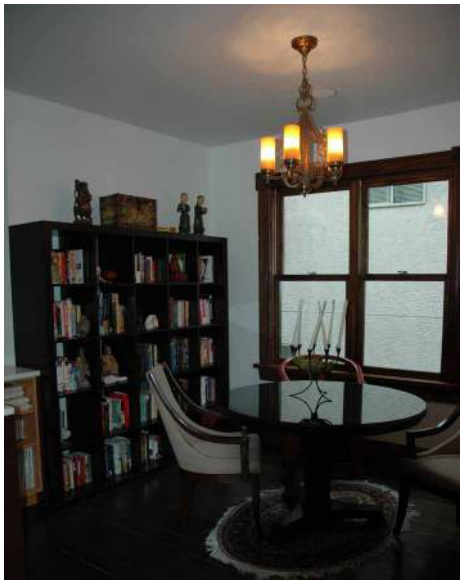
- generally selected only in the case of a major renovation, as it is installed in blocks between exposed wall studs

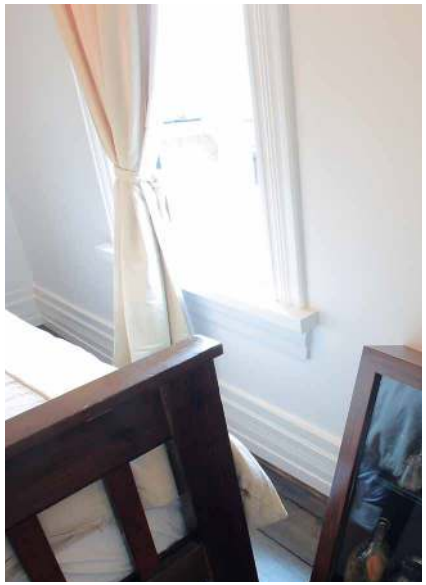
[1] Mack, C.M. What's the Best Insulation? Scotiabank Ecoliving, 2014. Web. 25 Aug. 2014.

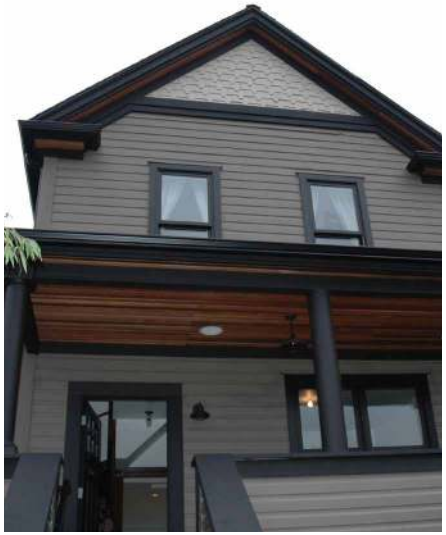
[2] Hershey, Jonathan. Reader's Digest New Complete do-it-Yourself Manual. 122 Vol. New York: Media Source, 1997. p. 457 - 460.

One further consideration in insulating the attic was that of creating a hot roof or a cold roof. A hot roof is the result of insulating against the rafters, thereby creating an insulated (and warm) attic space. A cold roof refers to insulating above the ceiling, meaning that the attic itself is not insulated. Brian and Cheryl decided to insulate below the rafters and create a hot roof. The aim of this decision was to reduce thermal bridging and energy transfer through the roof, although they then had to ensure that the attic space was properly ventilated to avoid condensation. The alternative, an unconditioned cold roof, might allow more heat to escape; however, the possibility of condensation and rot is avoided.

When it came to addressing the windows of the historic house, Brian and Cheryl knew it was important to stay true to the home's heritage character. The original windows had long since been replaced with vinyl and aluminum sliders, so choosing to repair instead of replace the windows was not a viable option. At the same time, the couple was looking for a solution that would reduce energy loss in the home. They therefore chose to replace the existing windows with double-glazed, double-hung wooden sash windows with aluminum cladding on the exterior. This exterior metal cladding - a relatively new approach - reduces maintenance of the windows' exteriors, while leaving the wood frame exposed on the interior to create a look and feel similar to what would have existed in 1892.







