Barriers to the Conservation of Pre-World War II Residential Wood Windows

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

The decision to practise conservation or replacement of deteriorated building components is a highly polarised issue between many building owners, product suppliers, contractors and heritage advocates. Many stakeholders have an attitude that new is better than old. This is especially true with windows, when considering whether to practise conservation on deteriorated original wood windows or whether to replace them with new windows. Most window suppliers and contractors recommend window replacement with new vinyl replacement windows, stressing energy savings and maintenance free installations. Advocates of conservation stress the importance of conservation for cultural heritage value, environmental benefits and economic benefits. Conservation advocates also refute that new replacement windows provide significant energy savings.

Vast numbers of pre-World War II residential wood windows continue to be replaced with new replacement windows. Acknowledging replacement is often the option of choice, this research study addresses the question, are there barriers to the conservation of pre-World War II residential wood windows? This study includes surveys and interviews with homeowners and other stakeholders to obtain their opinions of the reasons for choosing either conservation or replacement. A case study is used for this research, which utilises the homes of the pre-World War II residential neighbourhoods in Stratford, Ontario. This research reveals that homeowners of these older houses, who have proper knowledge and resources, will have a preference for window conservation.

Analysed data reveals that older residential wood windows contribute to a community's cultural heritage value. The heritage planning implications gained from the case study demonstrates that heritage planning policies need to acknowledge older residential wood windows as a heritage resource for homeowners and the larger community.

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Special thanks goes to my many colleagues and friends, too numerous to mention by name, who have given their encouragement and advice on this thesis.

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CHAPTER 1 – INTRODUCTION

1.1 Background

Heritage planning includes conservation of the built environment. Physical components of the built environment, such as older buildings and streetscapes, are often considered heritage resources. The merits of conservation of these resources are often debated. This is particularly the case when considering conservation of original wood windows. Original windows constitute a major component of an older building, but are often subject to debate on the merits of their conservation. Many heritage advocates stress the importance of maintaining the cultural heritage value of existing wood windows. However, many owners of heritage properties replace original wood windows believing window replacement provides greater benefits than conservation. In many instances, owners are advised that window conservation is too expensive.

Pertaining to pre-World War II houses, there is a trend of window replacement in lieu of conservation. Travel to older urban communities in Canada, and you will notice many of these older pre-World War II houses have newer replacement windows. Usually, these replacement windows are white vinyl windows. This trend tends to be more pronounced in older urban neighbourhoods experiencing rapid urban revitalisation. For example, a visit to downtown St. John's, NL, reveals rows of newly renovated traditional row houses. Common to the majority of these older row houses is the installation of white vinyl replacement windows [Fig. 1]. From a heritage conservation perspective, this example of window replacement represents an irreplaceable heritage loss. This perspective leads to questioning of the rationale for these windows being replaced.

To illustrate one possible reason for window replacement, consider a recent "house for sale" advertisement for a century old house [Fig. 2]. This advertisement could represent any number of older houses with newer replacement windows. The advertisement markets this house as being an eco-friendly house with replacement windows. Typically, the current homeowner will have replaced their ordinal wood windows with new non-wood

Figure 1: Example of Window Replacement, St. John's, NL

replacement windows. Often this means the homeowner didn't consider the house's original wood windows worth keeping, probably with the belief that new replacement windows would increase market value of the house, due to perceived lower heating costs. This scenario is frustrating for many heritage advocates who believe original wood windows are worth keeping due to their cultural heritage value. The actual issue is more complex, as there could be many underlying reasons why homeowners of older houses don't conserve their windows.


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100 - HOUSES FOR SALE

ECO-FRIENDLY CENTURY HOME - Fully insulated, replacement windows, 95% eff furnace. Enclosed front porch. Kitchen w/ island and sliders to rear deck. Call Steve **519-273-**

Figure 2: Example of House for Sale Advertisement

1.2 Research Questions and Objectives

1.2.1 Overview

Houses constructed prior to the 1950s, typically up until World War II, were usually built with single-glazed, operable, wood sashed windows combined with single-glazed, wood storm windows. All existing wood windows periodically need repair and maintenance. This is generally referred to as conservation work. At some point in time, most owners of these older houses are faced with the decision to either conserve their original wood windows or replace them with new windows. Many of these older windows will be replaced with new replacement windows.

Each year thousands of existing original pre-World War II residential wood windows are unnecessarily replaced and sent to landfill (Leeke, 2009). Usually homeowners replace them with new vinyl, aluminum or composite wood clad, double-glazed replacement windows. Often this decision seems to be swayed by window sales people, who offer the hope for large energy savings. Window sales people, according to Alter (2009), provide misleading information to homeowners. Although, as a culture we are becoming more environmentally conscious, it may well be that our throw away culture still leads to a lot of unnecessary window replacement (Carroon, 2010). There is extensive literature supporting this position of unnecessary window replacement. However, as there is a trend that seems to favour replacement, it is a hypothesis, that there are barriers to the conservation of original residential wood windows.

1.2.2 Problem Statement, Research Questions and Objectives

Problem Statement

Given that thousands of pre-World War II residential wood windows are unnecessarily thrown away as stated by Leeke (2009), there is a need to find answers to address the above hypothesis that there are barriers to the conservation of these original residential wood windows.

Research Questions

The central research question is: are there barriers to the conservation of pre-World War II residential wood windows, and if so, what are they?

This central research question also leads to many sub-questions, but all of them leading back to addressing the central research question:

1. What are the benefits of wood window conservation?
2. What are the non-benefits of window conservation, or conversely what are the benefits of replacement?
3. What are the reasons that lead homeowners to either conserve or replace?
4. What are the costs to homeowners for conservation of original wood windows compared to replacement?
5. Is there really a preference for replacement in lieu of conservation?

Research Objectives

The specific objectives of this research are:

1. To answer the central research question, if there are barriers to the conservation of pre-World War II residential wood windows, what are they?
2. To provide informative literature that provides a greater insight into the barriers against conservation of these older residential wood windows, if there are barriers.
3. To provide recommendations to professionals in the field of conservation that can lead to more effective strategies for conservation.
4. To provide homeowners with more information on window conservation, allowing them to make better informed decisions.

1.3 Research Significance

Too often a homeowner's decision is based on preconceived ideas rather than rational reasons (Carroon, 2010). From a conservation perspective, maintaining resource artifacts having heritage value, including older pre-World War II wood residential windows, is a priority. Every time a homeowner replaces an original wood window a piece of authentic

heritage fabric of a house is lost. From a conservation perspective, this loss is more than just a loss for a specific house, but also a loss for its neighbourhood and for the larger community. Advocates for heritage conservation tend to understand this, but the decision to conserve windows usually rests with the individual homeowner. From a heritage planning perspective, replaced windows are a problem, a non-reversible loss of heritage. In the endeavour to solve a problem, one has to understand the problem. Central to this problem is to understand a homeowner's rationale on why they would choose replacement in lieu of conservation. This research addresses this problem by gathering data in the form of opinions from homeowners and other stakeholders. By analysing the data this research will answer the research questions and achieve its objectives. This research will contribute to literature and hopefully provide stimulus for more conservation, which would strengthen an existing but limited size conservation industry. This research will also contribute to the field of heritage planning. Not only is this good from a conservation perspective, but on more of global level, more window conservation has benefits for reducing energy consumption and undesirable environmental impact (Parrett, 2007).

1.4 Thesis Layout

The pathway for this thesis research starts with the big picture of urban planning and narrows to heritage conservation. The specific focus of this thesis is the conservation of pre-World War II residential wood windows. The motivation and problem statement stems from past experiences which have led to the central research question: are there barriers to the conservation of pre-World War II residential wood windows, and if so, what are they? This question and related sub-questions leads to the literature review primarily focusing on benefits and obstacles to wood window conservation. If there are significant benefits in conserving windows, then it would appear that, there must be barriers, if replacement is common practise. This leads to exploratory research, data collection, analysis and to the identification of barriers. A discussion of these barriers leads to recommended strategies for more efficient conservation.

The Layout

There are eight chapters in this thesis:

1. Chapter 1 – Introduction: Introduces the topic background, the problem, the research questions, objectives and the significance.
2. Chapter 2 – Literature Review: Presents a review of relevant literature on conservation of wood windows.
3. Chapter 3 – Research Methodology: Outlines the research methods including three exploratory investigations.
4. Chapter 4 – The Study Area: Provides a description of the houses and windows used as a case study in Stratford, Ontario, for this research.
5. Chapter 5 – Findings: Provides a summary of the collected data from a homeowner mail survey and stakeholder interviews. Complete data is presented in Appendix B.
6. Chapter 6 – Analysis of Findings: Delivers the analysis of the collected data.
7. Chapter 7 – Discussion and Recommendations: Identifies the barriers, discusses conservation market potential and provides recommendations to reduce barriers.
8. Chapter 8 – Summary and Conclusions: Provides a summary and conclusions of the research.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

The first step in answering the research questions is to explore literature pertaining to the conservation of pre-World War II wood windows. The following is a summary, which includes a contextual review of conservation and windows, and a review of window conservation following five themes: cultural, energy and environmental, maintenance and operation, cost and economics, and legal. Each theme provides a perspective which helps illustrate benefits of conservation as well as obstacles to wood window conservation. These perspectives are used in this study's exploratory research as outlined in Chapter 3 – Research Methodology.

2.2 Contextual

2.2.1 Conservation

A description of conservation includes all activities to protect cultural artifacts for the future. Activities include studying, recording, retaining and preserving artifacts with the least intervention (Earl, 2003; Parks Canada, 2008). This description also applies to the conservation of pre-World War II wood windows. In residential wood window conservation, the primary activities include keeping, repairing and maintaining original wood windows with the least amount of alteration.

Conservation philosophy, with resultant standards, has been in ongoing development in Europe and North America for over 200 years. Many conservation standards have been an outgrowth of conservation philosophy established from past manifestos and charters, such as the Venice Charter and Burra Charter (Earl, 2003).

In Canada, conservation philosophy and past conservation standards have led to Canada's current conservation standard, *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada, 2008). These Canadian standards include definitions, standards and guidelines for conserving older wood windows. As written in these

standards, (Parks Canada, 2008), conservation includes three main activities: preservation, rehabilitation and restoration. All three of these related activities are intended to protect cultural heritage value. Only in cases of extreme window deterioration is replacement with a compatible substitute window considered acceptable, and only when the same type of material is not available or not economically feasible. These standards provide both recommended and not recommended actions. For example,

> **Recommended** – preserving windows and their functional and decorative components – such as frames, sashes, muntins, glazing, sills, heads, hoodmoulds, panelled or decorated jambs and mouldings, interior and exterior shutters and blinds – that are important in defining the overall heritage value of the building. (Parks Canada, 2008, guidelines - buildings p. 25)
>
> **Not recommended** – removing or radically changing windows that are important in defining the heritage of the building. (Parks Canada, 2008, guidelines - buildings p. 25)

These standards have been developed to provide guidance for the protection of historic buildings, which are deemed to have recognised heritage value (Parks Canada, 2008).

2.2.2 Role of Windows

Windows have both an aesthetic and functional role in house design. The primary functional role of a window is to allow for day lighting, natural ventilation and views (Louw, 2007; Roberts and Wilson, 2011). Prior to 20th century mechanical and electrical systems, windows were the principal means for day lighting and ventilation in buildings. Historically, windows were simply openings in exterior walls. The development of glass allowed for enclosing these openings, while still allowing day lighting.

Windows can be referred to as either fixed or operable. Fixed windows only allow for day lighting and views. Operable windows can be opened for natural ventilation. The three main components of an operable window are a frame, sash and glass. Glass, referred to as glazing, is installed in a sash. The sash is installed into a frame, which in turn, is installed

into a wall opening. Sashes are typically designed so they can be operable to allow natural ventilation.

Other functional roles noted by Roberts and Wilson (2011), includes keeping insects out, keeping children and pets in, and keeping intruders out. In performing these roles, windows are designed to (Roberts and Wilson, 2011):

- control air leakage, both infiltration and exfiltration
- control heat loss from the interior
- control solar heat gain from the exterior
- control water leakage from rain
- be easy to operate
- be easily cleaned
- be safe
- be durable

2.2.3 New Residential Replacement Windows

New replacement windows are categorised into two types of replacements. Type one is called an insert replacement window, in which a new window is installed within the frame of an existing window (Baker, 2012). In this situation, the original window sashes are removed, and a new insert replacement window, with a smaller frame, is fitted within the original wood frame. Generally, this is more economical because the entire original window doesn't have to be removed. Usually, the original frame is then cladded with the same material as the new insert replacement window. Type two is called a complete window replacement, in which the entire original window, including frame, is removed, and a new full replacement window is installed in its place (Baker, 2012). In this research study, the term replacement window includes both of these types of replacement windows. Data included in Appendix B contains responses from several window replacement contractors, who advised that both types of replacements are common.

New replacement windows are also classified by their frame type. These frame types include wood, aluminum, vinyl and fiberglass. Some windows are composites, such as

aluminum clad wood windows. Currently, vinyl windows have superseded wood and aluminum as the most common type of residential replacement window, at approximately 70 percent of the replacement market. This has increased from approximately five percent of the market since the mid-1980s (Roberts & Wilson, 2011).

A secondary classification is the window's operating type. In most instances, the operable portion of the window is a glazed sash. Common types are:

- double-hung (vertical sliders, top sash slides down and bottom sash slides up)
- single-hung (vertical slider, bottom sash slides up, top sash is fixed)
- casement (hinged on side, opens in or out like a door)
- horizontal sliders
- awning (hinged on top and swings out, often a casement turned on its side)
- hopper (hinged on bottom and swings in)

Often these window types are also combined with fixed windows.

Typical new windows include sealed insulated glass units (IGU). Typically, this is a sealed double-glazing unit, with the air space filled with a low-conductive inert gas, such as argon. Inert gas increases thermal conduction resistance. Most standard replacement windows also include a low-emissivity coating (Low-E), which also increases the thermal performance of the window (Roberts & Wilson, 2011).

2.2.4 Pre-World War II Residential Wood Windows

The most common type of residential window installed in most pre-World War II Canadian and American houses were single-glazed, double-hung operable wood windows (Fram, 1988; Leeke, 2009; Meany, 2008). Although some literature sources use the term "wooden" window, this study uses the more commonly found term "wood" window. This study also refers to pre-World War II wood windows as older or original wood windows, because in laypersons' terms they are commonly referred to as older wood windows and in most cases, they are a house's original windows.

Opposed to other types of operable windows, double-hung windows owe their popularity to their double-sash operation. This allows for adjustable air circulation, using stack effect from high level and low level openings of the window (Louw, 2007). The popularity of double-hung windows in Canada is also owed to its British heritage, developed in the 18th century, to provide more efficient ventilation in British houses. This was due to varying ventilation needs, caused by varying climate conditions (Louw, 2007). Of interest, casement windows were more popular in Quebec, owing their popularity to casement windows being more popular in France (Louw, 2007).