DISCUSSING WINDOWS

double-paned windows

windows with two panes of glass provide a more insulating barrier than a single pane, and can improve a home's thermal comfort and reduce noise transmission.

Many double-paned windows are filled with an inert gas such as krypton or argon, further slowing heat transfer.[1]

low-E coating

low-E (low emittance) coatings are thin, virtually invisible metal or metallic oxide layers on glass. They help prevent heat from escaping through glass by reflecting radiant heat waves back into a building. Another type of low-E coating helps block heat from entering into a structure in hotter months.[2]

[1] Johnston and Master, 244.

[2] Ibid, 244.

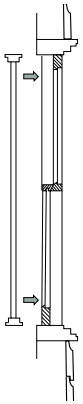
fact: windows account for only 10% of heat loss in a home[1].

[1] NRCan 2008

■ *wooden frame is revealed on interior, aluminum casing painted in heritage colours on exterior*

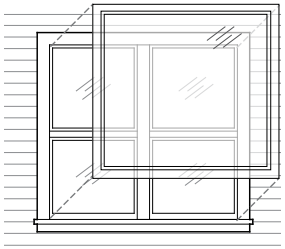
Retrofit options to increase energy efficiency

retrofit with interior panel



- mounting a panel on the inside of a single-pane window adds an insulating layer, increasing thermal efficiency and reducing noise infiltration
- panel can be glass, rigid plastic, or flexible plastic sheets

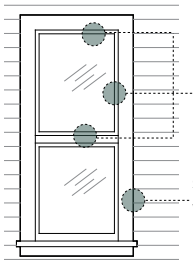
retrofit with exterior storm windows



- an exterior storm window protects the primary window from the elements and increases thermal efficiency
- may be permanent or temporary

replacement double-glazed wooden windows with aluminum casing and low-E coating were used in this project

retrofit with caulking and weather-stripping



- use a strip of metal, foam, rubber or vinyl to seal window from the elements
- prevents moisture from entering in and interior air from leaking out

WORKING WITH WINDOWS

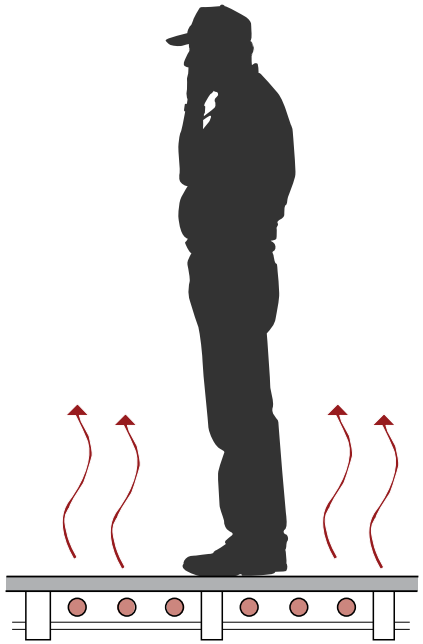
Replacing the older, leaky single-pane windows of an historic home often seems to be a logical first step in improving the building's energy efficiency.

However, building life cycle analysis demonstrates that this may be a more energy intensive and expensive choice in the long run. Due to both the energy required to produce a new window and the energy embodied in an older window, it may take years for a new, double-glazed window to make up for energy lost in replacing an older one, as well as for energy savings to make up for the financial investment. What's more, those same new windows have a shorter life cycle and may need replacing in as little as 20 years[1].

While total replacement is sometimes the answer - such as at 878 Keefer Street, where the original wood windows had already been replaced with poor-quality aluminum sliders - the recommended option is that of repairing existing windows whenever possible. With the use of paint, weatherstripping and storm windows, single pane wooden windows may be superior to their replacements in terms of materials, details and construction, and even have the potential to meet contemporary energy standards[2].

[1] English Heritage. Energy Efficiency and Historic Buildings: Draught-Proofing Windows and Doors. February 2010. Web. 24 Aug. 2014.

[2] New York Landmarks Conservancy. Repairing Old and Historic Windows: A Manual for Architects and Homeowners. New York: John Wiley & Sons, Inc.. 1992. p.9.



in-floor radiant heating

- heat rises from hot water running through tubes beneath the floorboards
- heat waves warm any objects they strike, producing an even blanket of heat
- can be up to 30% more efficient than traditional forced air heating systems[1]

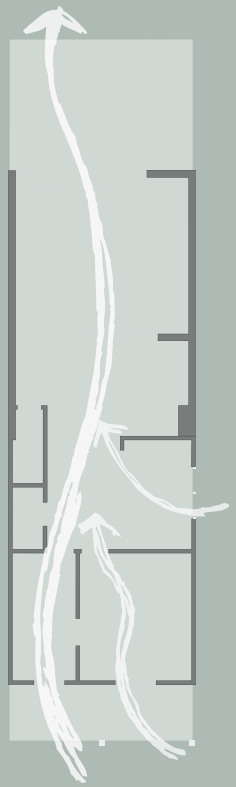
As previously mentioned, the home's most recent resident had used a pot belly stove to heat the entire house. This heating method was evidently in need of an update, due not only to preference for a cleaner, more efficient method but also due to the increased size of the house with the addition. Once again, the extent of the rehabilitation (the plaster and lath on the ceiling was removed, exposing the floor joists and boards from beneath) gave the opportunity to implement the heating system of choice: in-floor radiant heating.

In-floor hydronic radiant heating uses hot-water tubes between the floor joists that radiate invisible waves of thermal heat, warming the objects they touch and providing an even blanket of heat throughout a room. Although ambient air temperatures are slow to change, the environment stays comfortable as the room's surfaces are warmed and aren't stealing heat from occupants' bodies.

Using in-floor radiant heating can be up to 30% more energy efficient than the forced air heating systems found in many Vancouver homes, working to both increase comfort and reduce energy costs[1]. Brian and Cheryl selected a Navien tank-less hot water heater to provide the hot water for the in-floor heating. This type of water heater is small and heats water as it is required, reducing standby energy losses that occur in hot water storage tanks.

In-floor radiant heating does not address cooling; however, the maintenance of existing operable windows and the installation of new ones in a skylight ensure that the house is well-ventilated and Brian and

PASSIVE COOLING



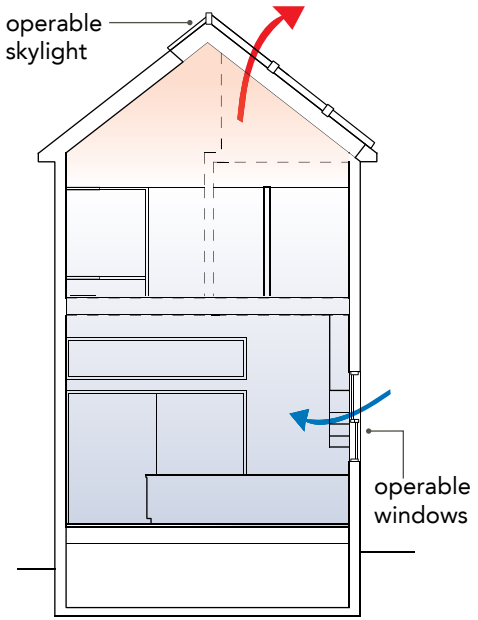
The use of natural ventilation, or air flow, to both cool and bring fresh air into a house is a passive design technique that has been used for centuries. It is often a feature of vernacular architecture.

In 878 Keefer Street, operable windows on opposite ends of the house allow for air to flow through the structure. This cross ventilation can cool bodies within the space and cool the home by removing hot air.

[1] D'Agnese Joseph. "Radiant Floor Heating". This Old House Magazine. n.d. Web. 4 Sept. 2014.

Cheryl can control the indoor environment according to their comfort level. This reduces the need for mechanical systems and relies instead on passive systems to mediate air temperature. Additionally, the deliberate placement of the 2-storey lightwell between the historic house and the addition brings light into the centre of the home, reducing the need for electric lighting throughout the day.

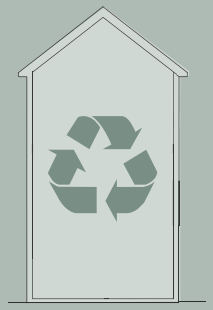
A remote that remains in the ground-floor kitchen allows one to open the skylight from a distance, creating an easily user-controlled environment.