As shown in figures 3 and 4, the main components of a typical, pre-World War II, single-glazed, double-hung window consists of:

- a wood frame (jamb, sill, frame header, and various stops and parting beads to hold wood sashes in place)
- two wood sashes (including stiles, rails and muntins)
- glazing (glass, glazing points and putty)
- hardware (shown in figure 4: pulleys and sash weights; not shown: weather-stripping, sash lifts, sash locks)
- window trim (exterior and interior trim such as casing, drip cap, stool and apron)

Note: Figures 3 and 4 do not include a wood storm window that would normally also be installed.

Proportionally, older double-hung windows were taller than wide. This allowed for better day lighting and ventilation within rooms. Aesthetically, one of the key features of many older windows is the proportion and pattern of subdivided lights within a sash. As noted by Fram (1988), due to early limitations on glass size, referred to as lights or windowpanes, smaller windowpanes were incorporated into the sash separated by wood muntins. These windows are referred to by the number of panes in the upper sash over the number of panes in the lower sash. For example, in figure 3, the window is referred to as a six over six window.

Early windowpane sizes were small due to 19th century handmade crown glass and cylinder glass methods of glass making (Fram, 1988; Martlew, 2007). Advances in glass making permitted larger and stronger window panes by the mid-1850s, often eliminating the need for muntins. From this time on, muntins were used more for decorative patterns and in revival architectural styles (Fram, 1988).

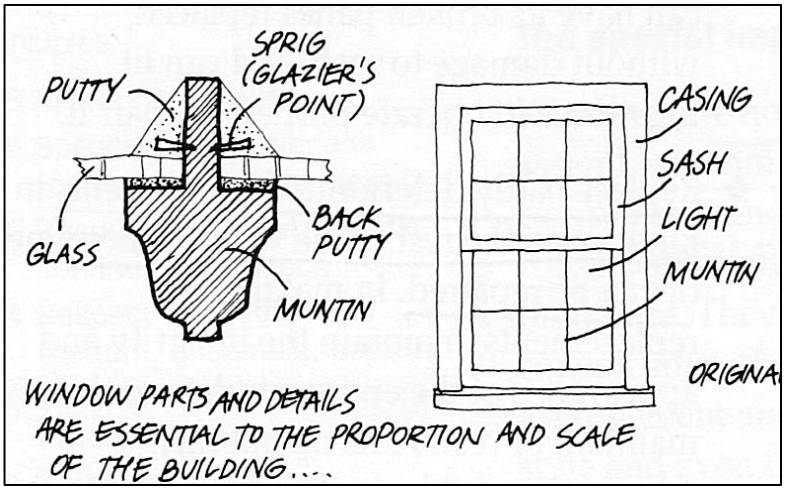


Figure 3: Typical Older Wood Window (Source: Fram, 1988, p. 150)

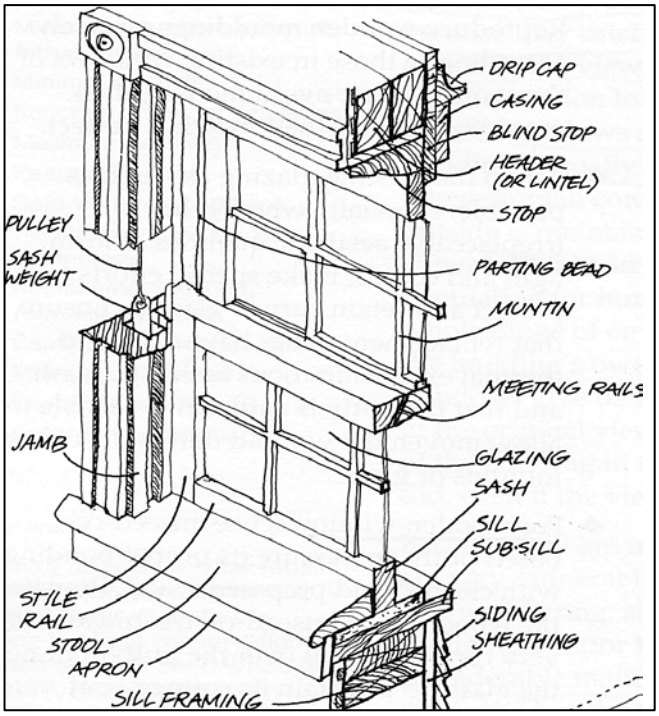


Figure 4: Typical Older Wood Window (Source: Fram, 1988, p. 150)

In colder climates, due to minimal thermal resistance of a single layer of glass, single-glazed wood storm windows were also installed on the exterior of the main windows to improve thermal performance (Fram, 1988). A storm window provided a means of double glazing thus increasing the overall thermal performance of the window. Wood storm windows were normally fixed, installed during the fall of each year and removed in the spring. Wood storm windows typically consisted of wood sash with single glazing subdivided by muntins. From the 1960s onwards, many wood storms were replaced with operable single-hung aluminum storm windows, which would remain fixed to the main window, while still providing for ventilation.

Wood windows are finished with field applied paint. In most cases, older windows were painted with oil-based, lead paint protecting the wood window from moisture decay. In many instances, these windows will have multiple layers of lead paint on them (Morrissey, 2007).

2.3 Literature Themes

The reviewed literature indicates building conservation is beneficial from three main perspectives: cultural, energy and environmental, and economic. Traditionally, benefits were focused on cultural heritage importance. Recently, literature has included the benefits of reduced environmental impacts as compared to new construction (Jackson, 2005). In the field of building conservation, windows represent a small scale version of all the conservation issues that apply to an entire building (Fram, 1988). Much of conservation focuses on iconic heritage buildings, however Fram (1988) notes, our society has an abundance of common place buildings, such as older houses, which are as valuable to our cultural inheritance as much as grand edifices. This is an important distinction for this thesis research. This thesis will explore if all older houses contribute to cultural heritage value.

Literature also indicates that building conservation has obstacles or issues that cause decision makers not to protect cultural heritage artifacts. These obstacles tend to focus on

issues of maintenance, cost and legal requirements. These themes are often interconnected. For example, maintaining a window also involves the cost of maintenance.

A summary of these themes is presented in this literature review. This includes a cultural perspective, energy and environmental perspective, maintenance and operation perspective, a cost and economic perspective, and a legal perspective. These themes form a framework for the exploratory research and data analysis.

2.3.1 Cultural Perspective

The cultural perspective focuses primarily on the cultural heritage value of pre-World War II wood windows. As stated by Parks Canada (2008), heritage value is,

> the aesthetic, historic, scientific, cultural, social, or spiritual importance or significance for past, present or future generations. The heritage value of a historic place is embodied in its character-defining materials, forms, location, special configurations uses and cultural associations or meanings. (introduction - p. 2)

From a cultural perspective, the issue of heritage value comes down to simple terms. As a society and as individuals, do we value these older wood windows enough to keep them when there are alternates such as new replacement windows. Three issues cause difficulty in addressing the heritage value of windows.

First, heritage value is not usually measured in monetary terms as compared to most consumer items, such as the measureable cost of a kilowatt of electricity or the actual dollar cost to repair a window. In analogy, an apple can have a price, but its taste can be priceless. Heritage value, as defined by Parks Canada (2008), includes these hard to measure terms. For example, Furlan (2012) discusses that people enjoy the aesthetics of historic windows, such as how light bounces off hand-crafted, wavy glass as opposed to smoother, modern glass. Also noted by Furlan (2012), there is an appreciation for a past craftsman's ability to create functional but aesthetically pleasing windows. For example, many windows were hand-crafted to include individual glass panes being proportionally divided using the harmonious golden ratio (Furlan 2012). Similarly, there can be a non-

monetary heritage value of maintaining old, wavy, crown glass, simply because it represents the scientific advancement in glass making of that time. Concurring, Shirley, Gamble and Galvin (2010), in an energy study of old windows, concludes "that the historical window is preserved also offers intangible priceless benefit, such as… maintaining the thin, elegant lines of the sash and muntins, neither of which is replicated in the replacement window" (p. 27).

Second, determining heritage value can be confusing because until recently, identification of buildings with heritage value tended to focused on the best examples (Fram, 1988). Generally, this is the focus of heritage designation legislation. For example, the Ontario Heritage Act (OHA) (2009) is intended to provide formal recognition of properties with cultural value or interest, such as houses with rare and unique architectural styles, or those that demonstrate high level of craftsmanship. The rationale was to protect the best examples of heritage artifacts due to the rapid destruction of older buildings taking place during rapid urban redevelopment of the 1960s and 1970s (Fairclough, 2013). In many municipalities, this has resulted in only the best examples of buildings, including houses, receiving a heritage designation. However, as also noted by Fairclough (2013), there is a new trend for more inclusion of the common, such as simple vernacular houses and entire older neighbourhoods. Windows are artifacts within these houses and neighbourhoods. This has huge future implications, as this represents a paradigm shift, in which not only the best examples are recognised, but common original wood windows, in common older houses can be recognised for cultural heritage value. This also has implications that entire older neighbourhoods can also be recognised for their heritage value.

The third difficulty is a lack of appreciation of the direct heritage relationship between a house and its original wood windows. For example, it is common knowledge that current heritage designation isn't always specific to whether a house's older windows are part of the overall heritage value of the house. This often leads to differences in opinion on whether older windows have to be retained in a heritage designated house. However, most experts in heritage and window conservation are adamant that windows are one of the most important elements of a house. Fram (1988) notes, windows help define a building's character. Louw (2007) mentions, from a concept from the 19th conservationist Sir George

Gilbert Scott, that windows are the most important feature of a residential building, and deserve respect. Furlan (2012) and Leeke (2009) both stress that maintaining original window material is important to overall heritage value. Furlan (2012) and Meany (2008) both indicate older wood windows, such as a traditional double-hung window can be considered a thing of beauty and are part of the overall heritage fabric of a building. There are strong implications that heritage value of a window is a given. For example, in energy performance studies of older windows, most researchers take into consideration the importance of maintaining heritage appearance when considering options for energy upgrades to older wood windows (Baker, 2010; Ellsworth & Kinney, 2010; Shirley et al., 2010; James, Shapiro, Flanders and Hemenway, 1996).

Literature addressing the above three difficulties, indicates older residential wood windows have cultural heritage value. This can include all older wood widows, in all older houses regardless of whether the house has a legal heritage designation.

This is important, existing wood windows account for the majority of windows in pre-to-mid-1900s houses in Ontario (Fram, 1998). Parks Canada (2008) also recommends that all window components can have heritage value and should be conserved, including frames, sashes, muntins, glazing, sills, heads, trim and hardware. Windows if deteriorated, should be repaired rather than replaced if they contribute to the architectural character and are largely in good shape (Fram, 1998). Terms such as maintaining authenticity, appearance and character are often mentioned as prime reasons for conservation. The National Trust for Historic Preservation (2009a) indicates windows significantly define the character of a house. This includes size, location, proportional, style and materials, all adding to the cultural attributes of a building. Maintaining a building's authenticity is culturally important, which is achieved by conservation (National Trust for Historic Preservation, 2009b). Even minor changes to the appearance of windows can negatively affect the look of the building (National Trust for Historic Preservation, 2009c). Similarly, English Heritage (2010) strongly advises a preference for repair and conservation rather than replacement with new modern windows, in order not to lose authentic historic window elements.

Overall, literature supports the perspective that society does consider these older residential wood windows a contribution to cultural heritage value. However, as noted, in one study pertaining to valuing cultural heritage, Navrud and Ready (2002) identifies a problematic issue, that the public values heritage based only on what they know. This is a key area of exploration in this research study, to explore what homeowners know about their windows, since they have direct control over conservation. In essence, do homeowners know the value of their older wood windows enough to keep them?

2.3.2 Energy and Environmental Perspective

Energy

The concern for many homeowners is their pre-World War II wood windows may not be energy efficient. Carroon (2010) states, "it is widely assumed that the older the building is, the more energy will be required to use it comfortably" (p.173). It is common that homeowners replace these older wood windows due to a belief that their windows lack energy efficiency. As a result, even though windows are considered critical to the look of an older house, they are often replaced by new vinyl, aluminum or composite windows for assumed energy savings (Alter, 2009). Generally, many of these older existing wood windows do permit higher air infiltrations compared with new replacement double-glazed windows (Kelso and Rabun, 2009). This is usually a result of insufficient weather-stripping. However, as noted by the Clean Air Cool Planet organization (2009), for most homeowners, the most common solution to draughty and poor thermally performing windows is window replacement.

In some cases, a homeowner's assumption of high energy savings from window replacement is understandable. As stated by Osterhoudt (2009) the average homeowner's energy savings on heating and cooling costs is up to 35 percent by replacing their single-pane windows. However, this percentage is deceptive as it is based on replacing poorly performing single-glazed windows, without storm windows, with new energy efficient replacement windows. In many moderate climates, single-glazed windows, without storm windows still exist and are used as the benchmark for energy comparisons (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). However, in colder climates, such as

Ontario, older single-glazed wood windows are usually combined with storm windows, making claims of high energy savings questionable.

There is also literature that indicates a need to keep the loss of energy through older windows in perspective to the overall energy use of an older house. Fram (1988), a well-known Canadian architectural heritage consultant advises to be realistic, that windows in these older houses only accounts for approximately 15 percent of overall heat loss. Sources such as the National Trust for Heritage Preservation (2009b) also argue, that adding small amounts of insulation, such as 3 ½" (89 mm) in an attic will more than offset losses through a house's windows. In short, there are more effective and less intrusive ways of saving energy in a house than replacing windows.

The statement of less intrusive ways of saving energy must be tempered with understanding the overall construction character of typical pre-World War II houses. For example, pre-World War II Ontario houses, unless upgraded with energy retrofits, typically do not have high levels of thermal resistance that is associated with newer houses. Many larger pre-World War II houses were constructed with uninsulated solid structural masonry exterior walls, such as double wythe exterior brick with plaster and lath interior finishes strapped directly on the inside face of the brick. Alternatively, many mid-size and smaller pre-World War II houses were structurally wood framed with cladding, but didn't include insulation. By the early 1900s some wood framed houses did have insulation installed within the exterior wood framing; however the available insulation types and thermal resistance properties were typically less efficient than in post-World War II houses and significantly less that required after the 1970s oil crisis. Building code requirements since the 1970s have progressively increased the requirements of thermal performance (Ontario Building Code, 2012). Similarly, attic spaces and basements of pre-World War II houses were not insulated or only included minimal insulation.

In considering air leakage, which typically is major source of heat loss, pre-World War II houses can be generalised as leaky. Pre-World War II houses were not constructed with air barrier components. Typically, joints between most structural and exterior wall components were not sealed or covered by materials to stop air infiltration. Post-World

War II houses typically have air barriers that have progressively increased in effectiveness. Of interest, the effectiveness of air barriers in late 1900s houses increased so much that mechanical ventilation became required for occupant health.