The Stack Effect

The operable skylight provides a natural and energy efficient alternative to mechanical ventilation through use of the stack effect. Warm, stuffy air moves naturally upward and escapes through the skylight while fresh air is consistently drawn in through windows below. The house is consequently ventilated and cooled.

material recycling and re-use



waste by the numbers:

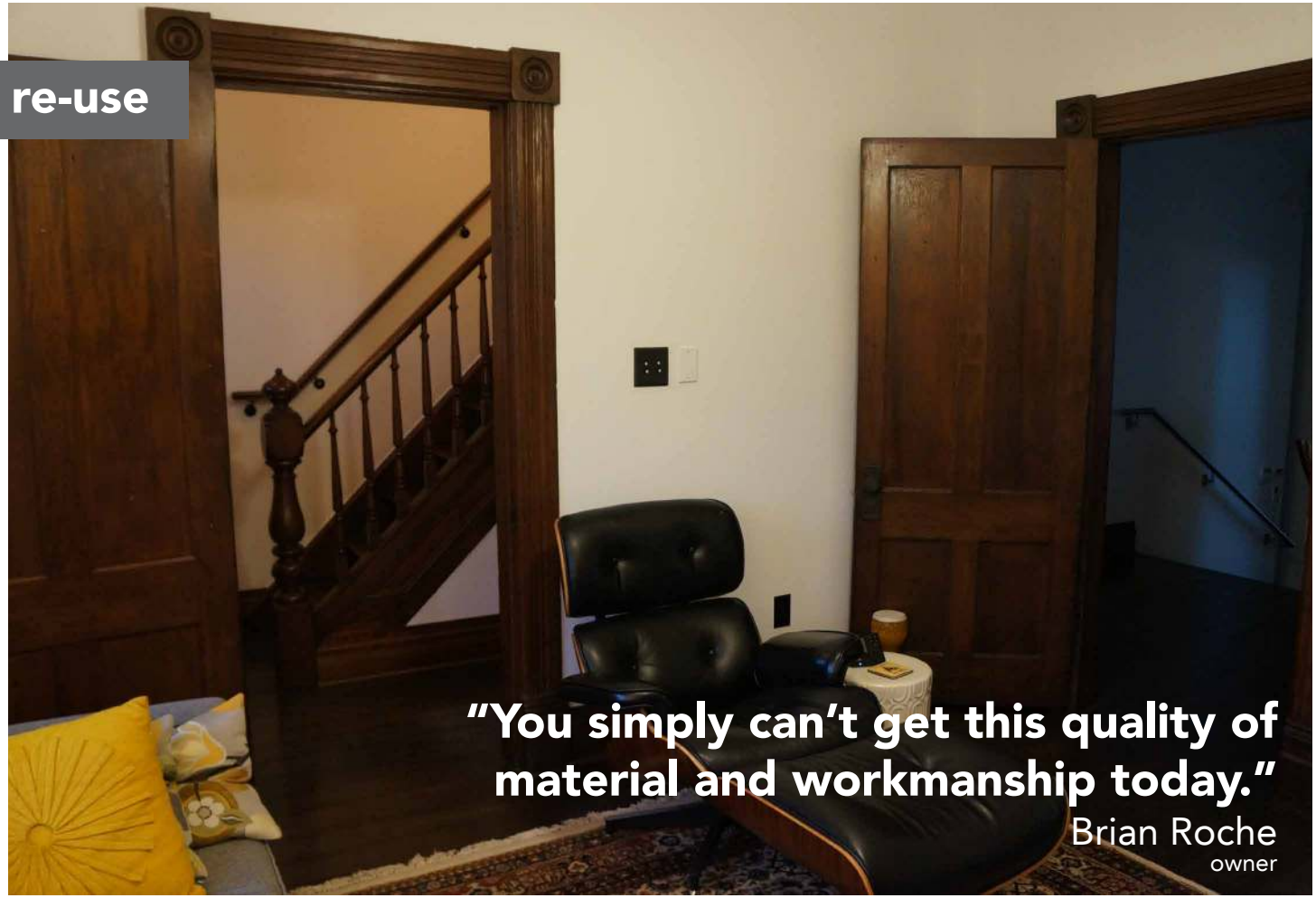
1/3 of all waste sent to the landfill in Metro Vancouver comes from construction, renovation and demolition.[1]