Statements such as a 35 percent energy savings with replacement windows, or adding 3 ½ inches of attic insulation to offset energy loss through older windows can be misleading unless consideration is taken of the overall construction characteristics of the house's full building envelope design. For example, the percentage of a house's energy loss through its windows compared to the entire building enclosure will differ significantly depending on the energy performance of the rest of the building envelope. Conversely, the percentage of energy savings by replacing windows will not only be depended on the condition of the existing windows, but also on the energy performance of the remainder of the building envelope. However, there are many sources that support less costly energy upgrades can more than offset energy savings provided by replacement windows.

The main source of heat loss through windows is caused by air infiltration through window joints and gaps. Occupants often refer to this as a draughty window. According to a report by English Heritage (2010), most of the heat loss through windows is not by conduction, but preventable loss from air infiltration. Heat loss by conduction through window glass only accounts for about 25 percent. The remaining 75 percent is from air draughts (infiltration), and simple repairs can reduce this loss by up to a third. The National Trust for Historic Preservation (2009b) concurs, most of the heat transfer occurs around the perimeter of a window rather than through the window glass, but indicates high savings from repairs such as weather-stripping, providing reduced infiltration by as much as 50 percent. Likewise, Caroon (2010), states "An ever-growing body of articles and guidelines document and demonstrate how existing windows can be repaired in order to reduce air infiltration and can come close to matching the performance of new windows" (p.187).

The second main source of heat loss at windows is from conduction loss through the window frame, sash and glass, in which the most heat loss is through glazing. New replacement windows typically have double-glazed, inert gas-filled, sealed glazing units,

while older wood windows typically have single-glazing, with double-glazing provided by attaching an exterior storm window. Various literature sources concur that insulating with a storm window, combined with good weather-stripping of the inner window can provide energy performance comparable to new replacement windows. For example, The National Trust for Historic Preservation (2009a) notes there is a growing number of studies indicating that when older wood windows are properly maintained, weather-stripped, and have a storm window, they can perform as well as a new window. Similarly, window energy studies by Donovan Rypkema show that properly repaired historic windows have thermal resistance values nearly the same as new windows (Alter, 2009). Shapiro and James (1997), in their Vermont study of energy performance of older wood windows, concluded that energy savings provided by upgrading existing wood windows was similar to replacement windows.

This Vermont study was based on energy performance testing of wood windows at 19 test sites that were geographically and climatically similar to Ontario (James et al., 1996). This study, *Testing the Energy Performance of Wood Windows in Cold Climates*, was commissioned to "address the energy impacts of the rehabilitation versus replacement issue" (James et al., 1996, p. 1). The study included field testing of 151 existing wood windows, at various sites in Vermont, with various upgrading approaches. Testing also include laboratory simulations of older wood windows. Two key conclusions from this study were:

> As a result of the similarity in savings between upgrade types and the small savings indicated when existing windows were similar in performance to a typical or tight window, the decision to rehabilitate or replace a window generally should be made on the basis of considerations other than energy cost savings. (James et al., 1996, p. iii).
>
> Within the decision-making process for deciding to replace or renovate an existing window, energy considerations should not be the primary criteria. (James et al., 1996, p. iv).

Even more optimistic, Myers (2002) indicates that historic wood windows combined with quality storm windows should outperform a new double-glazed window. This claim is a little deceptive since Myers' study is based on comparison using thermally, non-broken, aluminum framed windows, which is uncommon in current windows. A similar study by Klems (2002), found that adding an aluminum storm window with Low-E glazing to a single-glazed, double-hung wood window provided energy performance similar to high quality vinyl windows with Low-E, argon-filled, insulated glazed units. Klems 2002 study, like several other energy studies, was trying to address a common energy problem in the United States, where many older houses with original single-glazed windows don't have storm windows. Klems 2002 study was done in a test facility in Nevada, simulating original single-glazed, double-hung wood windows by using new custom made new single-glazed, double-hung windows.

In recent years, several additional energy performance studies also found results indicating a weather-stripped, original single-glazed wood windows combined with a storm window provides an energy performance that justifies maintaining original windows (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). Literature suggests that homeowners are concerned about the energy performance of their older wood windows. The following is a brief overview with conclusions from these three recent studies. All of these studies take into account energy performance that includes infiltrative heat loss from air leakage, non-infiltrative heat loss such as conduction through the glass and frame as well as heat gain from solar exposure. For brevity, the following summaries only include conductive thermal resistance comparisons using imperial measurement R values listed in the following three American studies.

Measure Guideline: Wood Window Repair, Rehabilitation, and Replacement

Baker (2012) conducted a comparative energy performance study between various window upgrades. The benchmark for comparison was a clear, single-glazed, double-hung wood widow with a thermal resistance value of approximately R 1.2. Test simulations were run in four American cities representing four different climate zones. The stated reason for the study was to provide guidance to homeowners, due to their lack

of knowledge, on options to improve the energy performance of existing single-glazed wood windows, while also considering appearance, durability and cost. Eight upgrading options included: retrofitting an existing window to reduce air infiltration, installing an exterior storm window, installing a removable interior storm window, installing a permanent interior storm window, modifying existing sashes to accommodate insulated sealed glazing units, full sash replacement, insert replacement window and complete window replacement. This study concluded that adding a storm window to an existing single-glazed wood window was the most cost justifiable upgrade. This was even the case when a new Low-E, double-glazed, Energy Star rated window, with a thermal resistance value of R 3.3, was compared to a single-glazed prime window, combined with a new clear glass storm window, with a thermal resistance value of R 2.0.

Overall, this study concluded all upgrading options improved thermal performance, but installing a storm window provided the most economical approach, even when thermal performance tested less than a new replacement window. The study also concluded that storm windows helped to maintain the heritage appearance of the original window.

Two cost items not factored into this study were: one, extra cost, if repairs were needed and two, cost savings, if a storm window already existed.

The Effects of Energy Efficiency Treatments on Historic Windows

Ellsworth and Kinney (2008) conducted a comparative energy performance study for upgrading the energy performance of older wood windows using a retrofitting house in Boulder, Colorado. The house was a 2,700 square foot brick house, built in 1902. It had many original single-glazed, double-hung wood windows combined with aluminum storm windows. This house could be representative of many older houses in Ontario. This study included various options for upgrading older, single-glazed, double-hung widows, in comparison to a new vinyl replacement window. The benchmark window was an older single-glazed, double-hung window, with a tested average thermal resistance value of R 1.29 [Fig. 5]. When retrofitted and fitted with a new single-glazed wood storm window, the thermal resistance was increased to R 3.0. This average was greater than the tested R 2.75 thermal resistance value of a new vinyl replacement window. This study also tested

additional storm windows upgrades, with several options exceeding R 5.0 thermal resistance.

Similar to the Baker study, this study focused on improving energy performance of an original wood window, concluding "that it is possible to improve the overall energy performance of existing windows systems by over four fold through repairs, and sealing plus the installation of an excellent storm window without altering their historic character" (Ellsworth & Kinney, 2008, executive summary p. 5).

Also similar to the Baker study, extra cost of repairing the original windows, if needed, was not factored in the study.

Table ES-1. Measurements of U-factors and R-values

Description	Number of test runs	Total test hours counted in calcs	Standard Deviation of hourly U-value	Weighted Average (U)	Weighted Average (R-value)	Wind adjusted R	Wind adjusted U
Old double hung from window 5	4	102	0.000872	0.78	1.29	0.79	1.27
Single glazed original alum storm	2	39	0.000872	0.97	1.03	0.53	1.88
New Storm w/o insulated frame	2	32	0.00132	0.27	3.65	3.15	0.32
New Storm w insulated frame	1	16	0.00077	0.24	4.11	3.61	0.28
New Storm single glazed	2	40	0.001045	0.76	1.31	0.81	1.23
Old DH from 5 + new storm w/o Ins	2	39	0.000908	0.21	4.87	4.37	0.23
Old DH from 5 + new Storm w/ Ins	1	42	0.001054	0.19	5.18	4.68	0.21
Retrofitted double hung from wind 5	1	24	0.000862	0.48	2.07	1.57	0.64
Ret DH from 5 + new storm w/o ins	2	39	0.000958	0.19	5.32	4.82	0.21
Ret DH from 5 + new storm w/ ins	3	91	0.000958	0.17	5.83	5.33	0.19
Ret DH from 5 + sg wood storm w/o ins	3	116	0.000926	0.33	3.00	2.50	0.40
New Vinyl Window	3	110	0.000926	0.36	2.75	2.25	0.45

Figure 5: Comparison of U and R Factors from an Energy Performance Study (Ellsworth & Kinney, 2008, executive summary p. 2)

A Comparative Study of the Cumulative Energy Use of Historical Versus Contemporary Windows

Shirley et al. (2010) conducted a life-cycle comparative cost study of upgrading the energy performance of an original double-hung wood window combined with an aluminum storm window in comparison to a new double-hung vinyl replacement window. This study used a pre-World War II house in Boston, MA, as a case study. The study had two main findings: "(1) the thermal performances of the two windows systems are similar and (2) taking all costs into account, it is more cost effective to add a storm window to an historical window" (Shirley et al., 2010, p. 3). The comparative thermal performance values were almost identical, R 2.85 for the new replacement window and R 2.86 for the

original window combined with a new storm window. The resistance value for the new window was an initially R 3.3, but degraded to R 2.85, with the assumption that there would be a loss of argon gas over time, thus reducing its thermal performance. The energy comparison demonstrated minimal difference between maintained older wood windows with storm windows, compared to new replacement windows.

Overall, these energy studies demonstrated that when older wood windows are properly weather-stripped and fitted with storm windows no significant energy cost savings is achieved by replacing original wood windows (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). One study even demonstrated several upgrading approaches that provided better energy performance than a replacement window (Ellsworth & Kinney, 2008). In summary, the literature indicates that while energy savings is desirable, replacement of older wood windows is not an effective approach to achieve energy savings.

Comparable Climatic Conditions

Similar to the earlier Vermont study, James et al. (1996), *Testing the Energy Performance of Wood Windows in Cold Climates*, the Baker (2012), Ellsworth and Kinney (2008) and Shirley et al. (2010) studies included field testing and laboratory testing to determine the energy performance effectiveness of maintaining and upgrading existing original wood windows as compared to replacement. All of these studies include testing, analysis and conclusions using climatic conditions comparable to those in southern Ontario, making them applicable for addressing the case study of conservation of pre-World War II homes in Stratford, ON. These studies are also applicable to many other locations in Ontario and Canada. In these studies, many of the communities used for both on-site and in-lab simulation testing represent the same climatic zones as in southern Ontario. A climate zone as related to heating and cooling requirements provide similar degree-day characteristics within a defined geographical area. In the United States, established climate zones by the U.S. Department of Energy, range from 1 to 8. Data from these climatic zones are used in energy designs for buildings, using American Society of Heating, Refrigeration and Air Conditioning (ASHRAE) standards. ASHRAE standards are also

accepted for building design in Canada. Briefly, a greater zone number indicates a colder climate, longer heating season and more heat loss. For example, Florida is in zone 2, Alaska is in zone 8. Stratford is in located in zone 5, as is most of the lower area of southern Ontario. The middle of southern Ontario is a zone 6. In comparison, the Vermont Study, is in zone 6, similar to much of Ontario, but colder than Stratford. The Baker study (2012) includes Boston, MA, in zone 5, is in the same zone as Stratford, while Duluth, MN, in zone 7, is similar to northern Ontario. The Ellsworth and Kinney study (2008) includes upgrading windows in a house in Boulder, CO, in zone 5, same as Stratford. This study also used simulations in other northern cities, including Boston. The Shirley et al. (2010) study also used Boston for their study, zone 5. Overall, all of these energy performance studies on older wood window utilised field testing or simulated laboratory testing using climates that can be considered applicable to Stratford case study used in this thesis research.

In Praise of Older Windows

A recent Ontario case study, Kyles (2014) compared the energy performance of a 220 year old restored original wood window to that of a three year old replacement window. Using infra-red thermography, this study compared these two windows under the same existing climatic conditions. Both windows were located on the same exterior wall of a late 1700s Ontario Georgian house. The exterior air temperature was minus 20 degrees Celsius and the wind speed was 50 kilometers per hour. The measured interior temperature of the restored window ranged from five to six degrees Celsius at the surface of the glazing and approximately two degrees Celsius at the sash perimeter. In comparison, the replacement window had an inside glazing surface temperature ranging from four to five degrees Celsius and approximately minus two degrees Celsius at the sash perimeter. Although this case study is presented as a web based video and anecdotal in nature, it also demonstrates that conserved wood windows can be similar in energy performance to newer replacement windows. In this particular comparison the restored window performed better at reducing conductive and infiltrative heat loss.

Environmental

Even if conservation measures result in marginally lower thermal performance levels, this is counterbalanced by reduced environmental impact (Parrett, 2007). Awareness in global warming and related carbon emissions has become a major issue in literature pertaining to conservation. As noted by Beresford (2012), to avoid problems to the climate from greenhouse gas (GHG), emissions need to be reduced. Reduction in GHG can be assisted by retrofits to houses. Preference given to new green buildings will not provide as much reduced carbon emissions as focusing on greening of existing buildings (Carroon, 2010). English Heritage (2009) advises that the goal to reduce carbon emissions is focusing the spot-light on existing buildings.

Central to the discussion of reduced carbon emissions is the topic of embodied energy. True environmental impacts must take into account the embodied energy of the entire life-cycle of the building (National Trust for Historic Preservation, 2009a). Most embodied energy studies include the sum of all the energy required to extract, process, deliver and install the materials needed to build (Jackson, 2005). From a conservation perspective, existing windows already have embodied energy in place (National Trust for Historic Preservation, 2009b; Shirley et al., 2010). As quoted by the National Trust for Historic Preservation (2009a), window replacement "… not only wastes embodied energy, it requires additional energy to remove and dispose them. This is on top of the energy required to create and install the new windows" (p. 5). Even worse, replacing an existing window may actually require additional energy and effectively increase carbon emissions.

Environmental literature also suggests that some of the materials used in replacement windows are not environmentally friendly. National Trust for Historic Preservation (2009b) notes that vinyl and poly vinyl chloride (PVC) windows produce toxic by-products. As concurred by Furlan (2012), PVC windows pose hazards in their manufacturing, their product life and in disposal. Replacement of old wood windows not only sends embodied energy to landfill, but eventually new replacements windows will also be replaced sending even more waste to landfill (National Trust for Historic Preservation, 2009a).

2.3.3 Maintenance and Operation Perspective

Osterhoudt (2009) states easier to operate replacement windows are a good reason to replace older windows because older windows tend to need a lot of maintenance to remain operational.

Most professionals involved with repairing old windows agree that older wood windows require routine maintenance to remain operable (Fram, 1988). In comparison, replacement windows are often referred to as being maintenance free. However, Shirley et al. (2010) indicates the cost of maintenance of older wood windows is offset by the higher failure rate of replacement windows over a shorter lifespan of 25 to 35 years. Often seals on glazing units fail, and often it is difficult to obtain replacement parts, which leads to ongoing replacement of replacement windows (Shirley et al., 2010).

Conservation professionals advise that pre-World War II wood windows are more durable and reparable than new replacements. As proof, many existing original wood window are already in excess of 100 years old, and as stated by Furlan (2012), with proper maintenance can easily last another 100 years. In the life-cycle costing of Shirley et al, (2010) study, 35 years was used as the accepted maximum life span for replacing replacement windows, while 60 years was used for just replacing putty on older wood windows.

Fram (1988) advises older wood windows usually suffer from a lack of maintenance, and are often left to a point when more expensive repairs are needed. Meany (2008) notes, lack of maintenance or lack of care leads to common problems such as:

- sashes that are painted shut, creating inoperable windows
- broken counter balance ropes, causing difficulty in opening and closing
- deteriorated putty, leading to air leakage, wood decay and unpleasant appearance
- missing or broken hardware, causing difficulty in operating
- cracked panes, leading to wasted energy
- lack of or damaged weather-stripping, leading to poor operation and wasted energy
- deteriorated paint finish, leading to wood decay and unpleasant appearance

Window conservation often includes repairs and ongoing preventative maintenance. Major repairs usually include repair of decayed wood and reglazing. Wood decay often results from moisture penetrating wood joints due to paint failure. The most common cause of paint failure is caused by excessive layers of paint or from trapped moisture (Leeke, 2009; Morrissey, 2007). When there are excessive layers of paint build-up, conservation work usually requires full paint removal. Pertaining to repair from wood decay, there are two main methods of repair. One includes cutting and fitting in new pieces of wood, the second includes repair with epoxy consolidates and epoxy fillers (Leeke, 2009; Meany, 2008). These methods of repairs require skilled window conservation specialists (Leeke, 2009).

Preventive maintenance includes acceptance of ongoing repainting to protect both wood and putty substrates (Morrissey, 2007; Roberts & Wilson, 2011). Time between repainting varies but the maximum is usually every 10 to 12 years (Morrissey, 2007). Older wood windows normally will have been painted with oil-based lead paint. The most common paint type, up until the early 20th century, was a combination of linseed oil, turpentine, driers, white lead and natural earth coloured pigments (Morrissey, 2007). Today, lead is not permitted in paints. Lead, which was once a common construction material, is now considered a hazardous material. Oil-based paints are also being phased out due to concern for volatile organic compounds (VOC) off-gassing. Conservation usually requires specific lead paint removal and disposal requirements regulated by federal, state or provincial legislation (Leeke, 2009; Meany, 2008; Morrissey, 2007).

2.3.4 Cost and Economic Perspective

Two cost and economic sub-themes emerge in relation to conservation of wood windows. First is the impact on the local economy. Second is the poor return on investment provided by energy savings from window replacement.

Local Economy

Maintenance, repair and conservation of wood windows are normally done by skilled local tradespeople, with labour cost being the largest cost component. This is good for the local

economy (National Trust for Historic Preservation, 2009a). Replacement windows are normally manufactured at a non-local manufacturing facility, such that a greater percentage of profits don't benefit the local economy (Alter, 2009). Even regular maintenance, such as repainting, provides jobs to local painters, putting more money into a local economy (Morrissey, 2007).

Energy Cost Savings

Some energy studies provide evidence that replacing windows provides energy cost savings. However, among all reviewed studies, the consensus is that the amount of cost savings results in an unacceptable long payback period (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). National Trust for Historic Preservation (2009a) gives an example of an average window replacement cost for a house at $12,000, but the energy savings was only $300 per year. This translated to nearly an 80 year payback if interest payments are added to capital replacement costs.

Energy studies conclude that the cost of window replacements is more expensive when long term costs and minimal energy cost savings are factored in as compared to the cost of keeping an original wood window combined with a storm window (Baker, 2012; Ellsworth & Kinney, 2008; James et al, 1996; Shirley et al., 2010). For example, the life-cycle costing in the energy study by Shirley et al. (2010), determined that an initial cost of $900 for a replacement window wasn't cost effective due to the additional future costs of ongoing replacement at least every 35 years. In addition, the average replacement window also requires replacement of its insulated glass unit (IGU) due to seal failure, approximately every 20 years. In comparison, this study estimated, that even with future required periodic maintenance on wood windows, the overall cost savings favoured conservation.

Windows are a house's envelope component with the lowest thermal resistance. However, due to their typical small ratio to overall building envelope area, and that a well-maintained existing window can approach the same thermal resistance as a new replacement, window replacement is not considered cost effective (Clean Air Cool Planet, 2009).

Energy Studies and Window Repair Costs

Most energy studies don't include upfront conservation repair costs. Instead these studies use a benchmark of an older wood window that is already in good condition and that only needs to be upgraded with the cost of installing a new aluminum storm window (Baker 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). The question arises, would conservation still be favoured, from a cost perspective, if these studies had factored in a cost for upfront conservation repair. Available literature suggests that the cost of upfront repairs depends on the extent of conservation work required, which makes it difficult to factor in a variable for cost of repair. A range of repairs will vary among various wood windows in a window conservation project. In some projects, the overall cost will be less than the initial cost of replacement (James et al., 1996; Leeke, 2009). As suggested by Leeke, (2009), an American window conservation specialist, rarely is full conservation work required all at once, and many conservation scenarios will be less costly than window replacement [Fig. 6].

Window Costs				
Treatment	Remodel		Preservation	
	Per Unit	Total	Per Unit	Total
Replace 20 windows with vinyl	450	9,000		
Replace 2 windows with wood			1,500	3,000
Spot Repairs on 8 windows			100	800
Weather strip 18 windows			75	1,350
Paint 20 windows			150	3000
Totals		9,000		8,150
$9,000 minus $8150 Equals $850 Savings for Preservation Approach				

Figure 6: Project Scenario – Comparing Window Costs, (Source: Leeke, 2009, p. 13)

The above scenario compares $9,000 for window replacements on a house versus $8,150 for conservation costs. In many cases, factored in repair costs will provide a favourable scenario for conservation. For example, in the above scenario, if repair cost was offset by not having to install a storm window, then all of the energy studies would still conclude there was no cost advantage to replace windows.

There is also literature stating the cost of window replacement is too expensive for many homeowners. As noted by Beresford (2012), “a typical retrofit (with simple changes like upgrading hot water tanks, home heating and cooling systems, improving weatherization and insulation of homes) will cost a homeowner about $6,000 – a prohibitive amount for most people” (p. 5). A typical window replacement project exceeds $6,000.

2.3.5 Legal Perspective

There is concern whether legislated policies, regulations and standards have a positive or negative impact on conservation of older residential wood windows. One difficulty in reviewing applicable legal requirements is that they can vary between jurisdictions. This review covers some of the main heritage planning, building and heritage legislation, as it applies to older wood windows in the Stratford case study.

Heritage Planning

Local planning policies and regulations governing heritage planning are included in Stratford’s Official Plan. The authority to establish local heritage planning policy is provided through the authority of the Planning Act.

Stratford’s Official Plan is approved by the province and includes objectives and policies to provide guidance for the municipality’s development pertaining to social, economic and environmental matters (City of Stratford, 1993-2013). The Official Plan is currently in the process of renewal. The City’s planning department anticipates the upcoming new official plan will maintain current heritage policies.

Stratford’s Official Plan includes a section called Heritage Resources which states the heritage goals and objectives and policies. In the Official Plan “heritage resources…include buildings or structures, either individually or in groups, which as result of their architectural characteristics and/or history are deemed to be significant by the City, the Province or the Federal Government” (City of Stratford, 1993-2013, p. 9-1).

Three key aspects stated in the Official Plan:

- objectives of including protection of heritage resources, encouraging public awareness and appreciation of the value of protection of their heritage resources
- policies for heritage property designation and heritage conservation districts conforming to the Ontario Heritage Act
- a requirement that the City must keep an inventory of heritage resources

One of the unique inclusions in the Official Plan is a recognised heritage area. This area encompasses the majority of the pre-World War II developed portion of the city. This heritage area includes the City's downtown core, most of its older residential neighbourhoods, most of its older industrial areas, its downtown heritage conservation district and many of its designated heritage properties. The Official Plan identifies the majority of the older residential properties in Stratford is part of the heritage area. However, the heritage area only includes a policy statement that new development within the heritage area must respect the existing heritage buildings and neighbouring buildings in the area (City of Stratford, 1993-2013). There is vagueness in the heritage planning policy pertaining to conservation of these properties and neighbourhoods. From a conservation viewpoint, since there is a recognised heritage area, it could be interpreted that all of the pre-World War II houses and windows in the heritage area have heritage value and should be protected. Current heritage policy leaves this viewpoint open to interpretation.

Building

The Ontario Building Code (OBC), regulations under the Ontario Building Code Act, governs the construction of new buildings and renovations to existing buildings (Ontario Building Code, 2012). New windows must be tested to meet specific Canadian Safety Association (CSA) standards for assembly ratings in airtightness, water tightness and wind loading.

Conservation work, such as repair and maintenance of older wood windows is normally considered maintenance work and normally not subject to OBC requirements. This was

confirmed with the local building department. If window repairs are considered part of renovation project, then they could be considered renovations to an existing window system. In this situation, the only requirement would be that the performance of altered windows would need to match the existing performance (Ontario Building Code, 2012). For example, weather-stripping an existing window would improve window performance.

Heritage Legislation

A key piece of heritage legislation in Ontario is the Ontario Heritage Act (OHA). Current legislation permits municipalities to formally place heritage designations on individual properties, heritage conservation districts and archeological sites (Ontario Heritage Act, 2009). Regarding individual residential properties, the intent is to recognise and provide a measure of protection to houses that have cultural heritage value. Designation tends to be limited to only what is considered the best examples of artifacts having heritage value. However, designated residential properties only represent a small percentage of the total number of older residential houses. In other words, even though the Official Plan identifies a heritage area, there is no formal recognition for the majority of older houses located in the heritage area. As a result, even if heritage value is implied, it doesn't mean the majority of these houses or windows have any measures for legal protection.

Some municipalities are starting to employ other heritage planning tools in order to provide a formal recognition of heritage value for properties not designation under the Ontario Heritage Act. For example, Kingston's Official Plan recognises cultural heritage landscapes and cultural heritage character areas. Kingston's Official Plan states that "the city will investigate areas and landscapes of special heritage character that are described as cultural heritage character areas" (City of Kingston, 2013, p. 214). Even if an area is not designated under the Ontario Heritage Act, it can be formally recognised for its heritage value. Formal recognised heritage value from other planning tools other than the OHA provides a positive impact for conservation of older residential wood windows.

2.4 The question - are there barriers?

Literature identifies conservation of wood windows makes sense from a cultural perspective, energy and environmental perspective, and an economic perspective. However, homeowners often decide to replace their windows with new windows instead of conserving their existing windows through repair, weather-stripping, caulking and maintaining storm windows (Carroon, 2009).

Literature identifies that older wood windows must be maintained. Possibly, maintenance and operational issues are obstacles for window conservation.

Legally, only in the case of designated heritage houses is permission usually required for window replacement. There isn't a lot of legal protection that encourages window conservation for the majority of older houses.

Literature provides rationale and evidence that older residential wood window should be conserved. Given the trend of window replacement, it's logical that there are barriers to the conservation of pre-World War II wood windows.

CHAPTER 3 – RESEARCH METHODOLOGY

3.1 Methodology Approach

The research approach, used in this study, is qualitative. The approach is qualitative because it suits the research objective of finding the barriers to the conservation of pre-World War II residential wood windows, if they exist. If there are barriers, these should be identified by analysing homeowner and other stakeholder opinions about the merits of window conservation versus the merits of window replacement. As defined by Creswell (2009), qualitative research is a means for exploring individuals, using questions and analysis data using themes. Alongside this qualitative approach, some of the collected data is also analysed using a quantitative approach. Quantitative research analyses data by employing variables (Creswell, 2009). In this research study, quantitative analysis is used to supplement the primary qualitative approach to strengthen the study.

3.2 Research Structure

To explore if there are actual barriers to the conservation of pre-World War II residential wood windows, this research was structured using multiple methods of data collection. These methods of data collection included literature review followed by qualitative sampling of three separate but related exploratory investigations. The resultant data was used in identifying the reasons why homeowners replace their original wood windows and the resultant barriers to conservation. Systematic and random sampling was utilised to obtain accurate representative data based on the theory of probability (Neuman, 2007). Systematic sampling was used for distribution of homeowner mail surveys. Random sampling was employed for the selection of interviewees to increase the credibility of data collected (Patton, 2002). Using multiple methods and sampling provided cross-sectional triangulation of the data (Newing, 2011). Triangulation provided validation of the results (Creswell, 2009).

The first exploratory investigation consisted of purposive sampling by using a systematically distributed, self-administered homeowner mail survey. This mail survey was conducted using the pre-World War II residential areas of Stratford, Ontario as a case

study. Pre-World War II houses typically include all houses constructed with single-glazed, operable, wood-sashed windows with removable wood storm windows built prior to the mid-1900s. The second exploratory investigation consisted of purposive random sampling using semi-structured, face-to-face interviews of some of the homeowners who responded to the mail survey. The third exploratory investigation consisted of purposive random sampling using semi-structured, face-to-face interviews of five related stakeholder groups. Interviews with homeowners and other stakeholders were conducted to obtain "information-rich" data that would provide triangulation of the data (Patton, 2002, p. 230).

3.3 Data Collection

3.3.1 Literature Review

The literature review in Chapter 2 provided the necessary background information into issues concerning conservation of pre-World War II residential windows. Within the literature review, there are many professional opinions as to the value of conservation – the keeping and maintaining of original wood windows. Issues explored in the literature review were analysed using themes. Much of the reviewed literature related to reasons why old wood windows should be conserved. Most of the mail survey questions and interview questions were developed related to these themes.

3.3.2 Exploratory Investigation One – Homeowner Mail Survey

The Study Area

For this research, the pre-World War II residential neighbourhoods in the City of Stratford, was chosen as a case study. This City, the author's home community, was selected as it allowed for convenient case study access and due to its visual evidence of being representative of many older communities experiencing the trend towards replacement of original wood windows. Stratford is representative of many other Ontario municipalities with a larger number of existing pre-World War II houses. A brief visit to most municipalities, even those with extensive sub-urban growth, will reveal older residential neighbourhoods with similar diversity in pre-World War II housing stock. For example, Woodstock, ON, a similar size community located near Stratford has similar pre-

World War II housing as illustrated in Chapter 4. This is also the case with most other Ontario communities, such as nearby St. Thomas, London, London, Waterloo, Kitchener, Cambridge, Guelph and Brantford. All of these communities, like most, have large numbers of pre-World War II houses, and all of them experiencing the trend of having extensive replacement of original wood windows with newer replacement windows.