This amounts to **1.6 million** tonnes annually.[2]

About **60 tonnes** of material are sent to the landfill when a 2,000 square-foot house is demolished.[3]

85% of these materials could be reused.[4]

1. Metro Vancouver. "Reducing Waste in the Construction Industry". 2014. Web. 27 Oct. 2014.
2. Ibid.
3. Building Materials Reuse Association.
4. Ibid.

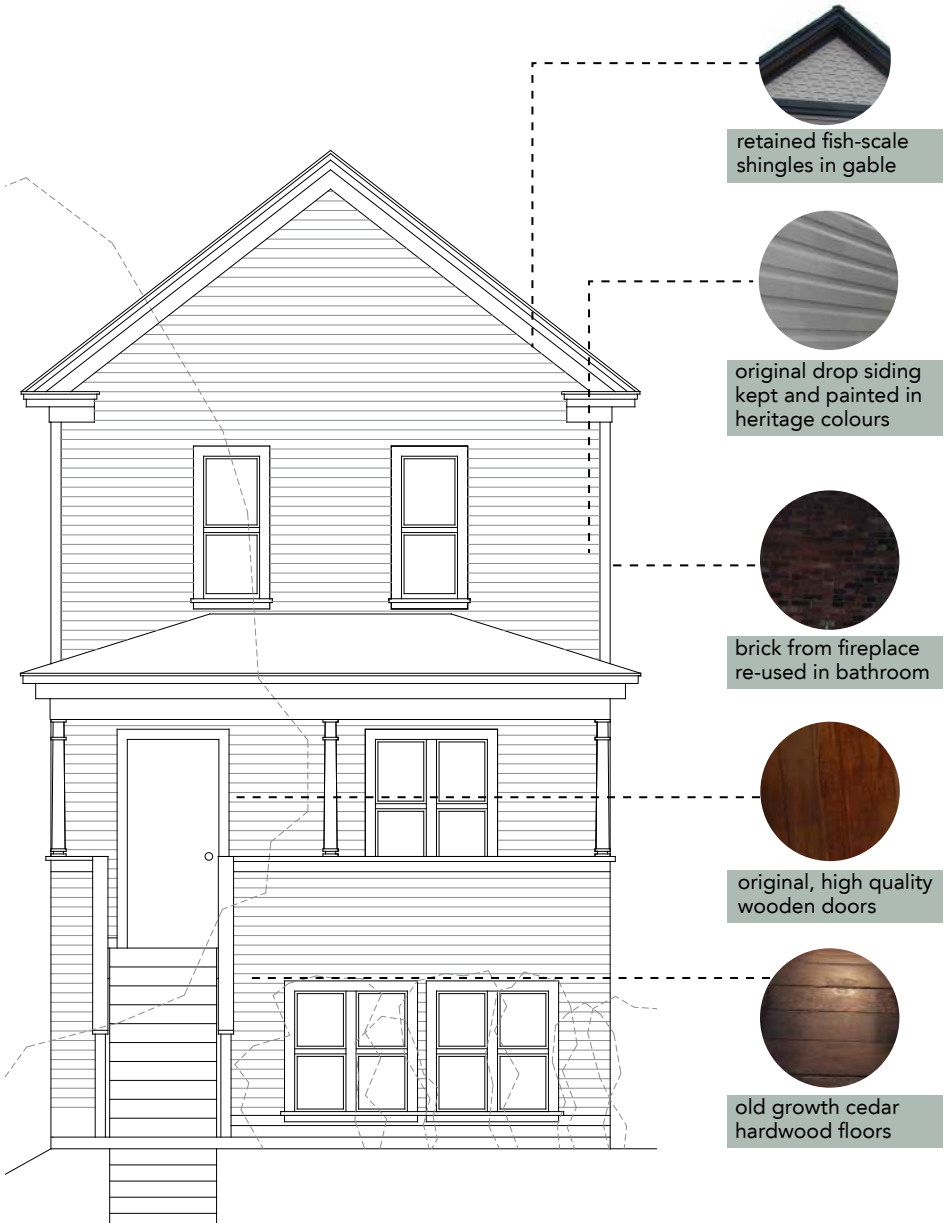


"You simply can't get this quality of material and workmanship today."