The number of pre-World War II houses in Stratford is approximately 3,200 and are in close proximity to the City's downtown core. Figure 7 indicates the approximate area of pre-World War II land uses superimposed on the City's current zoning by-law key map (City of Stratford, 2000). Originally, this case study was going to include all pre-World War II houses in Stratford. During early investigation, it was discovered that the majority of these older houses, approximately 2,700, were located in a defined area that is recognised in Stratford's Official Plan as a heritage area. This defined heritage area includes most of the land area highlighted in figure 7. Since the majority of the City's older houses were already within a legally recognised land area, it was decided to use this heritage area as the study area for this research. An overview of the study area, including history, house types and windows types is presented in Chapter 4 – The Study Area.

Identifying that there were 2,700 pre-World War II houses in the study area was based on a count of the approximate number of the houses within the study area, aided by the City's GIS aerial mapping system. This was also aided by a cursory street by street visual number count of the houses which appeared to be built prior to World War II. This was based on architectural styles of pre-World War II houses (Blumenson, 1990). Also, architectural styles of newer houses, such as Victory Houses, provided easy distinction of houses not to be included in this study (Blumenson, 1990). Further confirmation was made by reviewing the existing 1949 Insurance Plans of the City of Stratford. Of interest, these fire insurance plans are in the care of one of Stratford's insurance companies. These maps provided evidence that the majority of Stratford's pre-World War II houses are still in existence.

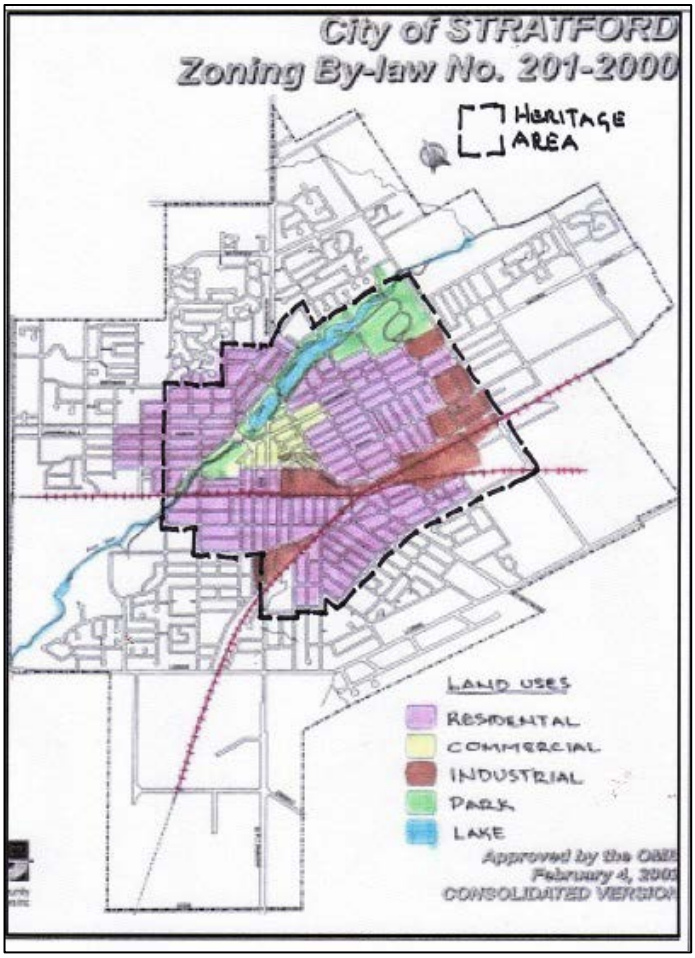


Figure 7: City of Stratford Zoning By-Law Map – Shaded areas show the main land uses. Dotted line indicates heritage area. (Map Source: City of Stratford Zoning By-law No. 201-2000 with shading and dotted line by author)

Homeowner Window Mail Survey

Exploratory investigation one used a self-administered mail survey. To achieve a representation within in this population, a stratified systematic sampling method was selected (Neuman, 2007; Newing, 2011). The stratification was based on including only homeowners of the approximately 2,700 single detached pre-World War II houses in the study area, not including owners of newer houses or owners of other residential building types or tenants. The rationale for this stratification is that homeowners of these older houses are the population group faced with decisions to either conserve original wood

house windows or replace with new windows. The homeowner mail survey was systematically distributed to 450 houses, approximately one-sixth of all the homeowners of older pre-World War II houses within the study area. Determining the optimum number of surveys to be distributed was undeterminable as the number of responses could not be known beforehand. In qualitative data collection the targeted sample size is generally based on the principle of saturation (Newing, 2011). However, based on past experience it was decided that a target sample size of 450 systematically distributed mail surveys should result in enough data for analysis. As the intent was to also use the collected data as quantitative data, 450 surveys represented an approximate four percent margin of error (confidence interval) using a confidence level of 95 percent based on the population of 2,700 homeowners. Even though only a portion of the surveys were expected to be returned, resulting in a higher margin of error, it was decided a systematic selection of one-sixth of the population size would provide sufficient responses for credible quantitative data analysis.

The mail survey, copy included in Appendix A, was designed to obtain information about the homeowner's house, its windows and the homeowners opinions pertaining to the reasons homeowners may prefer to replace their windows. The survey consisted of 20 questions, the majority worded as statements of opinion. These questions focused on four interrelated conservation perspectives, previously explored in the literature review: cultural, energy and environmental, maintenance and operation, and cost and economics. In addition, one question specifically asked homeowners their opinion, what is main reason for window replacement. Another question specifically asked homeowners what is the main reason for conservation. Provision in the survey also allowed for making additional comments. As recommended by Cresswell (2009), pilot testing was employed to develop and ensure top quality questions, format and scales.

Each survey was hand delivered, one to approximately every sixth house. Houses that appeared to contain businesses, or contain apartments were skipped. Each survey package contained an information cover letter, a survey and a self-addressed stamped return envelope. Surveys were distributed over a one week period in June 2013. One hundred

and sixty-six surveys were returned, the majority within six weeks of distribution, the last being returned in October 2013. Tabulated responses are included in Appendix B.

3.3.3 Exploratory Investigation Two – Homeowner Interviews

Exploratory investigation two used a semi-structured interview of randomly selected homeowners who had previously responded to the mail survey. The intent was to explore homeowner survey responses in more depth. The mail survey included a provision for the homeowner to provide their contact information, if willing to participate in a home interview. Over half of the survey respondents provided contact information. One survey question identified three homeowner sub-groups: homeowners whose houses still had all of their original wood windows, homeowners whose houses had all replacement windows and homeowners whose houses had a mixture of original and replacement windows. Using a random number generator program, five homeowners from each of these three sub-groups were selected for interviews. Only 11 agreed to participate in interviews. These 11 interviews were conducted over a period of two weeks starting in November 2013. Each interviewee was provided with an introductory information letter and requested to sign an interview consent form. Copies of these are included in Appendix C. Each interview followed a questionnaire format, based on the mail survey. As recommended by Creswell (2009), all interviews followed acceptable interview protocols. All responses were summarised from notes taken at the interviews. A copy of the each interviewee's responses was provided to the interviewee for an opportunity to correct any misinterpretations or add additional comments. A copy of the homeowner interview questionnaire is included in Appendix A. Responses to the questionnaire are compiled in Appendix B.

3.3.4 Exploratory Investigation Three – Other Stakeholder Interviews

To provide credible triangulation, exploratory investigations were also held with five professional groups of influential stakeholders. These investigations used semi-structured interviews to obtain data on each interviewee and obtain their respective opinions on window conservation and window replacement. These five stakeholder groups included window conservators, window replacement contractors, home inspectors, realtors and

members of Heritage Stratford, Stratford's heritage advisory committee. Although there are other related stakeholders, such as window manufacturers, the interviewed stakeholder types were selected due to their known direct involvement with homeowners pertaining to window conservation or replacement. With the exception of window conservators, three local members of each group were randomly selected for interviews. It was discovered there were no local Stratford window conservators. The three windows conservators, while not local, were selected as the three window conservators located closest to Stratford. Most interviews were held in the interviewee's place of business or residence. Fifteen interviews were conducted during the fall of 2013. Separate questionnaires were designed for each group. Questionnaires for the window conservators and window replacement contractors were more extensive, as these stakeholders are the most involved with windows. It was anticipated that these two groups would provide the most opposing opinions. As recommended by Creswell (2009), all interviews followed acceptable interview protocol. Each interviewee was provided with an information letter and an interview consent form. Copies of these are included in Appendix C. All responses were summarised from notes taken at the interviews. A copy of the each interviewee's responses was provided to the interviewee for an opportunity to correct any misinterpretations or add additional comments. Only one interviewee responded with one additional comment, this was then added to their response. A copy of each of these stakeholder questionnaires is included in Appendix A. Their compiled responses to the questionnaires are included in Appendix B.

3.4 Analysis

Data collected from the three exploratory investigations was interpreted to develop a categorised list of barriers as presented in Chapter 7 – Discussion and Recommendations. Interpretation of the data follows steps as outlined by Cresswell (2009), including organising and reading all the collected data, coding data, interpreting the meaning of the data, specifying themes, and descriptions of the barriers.

The first area of analysis was interpretation of the data from homeowner surveys. This used both qualitative and quantitative approaches. Quantitative analysis provided

information on the percentages of homeowners who have the same opinions. The main focus of the analysis was on the opinions given by the homeowners, presented through the various themes introduced in the literature review.

The second area of analysis was interpretation of the data from the homeowner interviews. This provided clarification and verification to the interpretation of the survey data.

The third area of analysis was interpretation of the data from the other stakeholder interviews. These stakeholder opinions were compared with the homeowner opinions. These comparisons helped identify the barriers.

3.5 Ethics Approval

Due to this research involving humans, ethics clearance was required from the University of Waterloo's Office of Research Ethics. This process followed the requirements of the Tri-Council Policy Statement for *Ethical Conduct for Research Involving Humans* (TCPS2, 2010).This research study received clearance from the University of Waterloo's Office of Research Ethics on June 13, 2013.

CHAPTER 4 – THE STUDY AREA

4.1 The Study Area

The study area, used in this window conservation research study, includes the majority of the older residential neighbourhoods within Stratford. It is identified in Stratford's Official Plan as a heritage area, shown in Schedule E – Heritage Areas and Corridors [Fig. 8]. This defined heritage area includes the majority of Stratford's pre-World War II residential properties, its historic central business district, its older industrial areas, and much of its park system. Within this defined area are approximately 2,700 pre-World War II single-detached houses. These houses constitute the population size for this study. Four hundred and fifty mail surveys were systematically distributed to owners of these houses, one-sixth of the population size.

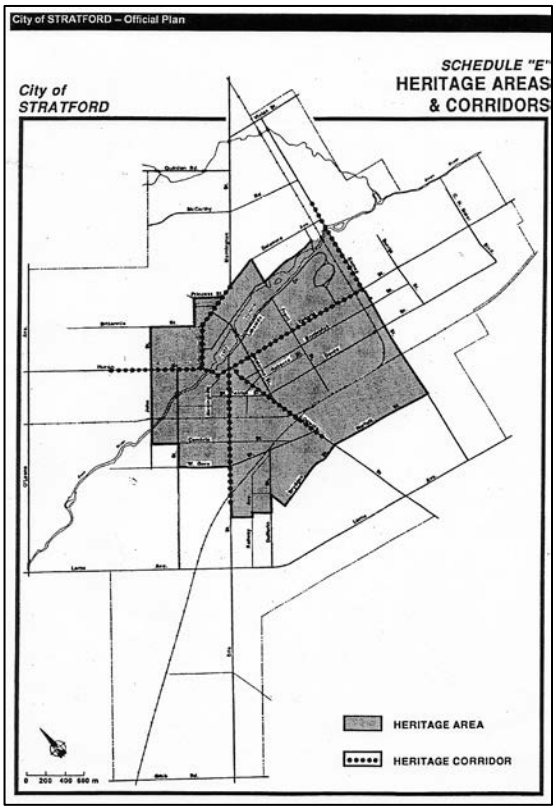


Figure 8: Schedule E – Heritage Areas & Corridors Map – Shaded area is current Heritage Area (Map Source: City of Stratford Official Plan)

Within Stratford, but outside of the study area, there are approximately another 500 pre-World War II houses. Although these houses are excluded from the study, they have similar characteristics to the older houses that are within the study area.

4.2 A Brief History of Study Area

The history of the study area is essentially the history of Stratford, commencing with the founding and planning in the 1830s. It also shares in the history of Upper Canada and the early settlement in southwestern Ontario. Much of the early settlement on Upper Canada (southern Ontario) up until the time of the war of 1812 was limited to the northern shore of Lake Erie, Lake Ontario and the St. Lawrence River. Although 1815 brought victory, Great Britain realised maintaining their colonial control of Upper Canada was still perilously threatened by the new American Republic. Britain needed more loyal immigration and rapid settlement in Upper Canada, but the end of the Napoleonic War in 1815 left Britain's finances severely depleted for the task of providing new settlement. Fortunately, this was also the era of the industrial revolution, with a new class of wealthy industrialists with money for land development in Upper Canada. Fueling land development was the promise of a better way of life for thousands of new immigrants to Upper Canada (Coleman, 1978).

Leading to the planning of Stratford was the creation of the Canada Company. The Canada Company, a British land development company, was formed in 1824, with a large group of investors. In a short period of time, they had acquired over two million acres of crown land in Upper Canada. Included were the one million acre Huron Tract and the 42 thousand acre Halton Block (Coleman, 1978). The Huron Tract included large portions of the current Huron County and Perth County, from Goderich on Lake Huron to Wilmot Township in the east. The Halton Block consisted of Guelph and a small portion of present day Wellington County.

The planning development of these Canada Company lands initially commenced with the establishment of the towns of Goderich and Guelph, and the surveying of the main connecting road known as the Huron Road.

> Unlike Guelph and Goderich, Stratford was an afterthought. When the Huron Road was first laid out from Goderich in a southeasterly direction through the forest, the line was taken to somewhere near present day Stratford. Then a line was surveyed from the western terminus of Bleam's Road in Wilmot Township straight west until it intersected the line from Goderich at an angle. There, a stake was driven in a beautiful large meadow beside a pretty stream. The surveyors made note of the fine situation and called it Little Thames. (Coleman, 1978, p.294)

Little Thames was renamed Stratford by the time the first survey for the new town was made in 1834. Stratford's early surveys were for a future city of 35,000, which ironically is only currently nearing that population. Stratford's early growth was focused around its mill pond, but expanded as it became the center of the newly formed Perth County. As a result of early planning, the layouts of most of Stratford's pre-World War II residential neighbourhoods were established by the 1850s as evident in the 1857 Town of Stratford map [Fig. 9]. Stratford was incorporated as a city in 1885 when it had grown to a population of approximately 10,000.

Like many communities, Stratford was transformed by the era of railways. Up until the 1950s, Stratford became a hub for the steam locomotive repair shops of the Grand Trunk Railway, which later became part of the Canadian National Railway (Leitch, 1980; Robinson, 2012). Stratford was also home to many of Canada's better known furniture manufactures of the early 1900s (Leitch, 1980). Both of these major industrial employers were located within the southern section of the study area shown as industrial land uses in figure 7 in Chapter 3. Of interest, many former industrial buildings used for furniture manufacturing still exist, and most still have original wood windows, many in need of repair. Also of interest, the last remains of the main steam locomotive repair shop still exists and is currently the centre of a community debate to either save or demolish.

Stratford's role as a railway centre ceased when the era of steam locomotives gave way to diesel. However, Stratford transformed itself with new industries, including the world renowned Stratford Shakespearean Festival, which continues today (Leitch, 1980).

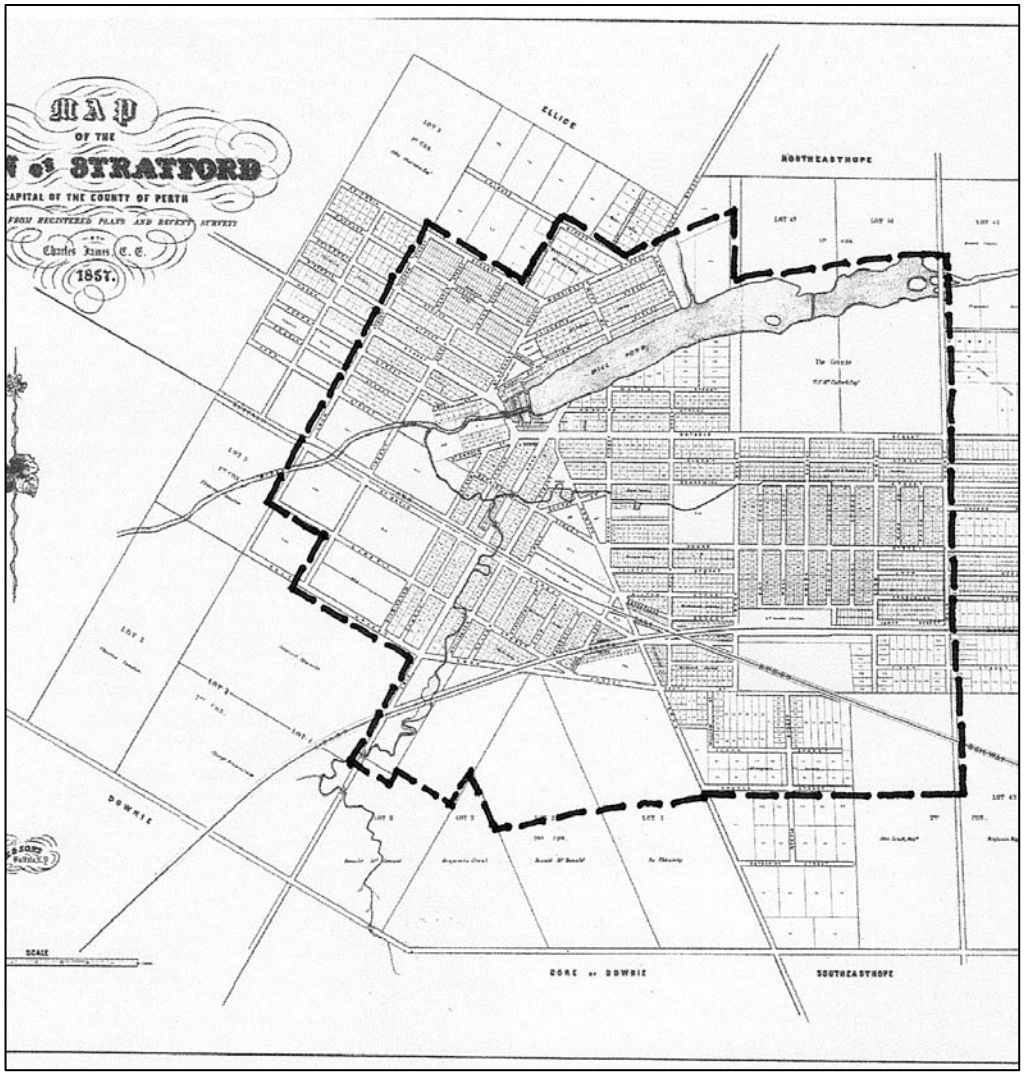


Figure 9: 1857 Map of Stratford - dotted line outlines current official plan heritage area (Map Source - Coleman, 1978)

4.3 Houses of the Study Area

The majority of the houses within the study area are older houses built prior to World War II. Most of the houses are single detached. Newer built houses tend to be limited to infill locations. Discovered through homeowner interviews, some of the existing oldest houses were built in the 1860s. Some houses in the study area maybe even older as it was common by the 1850s that many finer homes were replacing the earlier shanties and log homes (Leitch, 1980).

These older houses include a wide range of ages, sizes and architectural styles. Visual observation reveals a large number of these houses were built during the late Victorian era, late 1800s, and Edwardian era, early 1900s. There is a mixture of house sizes. Larger houses built for wealthier citizens and smaller houses built for the working class of the era. Similar to many older communities, there are neighbourhoods that have a predominance of large older homes as well as neighbourhoods that have a predominance of small houses. In this study area, neighbourhoods having a predominance of smaller houses tend to be located closer to older industrial land use areas. This is reflective of early urban planning of the city. Residential neighbourhoods located near the former railway repair shops and the former furniture manufacturing shops tend to include many streets lined with closely spaced smaller houses. Many smaller houses are of a simple vernacular design.

From visual observations, some generalities of these older houses are:

- The majority of the houses are two storey brick.
- There is a wide range of architectural styles throughout the study area, although there tends to be a higher number of vernacular houses located closer to the older industrial areas.
- Larger houses tend to have more architectural detailing, which is reflective of the styles of larger expensive houses of the era. Larger houses also tend to have more unique windows than smaller houses.

The following photographs, in table 1, are examples of some of the common pre-World War II house styles within the study area. These examples show some of the diversity of houses within the study area. These houses do not necessarily include any the houses owned by homeowners who participated in this study.

Table 1: Photo Group – Common Architectural House Styles within the Study Area

		
12 Elizabeth Street, Victorian Era Italianate	331 Colbourg Street. Edwardian Classicism	181 Brunswick Street, Ontario Cottage
		
322 Brunswick Street, Vernacular Gambrel Style	274 Douro Street, 1 ½ storey Front Gable Vernacular	210 Nelson Street, Ontario Farmhouse Style
		
71 Mornington Street, Craftsman Style	5 Elizabeth Street, Queen Anne Style	227 Cambria Street, Gothic Revival Style

4.4 Older Wood Windows of the Study Area

Some of the houses in table 1 still have original wood windows and some have newer replacement windows. This is common throughout the study area. Some houses still retain all of their original wood windows and some houses have all replacement windows, while

some houses have a mixture of both original windows and replacements. The most common type of original wood window appears to be a single-glazed, double-hung window, or single-hung, with either one over one, or two over two windowpanes. Double-hung windows were very popular due to their vertical orientation and operation. This window type allowed for better day lighting and ventilation during an era depended on natural light and ventilation (Louw, 2007). Sometimes in less expensive older houses, less costly single-hung windows were installed. All of the original wood windows either have exterior wood storm windows or exterior aluminum storm windows. Aluminum storm windows became popular replacements for original wood storm windows in the 1960s. Storm windows increase thermal performance by creating an insulating air space between the inner original single-glazed windows and the outer storm window. Newer replacement windows usually create an insulating air space by incorporating a sealed insulated glazed unit (IGU).

One over one, and two over two, refers to the number and pattern of glass panes in a double or single-hung window. Improvements in glass making allowed for larger panes of glass to be available during the Victorian and Edwardian eras than in previous eras (Fram, 1988). Typically, houses with two over two windows are older than houses with one over one. In some instances, from an exterior view, what appears as two over two is actually one over one interior window combined with a four pane exterior wood storm window.

Windows with greater numbers of individual panes, such as six over six and nine over nine, are rare in this study area. Originally, these windows with multi-panes are more common in houses built prior to the mid-1800s, due to smaller available glass size. However, in some instances, these smaller multi-pane windows were incorporated for aesthetic preference to create the look of older architectural revival styles (Fram, 1988). Of interest, many newer replacement windows aesthetically mimic smaller multi-pane windows even though there is no authenticity to the respective house era.

This is not to conclude that the older houses in the study area only had simple one over one or two over two original wood windows. Many houses also incorporate decorative windows, such as arched topped windows, round top windows, windows with multi-paned

upper sashes and stain glass windows. Many decorative windows are used in special locations, such as attic windows and stairwells. As discovered from one homeowner, many older houses have a piano window, a high horizontal window, located to provide lighting above an upright piano. The following photographs in tables 2, 3 and 4 illustrate some of the diversity of the common window types, special window types, and special window shapes found in the study area.

Table 2: Photo Group – Common Window Types within the Study Area

				
Original 2 over 2 wood window with rounded top	Original 2 over 2 wood window with arched top	Original 1 over 1, wood window with wood storm	Original Queen Anne style wood window with dental moulding on the horizontal mullion	Original Queen Anne wood window with a pronounced horizontal mullion

Table 3: Photo Group – Special Window Types within the Study Area

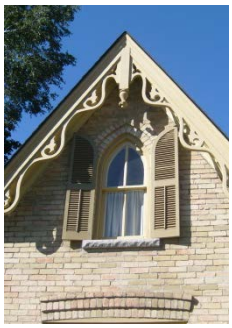
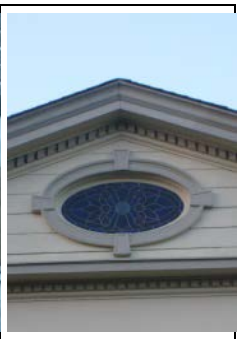
				
Palladian Attic Window	Decorative 3 over 1 double-hung window	Bay Window	Classical round arch window – vinyl replacement window	Gothic gable window

Table 4: Photo Group – Special Window Shapes within the Study Area

				
Vertical Oval	Diamond shape	Semi-circular	Trefoil	Horizontal Oval

Most of the above windows are original wood windows except where noted as replacement windows.

Of interest, the Queen Anne style window, as seen in table 2, was popular in Queen Anne style houses, but also incorporated in many other house styles in the study area. Queen Anne style was a popular decorative style, during the late Victorian and Edwardian eras (Blumenson,1990).

One of the issues explored in this study pertains to the importance of keeping and maintaining original wood windows for the appearance of an older house. The data and analysis will reveal appearance plays a significant factor in conservation of original wood windows. Often in contention is the difference in appearance of a proposed replacement window to that of the appearance of the original wood window. In some instances, replacement windows are custom designed to have a similar appearance, however, in most instances, they are not.

The following photographs in tables 5 and 6 illustrate examples of newer replacement windows. Table 5 includes replacement windows that significantly altered the appearance of the original window. Table 6 includes replacement windows that alter original window appearance while trying to mimic an older window appearance with the use of muntins.

Table 5: Photo Group – Replacements – Significant Changes to Original Appearance

		
Replacement with non-matching window(s), part of original window opening is filled in.	Replacement windows alter original window openings, altered shape and type of window.	Replacement window differs in shape and size. New vinyl window is installed behind original wood frame.

Table 6: Photo Group – Replacements – Common Changes to Original Appearance

		
Double-hung replacement window has muntins mimicking a 15 over 1 window – this pattern would not have originally existed.	A fixed (possibly casement) window with muntins – this type and pattern would not have originally existed.	Replacement window has bottom awning window with non-equal muntin spacings – this type and pattern would not have originally existed.

The following photographs in table 7 illustrate three examples of custom designed vinyl replacement windows designed with a closer appearance to an original wood window.

Table 7: Photo Group – Replacements – Closer in Appearance to Original

		
Vinyl replacement window with similar look of the original wood window.	Vinyl replacement window with similar look of the original window	Upper windows is a vinyl replacement window, bottom window is an original

4.5 Other Windows – Other Municipalities

One concern in using this specific study area is the question of whether the houses and windows are representative of houses and windows in other communities. This study will provide greater significance if the houses and windows of the Stratford study area is similar to a larger population. To explore, a visual exploration of pre-World War II houses was made in Woodstock, Ontario, a similar sized city near Stratford. Similar comparisons are apparent. Woodstock has a similar diversity of older houses with both original wood windows and replacement windows. This implies that the results of this study should be applicable to the larger community as a whole. Table 8 includes several examples of older houses in Woodstock to illustrate a similar diversity of house types as found in Stratford.

Table 8: Photo Group – Similar Architectural House Styles in Woodstock, ON

		
Ontario Cottage Style	Edwardian Classicism	1 ½ Storey Vernacular
		
Vernacular Gambrel Style	Italianate Style	Queen Anne Style

CHAPTER 5 – FINDINGS

5.1 Findings

The following is a summary of findings from the three exploratory investigations, focused on the homeowner responses to the mail survey questions and on the other stakeholders' opinions relating to these questions. Complete data findings from the homeowner mail survey, homeowner interviews and other stakeholder interviews is included in Appendix B. Appendix B includes a tabulation of the responses to each question in the homeowner mail survey, a tabulation of all the homeowner interview responses and compiled responses from all the other stakeholder interviews.

This summary of findings is presented in the following order:

- An overview of the homeowners and other stakeholders.
- A summary of the responses given by the homeowners about their houses and windows obtained from questions one through four in the mail survey.
- A summary of the responses from the opinions of the homeowners and other stakeholders pertaining to questions five through eighteen in the mail survey. These responses pertain to cultural, energy and environmental, maintenance and operation, and cost and economic themes.
- A summary of the main reasons for window replacement given by homeowners and other stakeholders, based on question 19 of the mail survey.
- A summary of the main reasons for window conservation given by homeowners and other stakeholders, based on question 20 of the mail survey.

5.2 Overview of Homeowners and Other Stakeholders

5.2.1 Homeowners

Information gathered on homeowners was limited to the opinions provided in returned mail surveys and from individual interviews. Personal information, such as age, gender and income level, was not included in the mail survey questions. All respondents to the

mail survey, except three, were the owners of the house receiving the survey. Opinions pertaining to conservation of original wood windows and window replacements varied, but in most instances there was a consensus among the homeowners on most of the survey questions.