Brian Roche
owner

The home at 878 Keefer Street is made rich by detail, and the desire to retain character through these details is evident throughout the home. This stands out perhaps the most when considering the amount of material that was re-used and restored throughout the rehabilitation process. Wherever possible, original materials were retained: the exterior drop siding, the fish scale shingles in the gable, the cedar flooring and trim, and the wooden staircase (complete with winders) are all still in use. Even the bricks from the fireplace were saved and repurposed as a wall in the new master bathroom. This re-use and repurposing of materials not only reduces the amount of debris heading to the landfill, but also retains real, high quality historic fabric and a connection to Vancouver's beginnings.

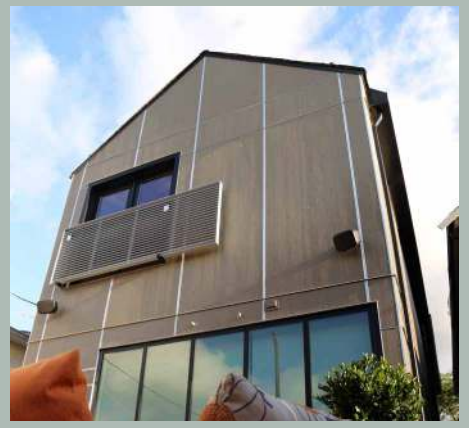
At the time of its purchasing in 2010, the home was sitting under



a heavy coat of stucco. Brian and Cheryl began by removing the stucco to reveal the original drop siding beneath, still in good condition. The siding on the new extension was made of cementious Hardiboard siding and milled to match the original in appearance. Where the back of the home was opened up to meet the extension, a wall facing the kitchen was retained with its siding intact – a reminder of the home's origins contained in its modern counterpart. The cedar flooring was retained in place along with the original cedar trim framing the doorways and the baseboards. In some cases the trim and moulding was missing or damaged beyond repair; when this occurred it was replaced with matching fir pieces. Brian notes that the craftsmanship and quality of work that was standard at the time of the home's construction is sadly now unusual. As a developer with an eye for design, he is well aware that it is the details of a project that can make it successful. Brian therefore made certain that care was taken with any replacement pieces, and sought to ensure both quality and detail in replicating the pieces' predecessors. Any new corner blocks of doors, for example, were first carved by hand, then placed in a bag filled with rocks and shaken to match the aged appearance of the original 1892 corner blocks.

Much of this meticulous attention to detail was carried out to ensure that the heritage character of the home was not lost. The original doors did not have to be maintained; the lighting fixtures on the second floor did not have to be derived from a 1901 patent (as they were). However, using original materials where possible and taking care to use era-appropriate replacements where necessary both retains real historic fabric, and ties the house to its history. Due to a careful rehabilitation and construction process, this house relates to both contemporary times and to its beginnings.

heritage and a sense of place



View of the house from the laneway, showing its sympathetic roofline and modern yet complementary materials

The architecture of Strathcona presents a visual and spatial narrative of the neighbourhood's history. The area is distinctive in its urban form, being the last surviving neighbourhood in Vancouver to have been developed before the introduction of the street car. The streetscape, lined with the gabled roofs of Vancouver's early detached homes, is unique to Strathcona due to the large number of historic buildings that have survived over the years.

Overall, maintaining the heritage landscape of Strathcona through preserving facades, roof lines, massing, and overall character of its buildings is integral in allowing its residents to develop a sense of place. The strong sense of community that pervades in Strathcona can be augmented by this continuation of, and attachment to, its built history. Preservation of historic environments such as Strathcona is key in ensuring the cultural sustainability of communities; feelings of pride and identification with a place often leads to increased local engagement and a lower likelihood of moving away. Preservation of historic fabric in Vancouver is often a homeowner's choice; however, the importance of maintaining the neighbourhood's heritage character has been recognized by the city, and unique zoning measures have been put in place in Strathcona to limit changes to its heritage streetscape.

The project at 878 Keefer St. specifically demonstrates how

Further reading:

Vancouver Heritage Foundation, "Conserving Heritage Buildings in a Green and Growing Vancouver" (2012)

url: http://www.vancouverheritagefoundation.org/wp-content/uploads/2013/01/Conserving-Heritage-Report-FINAL.pdf

brick and mortar fabric and connections to the past may be maintained, while still adapting the building for current use. Although the interiors have been altered and expanded in order to create spaces enjoyable by today's standards, careful attention was paid to ensure that the street-facing façade was restored to relate to its surroundings. The southern elevation of the house, that which faces the laneway, presents a more modern face and reveals that parts of the house are of contemporary construction and design. However, the addition still corresponds to the surrounding buildings and the original home itself through massing and material choices. Strathcona is distinct in its built heritage, a fact that the rehabilitation of this building recognizes and respects.

Examples of heritage streetscapes found in Strathcona (top: Hawks Ave., below: 600 block of East Georgia St.)

Strathcona's RT3-Zoning

The neighbourhood of Strathcona is unique in having special residential zoning, as part of the RT-3 Two-Family Zoning District. The goal of this zoning designation is to encourage the retention of neighbourhood and streetscape character, "particularly through the retention, renovation and restoration of existing character buildings". The external design of additions and new buildings are emphasized in order to preserve the area's overall historical architectural character.[1]

Strathcona has more than 200 structures listed on the City of Vancouver's Heritage Register. These buildings reflect the area's heritage character and its history. Its special zoning indicates that this has been recognized by the City, and is a significant step in preserving Vancouver's oldest district.

[1] "RT-3 District Schedule". The City of Vancouver: Zoning and Development By-law. October 1996. Web. 27 Oct. 2014.

urban densification + affordability

Owning a detached home in Vancouver is something that has become a financial impossibility for many of its residents. While housing prices on Vancouver's East Side have traditionally been lower than their counterparts on the West Side, they are far from low: as of March 2014, the average cost for a detached home in East Vancouver was $942,555.[1] Strathcona itself is more affordable than some areas. However, prices continue to rise as more people discover the many advantages and appeal of the area.

Brian and Cheryl were fortunate in finding a house with structural integrity, heritage character and high quality original elements in an estate sale. The extent of the rehabilitation itself, in addition to new construction for the addition, was a significant financial investment. To offset this cost, the couple included a basement suite as part of the addition to the home – a long-accepted Vancouver method of providing a secondary income. At the same time, the inclusion of a basement suite diversifies the types of dwellings in the neighbourhood, increasing overall socioeconomic diversity of its residents. It also adds density in one of Vancouver's most walkable neighbourhoods – a factor in line with Vancouver's goals of creating dense, walkable communities close to green transportation (as seen in the City's Greenest City 2020 Action Plan).

[1] Altus Group. "Altus RVA Single Family Housing Historical Market Review". The Province. 5 June 2014. Web. Accessed 22 Sept. 2014.

Floor plans showing 878 Keefer Street following its rehabilitation and expansion; spaces shaded grey are additions, those left white belong to the original house

Heritage and Job Creation

Heritage conservation can play an important role not only in reducing energy expended on construction and demolition, but also in the creation of jobs for those in the heritage sector. In rehabilitating 878 Keefer Street, for example, specialized carpenters were hired to restore and reinstate trim and details. Heritage consultants are often hired to put together a conservation plan and statement of significance.

On average, a historic preservation project will create more jobs than a new construction project with a similar budget.[1]

[1] PlaceEconomics. "Measuring the Economics of Preservation: Recent Findings". Prepared for the Advisory Council on Historic Preservation. June 2011. Web. 22 Oct. 2014.