5.2.2 Other Stakeholders

An interview was held with three separate members from each of the following stakeholder groups: window conservators, window replacement contractors, home inspectors, realtors and Heritage Stratford Committee members. The following is a brief overview of each of these stakeholder groups.

Window Conservators

All three window conservators provide window conservation consulting and construction services. All were owners or senior staff of their companies. Experience ranged from five to ten years in all aspects of wood window conservation. All indicated conservation of residential wood windows constituted a significant portion of their company's work. One indicated it constituted up to 90 percent of their work. All had previous related experience leading to their current conservation work. The majority had training in heritage conservation, including experience in finish carpentry. All of their companies employ less than ten employees. The majority indicated that they could make a full time living from conservation of wood windows. One noted that they could not keep up with the demand. One advised it would be difficult to make a full time living only from conservation of wood windows. None of the window conservators worked for local companies, but represented the three wood window conservation companies located closest to Stratford. All three were of the opinion that conservation of wood windows is preferable to that of replacing windows.

Window Replacement Contractors

All three window replacement contractors were owners of local window, door and siding renovation companies, specialising in window replacements. All had significant experience with window replacement, ranging from 20 to 30 years. All had previous

background experience in construction related activities. All had extensive work with replacing older wood windows with new replacements, ranging from 20 to 60 percent of their business. All were of the opinion that replacement windows are a good alternative in lieu of conserving original wood windows.

Home Inspectors

All three home inspectors were independent local home inspectors. All have significant experience providing residential house inspections, ranging from seven to eleven years. All have extensive inspection experience with older residential houses, accounting for approximate 50 percent of their business. Most were of the opinion that maintained original wood windows can perform well and be as cost effective as replacement windows. One was of the opinion that new replacement windows were superior energy wise.

Realtors

All three realtors were real estate sales representatives, from three different local firms. One is also a real estate broker. Two have over 20 years of experience, and one less than one year. One sales representative indicated that 80 percent of their business is with older residential houses, one 30 percent and one undetermined. All realtors were of the opinion that in older houses, new replacement windows usually increased market value of a house. All advised that current real estate training provided no training pertaining to conservation of older wood windows.

Heritage Stratford Committee Members

General information on each of the interviewed Heritage Stratford Committee members was not requested for this research. However, members of municipal heritage advisory committees are local citizens, typically with diverse backgrounds, and usually have a keen interest in their community's heritage. Most have a preference for conservation of items considered to have heritage value. Members are appointed by their municipal council, primarily to advise and make recommendations on heritage matters pertaining to designated heritage properties, such as proposed renovations.

5.3 Summary of Responses

The following is a summary of the responses from both homeowners and other stakeholders. This is presented following the order of questions in the homeowner mail survey. For each mail survey question a summary of the homeowner response is included, followed by the responses from the homeowner interviews. Also included, are responses from the various other stakeholders where applicable to these mail survey questions. Also where applicable, additional comments provided by the homeowners are included.

Of the 450 mail surveys distributed within the study area 166 surveys were returned. The survey response rate was 36.9 percent. The mail survey consisted of two parts, with a total of 20 questions. Part A, four questions, obtaining general information about the homeowner's house and its windows. Part B, sixteen questions, primarily obtaining homeowner's opinions on window conservation issues. The mail survey also provided for the submission of additional comments, in which over 25 percent of the respondents added additional comments. The survey also requested contact information, only if they would be willing to participate in a follow up interview, over 50 percent of homeowners provided contact information. Eleven homeowners were interviewed. The survey also asked if the homeowner would be interested in learning more about conservation of older wood windows, in which over 25 percent responded yes.

5.3.1 Homeowner Mail Survey – Part A: Questions One through Four

Part A of the homeowner mail survey and homeowner interviews included four questions designed to obtain general information about the homeowner, their house and windows.

Mail survey question 1: Are you the owner or tenant of this house?

Out of the 166 mail survey respondents, 163 where owners, only three identified themselves as tenants. As this small percentage of tenant responses will not significantly alter the overall quantitative results, they have been included with the owners' responses. All the 11 interviewees identified themselves as owners.

Mail survey question 2: How many years have you lived in this house?

The number of years lived in their house ranged from less than one year to 89 years. Over 40 percent of respondents had lived in their current house for ten years or less. However, the average number of years that people had lived in their current house was 17 years. This average is over twice the time that people in the larger community currently occupy houses before selling and moving. That community average is approximately seven years.

Mail survey question 3: Does your house have?

Approximately 21 percent of respondents indicated that their house still had all of its original wood windows combined with either all or some of its original wood storm windows or aluminum storm windows. Approximately 19 percent of respondents indicated that their house had all replacement windows. The remainder, approximately 60 percent, indicated that their house had a mixture of original and replacement windows.

Mail survey question 4: If all or some of the original windows in your house have been replaced, what type are they?

The majority of window replacements are vinyl windows, indicated by over 70 percent of the respondents. This is followed by smaller percentages of aluminum windows at approximately 14 percent, wood replacement windows at approximately 10 percent, and fiberglass windows at approximately two percent.

Of the interviewees who indicated that they had all replacement windows, their windows were typically double-hung vinyl replacement windows. Typically, these windows had insulated glazed units with an argon filled air space, with a Low-E coating. Typically, they featured tilt-in sashes for easier cleaning and an insect screen. Typically, they were also white in finish colour, except one house had coloured vinyl windows. Two of these houses had windows with muntins to imitate divided panes. One house had surface mounted muntins, and one house had muntins located within the sealed glazing units.

5.3.2 Homeowner Mail Survey – Part B: Questions Five through Eighteen

Questions five through eighteen pertain to homeowners' opinions on four themes: cultural, energy and environmental, maintenance and operation, and cost and economics. Although these questions are worded as statements of opinion, for simplicity, they are referred to as questions.

Accompanying data charts are provided for each question to clarify response breakdown. In the mail survey and in the corresponding tabulated responses in Appendix B, six response options were allowed for questions 5 through 18: strongly disagree, disagree, neither agree or disagree, agree, strongly agree or don't know. Several of these options are combined for presenting data in this chapter: percentages of disagree and strongly disagree responses are combined, and percentages of agree and strongly agree responses combined. These combined responses allow for identifying majorities, in which 50 percent or more homeowners either agree or disagree with each statement. The breakdown percentages are categorised to include both the combined total number of respondents and sub-group breakdowns. Sub-group categories include houses with all replacements, houses with a mixture of original wood windows and replacements, and houses with all original wood windows. Sub-group categories were determined from information gathered from question 3. Further category breakdowns, such as distinguishing between homeowners who had purchased a house with all replacement windows from those homeowners who replaced all their windows wasn't included in the survey, although it is acknowledged these sub-sub-groups may vary in opinion.

Questions five through eight include homeowner's opinions regarding cultural heritage and aesthetic value of the homeowner's neighbourhood, house and windows.

Cultural Heritage Value of an Older House

Mail survey question 5: Your house has heritage value.

The majority of homeowners, over 60 percent, responded that their house had heritage value, while only a small percentage of respondents disagreed [Fig. 10]. This majority was much higher among homeowners who still had all of their original windows.

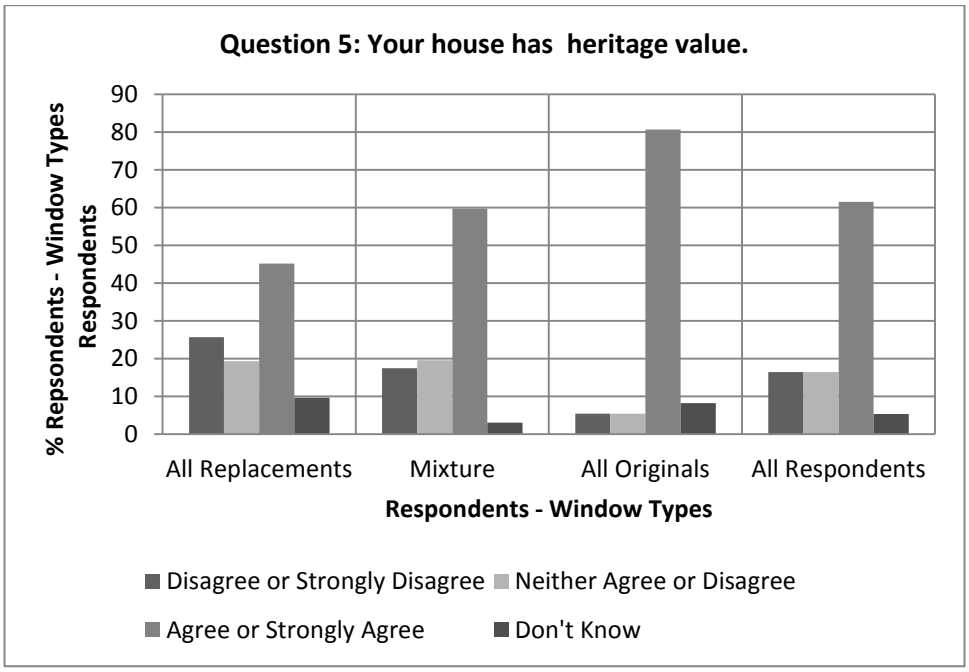


Figure 10: Response to Mail Survey Question 5

From the homeowners interviewed, it is also apparent that most homeowners are interested in their house's heritage. Most knew the approximate age, architectural style and some history of their house. For example, all homeowners knew the age of their house. All houses were over a century old, built between 1860s and 1911. Of interest, two of the oldest houses, built during the 1860s, were built approximately 30 years after the founding of Stratford, at a time when there would still have been log houses in the community. Most homeowners also knew the architectural style of their house. There were a range of styles, such as Ontario Cottage, Gothic Revival, Italianate, Edwardian Classicism and vernacular. Of interest, one homeowner knew their house was a Carpenter's Ontario Framed Cottage, different than the more well-known Ontario Brick Cottage. Most homeowners knew some of their house's history. For example, some knew who the original owner was or a well-known person who had previously lived in the house. Some knew historical associations of their house. For example, several knew that their houses were built for employees of the burgeoning Grand Trunk Railway, which was the largest employer in Stratford during the late 1800s and early 1900s.

Only one interviewed homeowner disagreed that their house had heritage value. Homeowner interviewee 2 stated that their house had lost too many of its original wood details to be considered heritage value. However, this owner still thought heritage was important, knew a lot about their house's heritage, but wished more of the physical heritage details were remaining. The opinion that older houses have heritage value was also shared by members of Heritage Stratford. Two members were of the opinion that the majority of old houses have heritage value, while one other member was of the opinion that all old houses have heritage value.

Heritage Value of an Older Neighbourhood

Mail survey question 6: The residential neighbourhood, in which your house is located, has heritage value.

The majority of homeowners, over 70 percent, responded that their neighbourhood has heritage value [Fig. 11].This response was unanimous among all three respondent sub-groups.

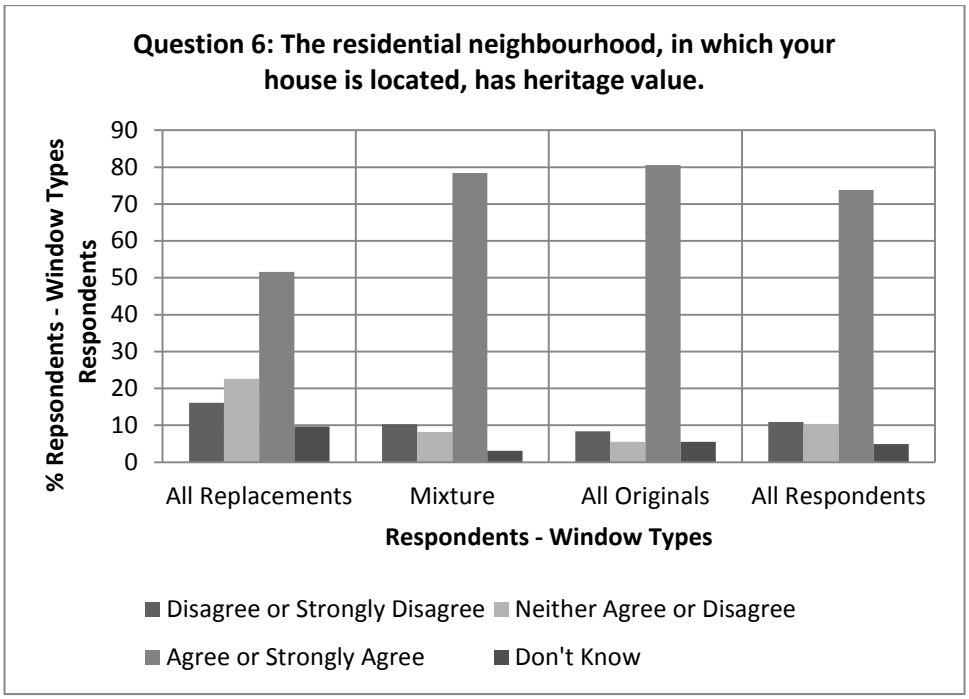


Figure 11: Response to Mail Survey Question 6

Most homeowners believe, not only their house has heritage value, but their neighbourhood has heritage value. This response was higher among homeowners who had houses with all original wood windows.

The majority of interviewees expressed their house was part of an older neighbourhood with unique character. For example:

- One homeowner identified their neighbourhood as a good example of a blue collar worker's neighbourhood, containing many old homes with unique character.
- One homeowner identified their house was a good example of early urban neighbourhood property development. Initially started with a large house on a large lot, followed by lot severances with smaller infill houses.
- One homeowner identified their neighbourhood consisted of some of the City's oldest houses, and included a diverse range of older house styles.

Two interviewed homeowners disagreed. One advised there were too many newer houses in their neighbourhood. Another with the opinion too many of their neighbourhood's older houses had lost their original architectural details. For example, many of their neighbourhood's houses original wood or brick exteriors were covered over with aluminum or vinyl siding. Even while disagreeing, these homeowners were aware of their neighbourhood's character.

None of the interviewed homeowners were aware their house and neighbourhood was located within a defined heritage area as per the City's Official Plan.

The opinion that these neighbourhoods have heritage value was shared by members of Heritage Stratford. All interviewed members indicated that all the older residential neighbourhoods have heritage value, with character and beautiful homes. Most of the members responded that conservation of original wood windows was important to the maintaining the heritage value of the older neighbourhoods.

Window Appearance

Mail survey question 7: Keeping and maintaining original wood windows is important to the appearance of an older home.

The majority of homeowners, over 57 percent, responded that keeping and maintaining, original wood windows is important to the appearance of an older home [Fig. 12]. This response was higher among homeowners with all original wood windows, at over 85 percent. Less than three percent of homeowners, whose houses still had all of their older windows, disagreed that keeping their original wood windows was important to the appearance of an older home.