Further reading:

City of Vancouver, "Greenest City 2020 Action Plan". 2011.

url: http://vancouver.ca/files/cov/Greenest-city-action-plan.pdf

rehabilitating for sustainability:

environmental sustainability

- improving building's energy efficiency
- keeping high quality materials from the landfill
- reducing energy costs by reusing existing materials instead of building entirely anew

cultural/social sustainability

- retaining a material connection to Strathcona's past
- nurturing a sense of place in the neighbourhood
- enriching architectural diversity

economic sustainability

- provision of a diversity of dwelling types
- supporting jobs in the heritage sector

CONCLUDING POINTS

Taking on the rehabilitation of 878 Keefer Street was not an easy task. Considerations ranged from that of ensuring structural integrity, bringing a historic house up to contemporary energy standards, and updating and expanding the home while staying true to Strathcona's heritage character. It was, however, a project taken on with enthusiasm, and a readiness to embrace the challenge. The resulting home is an example of how a heritage home can be successfully rehabilitated to meet sustainability goals in all sectors. It contributes to environmental sustainability, through improving energy efficiency, reducing potential demolition waste and saving energy that would have been expended in producing new materials. It supplies cultural sustainability in maintaining the historic streetscape of Strathcona and ensuring a continued sense of place for the neighbourhood's residents. And finally, the project at 878 Keefer Street provides economic sustainability through the provision of a variety of dwelling types within the neighbourhood and the employment of skilled workers in the heritage sector.

Overall, this type of project is integral to maintaining the historic building stock of Vancouver – providing a characterful home with the maintenance and care it needs, continuing its use and ensuring its future.

bibliography

Altus Group. "Altus RVA Single Family Housing Historical Market Review". The Province. 5 June 2014. Web. Accessed 22 Sept. 2014.

Atkin, John. Strathcona: Vancouver's First Neighbourhood. North Vancouver, BC: Whitecap Books, 1994.

D'Agnese, Joseph. "Radiant Floor Heating". This Old House Magazine. n.d.. Web. 4 Sept. 2014.

English Heritage. Energy conservation in Historic Buildings. 2008. Web. 22 Aug. 2014.

English Heritage. Energy Efficiency and Historic Buildings: Draught-Proofing Windows and Doors. February 2010. Web. 24 Aug. 2014.

Hershey, Jonathan. Reader's Digest New Complete do-it-Yourself Manual. 122 Vol. New York: Media Source, 1997.

Johnston, David and Kim Master. Green Remodeling: Changing the World One Room at a Time. Gabriola Island, BC: New Society Publishers, 2004.

Kluckner, Michael. Vancouver The Way It Was. North Vancouver, BC: Whitecap Books, 1984.

Mack, C.M. ``What's the Best Insulation?`` Scotiabank Ecoliving, 2014. Web. 25 Aug. 2014.

Metro Vancouver. "Reducing Waste in the Construction Industry". n.p.. 2014. Web. 27 Oct. 2014.

NRCan 2008. Energy Use Data Handbook, 1990 to 2008. Government of Canada, 2011. Web. 25 Aug 2014.

New York Landmarks Conservancy. Repairing Old and Historic Windows: A Manual for Architects and Homeowners. New York: John Wiley & Sons, Inc. 1992.

PlaceEconomics. "Measuring the Economics of Preservation: Recent Findings". Prepared for the Advisory Council on Historic Preservation. June 2011. Web. 22 Oct. 2014.

"RT-3 District Schedule". The City of Vancouver: Zoning and Development By-law. October 1996. Web. 27 Oct. 2014.

Vancouver Heritage Foundation. Conserving Heritage Buildings in a Green and Growing Vancouver. 2012. Web. 16 Sept. 2014.

A publication of Vancouver Heritage Foundation, 2014.

acknowledgments

The following individuals were instrumental in the creation of this document:

Brian Roche, Rendition Developments

Jim Stiven, Vintage Woodworks

Thank you to all involved.
This project has been made possible by the Government of Canada.

HERITAGE CANADA NATIONAL TRUST HÉRITAGE CANADA FIDUCIE NATIONALE

Canada

Jeunesse Canada au travail

Katie Filek
B.Ends, UBC 2014
VHF Intern
Writer/Researcher

VANCOUVER HERITAGE FOUNDATION