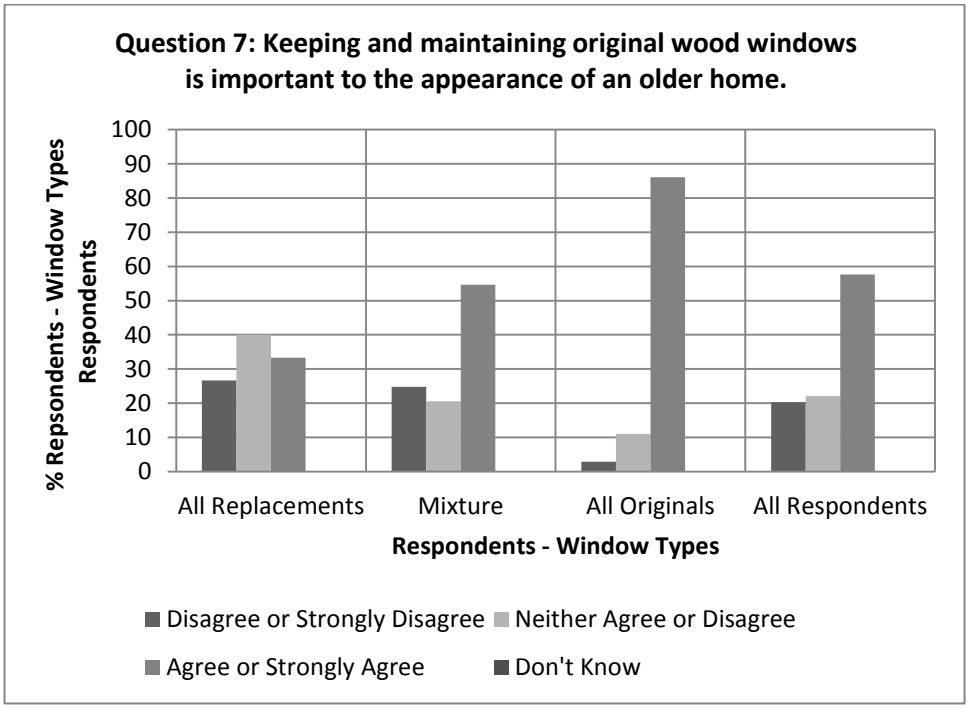


Figure 12: Response to Mail Survey Question 7

Most homeowners are of the opinion that maintaining original wood windows is integral for maintaining the overall appearance of their house. This response concurs with the main reason given in question 20, in which maintaining heritage character is the main reason for keeping and maintaining original wood windows.

All interviewees whose houses had original wood windows used similar terms in responding to the relationship between their windows and their house's appearance. For example, two homeowners said that the original wood windows "just fit" their house.

All interviewees whose houses had replacement windows mentioned that maintaining the original windows appearance was important, but not necessarily enough to keep the original windows. For example, interviewee 3 agreed, but replaced their original windows with coloured vinyl windows. These replacements included exterior surface mounted muntins, similar in width to the original muntins to simulate the original two over two window pattern. This homeowner's opinion was that replacement windows would maintain the appearance and character of the original windows while being easier to operate and less costly to maintain. They considered replacement windows an acceptable alternative to conservation. For some homeowners, acceptance of replacements depends on how close the appearance resembles an older wood window. For example, interviewee 1 disliked the appearance of their windows because of narrow square muntins, unlike original muntin profiles. The use of muntins, sometimes referred to as grilles, are intended to aesthetically provide the appearance of older individual divided windowpanes.

Homeowners used a range of terms and phrases to express opinions related to window heritage and aesthetics. Many listed terms, such as character, integrity and authenticity. Homeowners also tended to use simple phrases such as to look good, to blend in and to fit the house.

Window conservators indicated that keeping original wood windows are imperative for the architectural appearance of older houses, and not just houses with a heritage designation under the Ontario Heritage Act. One conservator stated 80 percent of a house's appearance relates to its windows. Conservators believe character-defining window elements should be maintained, such as original window sashes and muntin profiles. They advised most homeowners don't have an appreciation for building components made by past craftsmen. For example, old window glass having minor imperfections was integral to the craft of making glass. These imperfections often include small air bubbles and wavy glass. From a conservator's viewpoint, these imperfections are

part of the cultural heritage value of the window and should be valued by homeowners. One window conservator optimistically advised of a growing trend among the younger generation for valuing original older materials. This window conservator predicted younger generations will want conservation work.

Members of Heritage Stratford expressed similar opinions. All interviewed members stated it was important to conserve original wood windows in order to maintain original window appearance, regardless if the house was designated. However, this opinion was qualified. They advised conservation of original windows was the preferred approach, but not a mandatory approach. Heritage Stratford members noted an order of preference for maintaining appearance. First is to conserve the original wood window. Second is to closely match appearance with a wood replacement window. Third, while not preferred, was to install a vinyl replacement window, if it maintained a near look of the original. One member stated, even with a heritage designated house, conservation of the original windows cannot be enforced, especially not if it causes a financial hardship for the homeowner.

The approach of replacing original windows with near looking vinyl replacement windows was conducive with the opinion of one window replacement contractor who stated that a custom designed vinyl window can provide an acceptable “near-look” heritage appearance. Although window replacement contractors are not in the business of maintaining original wood windows, interviewed window replacement contractors advised they took into consideration the appearance of the original windows, to varying degrees, when proposing vinyl replacement windows. For example, all window replacement contractors advised they would propose double-hung windows when replacing double-hung original windows in order to have similar operable type of window.

One replacement contractor stated, if they determined the original wood windows were in very good condition, they would recommend keeping them, depending on the owner’s preference. In some cases, they would propose wood window replacements in order to provide a closer appearance to the original wood windows. The predominate opinion of the interviewed window replacement contractors was vinyl window replacements can be

custom designed to provide an appearance that will provide an acceptable match to the appearance of the original wood windows. One contractor indicated that most homeowners would not notice the difference in appearance, especially not from a curb appeal distance. One contractor stressed that a custom designed replacement window, while more costly, was important in order to maintain an older house's heritage appearance. However, this contractor acknowledged that some window replacement companies were not sensitive to heritage and do not provide custom design.

Mail survey question 8: Replacing original wood windows will improve, (or has improved), the appearance of your house.

A near majority, approximately 45 percent of respondents, indicated that replacing their original wood windows would improve, or has improved, the appearance of their house [Fig. 13].

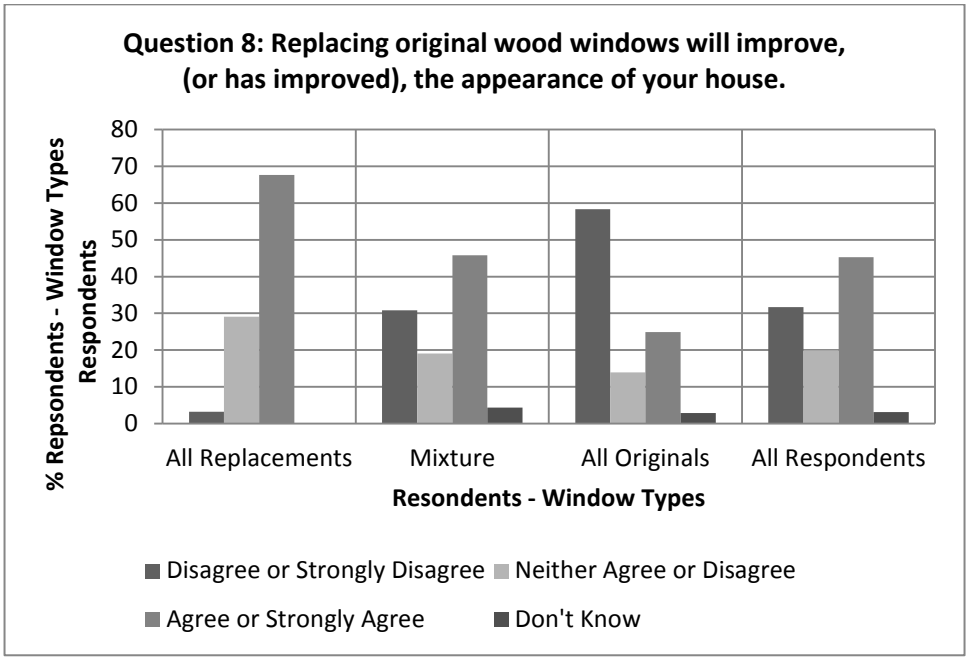


Figure 13: Response to Mail Survey Question 8

This level of response seems to contradict the previous question, in which the majority of homeowners responded that keeping and maintaining their original wood windows was important to appearance. This contradiction partially results due to distinct difference in

opinions between two respondent sub-groups. Over 60 percent of homeowners, with all replacement windows, responded replacements would improve the appearance of their house, while nearly 60 percent of homeowners with all original wood windows disagreed.

Clarification came from the homeowner interviewees. Most responded replacements would improve their house appearance compared to the appearance of deteriorated wood windows, such as those with peeled paint and rotted wood. Respondents didn't consider the appearance of their original wood window if they were repaired. For example, interviewee 4 indicated that replacements did improve the appearance of their house because their existing windows were a mixture of original and previous replacements, all in poor condition. Other homeowners responded with similar reasoning, new replacements had improved their house appearance because their existing wood windows were in poor condition.

Only one interviewee with all original wood windows agreed replacements would provide better appearance. However, they were only referring to replacement of their existing aluminum storm windows. This homeowner wanted to replace aluminum storms with replicated wood storms in order to obtain a more original house appearance. All other interviewed homeowners with original windows expressed replacements would not be appropriate. For example, comments included that vinyl replacements wouldn't look right, they would have different size of profiles and the typical white colour of vinyl windows would stand out too much.

However, there was an opinion among many homeowners, window replacement contractors and members of Heritage Stratford, that replacement window can be an acceptable alternative to keeping and maintaining original wood windows. This opinion was qualified, provided the replacement window creates an appearance that closely resembles the appearance of the original windows. Terms such as sympathetic look, near look and to replicate the look, were used to describe acceptable appearance.

While homeowners responded that maintaining the house's appearance was the main reason for keeping original wood windows, to a lesser extent, authenticity was also mentioned as a reason for maintaining original wood windows.

Energy and Environmental

Responses to questions nine and ten pertain to an energy and environmental theme, including energy performance of older wood windows and environmental issues pertaining to older wood windows.

To save on heating costs, homeowner response in question 19, was the primary reason stated for replacing original wood windows. This is attributed to poor thermal performance, such as windows having a relatively low resistance to heat transfer compared to other exterior building assemblies. Associated with this lack of thermal performance is the desire to make a house more comfortable. Making a house more comfortable often means eliminating cold draughts, which is also associated with heating costs.

Mail survey question 9: If original wood windows provided energy savings similar to new replacement windows; you would prefer to keep your original wood windows instead of replacing them.

The majority of homeowners, over 70 percent, responded that they would prefer to keep their original wood windows, if their windows provided similar energy savings as compared to new replacement windows [Fig. 14]. This majority was higher among homeowners who still had all of their original windows, but was also a majority among all sub-groups.

The majority of interviewed homeowners responded that they would prefer to keep their windows, as there would be no reason to replace, if there were negligible energy savings. Several of the homeowners who had all replacement windows qualified their opinions. No need to replace them provided that their existing windows were in good condition. Only one respondent, interviewee 4, disagreed and indicated that replacement provided other benefits such as easier window cleaning. One respondent, interviewee 10, stated that installing additional insulation in other exterior locations, such as an attic, would provide better energy savings than window replacement.

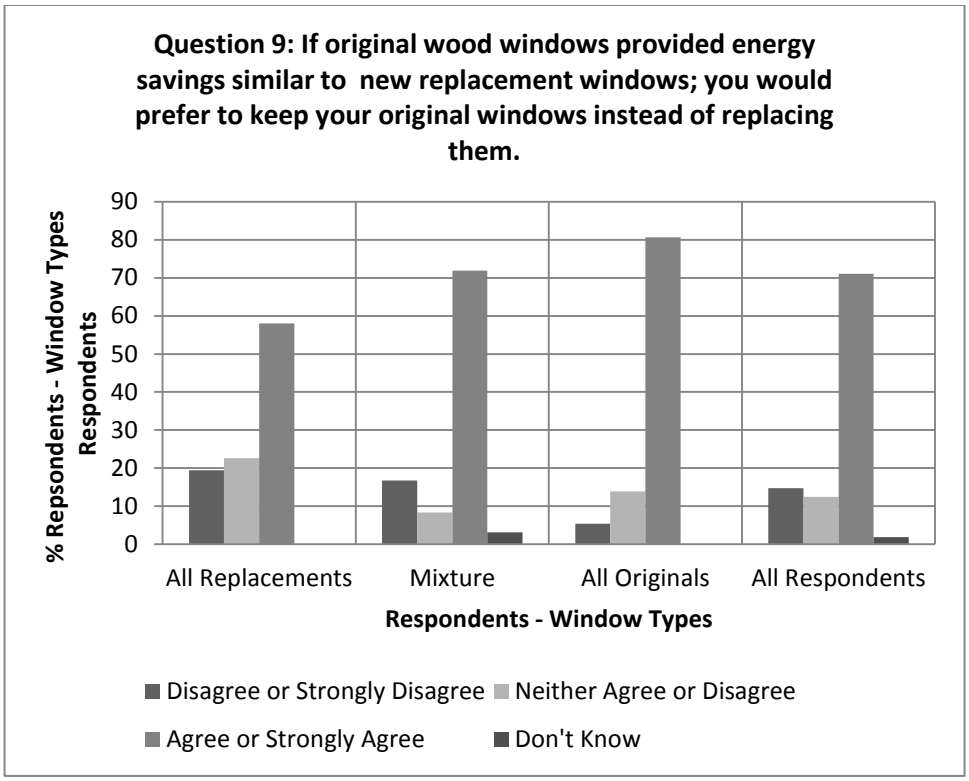


Figure 14: Response to Mail Survey Question 9

None of the interviewees were aware of research studies that concluded weather-stripped single-glazed original wood windows, combined with storm windows provided similar energy savings as standard new replacement windows.

Consensus among windows conservators was a properly repaired window, with weather-stripping and a storm window would provide the same energy performance as a new replacement window. One advised, in some cases, long term performance of repaired windows would actually be better since new windows with sealed glazing units reduce in thermal performance over time. This is due to loss of inert gas which is commonly installed inside of sealed glazing units. Conservators stressed proper weather-stripping was essential for good energy performance. Conservators also noted wood storms provided better thermal performance than aluminum storms as wood is a better insulator. Also noted, aluminum storms often lead to wood rot due to trapping moisture at screw fasteners to wood frames and at wood window sills.

In contrast, window replacement contractors were of the opinion new replacement windows provided better energy savings. However, they were not in consensus as to whether replacement windows provided enough energy savings to make it financially worthwhile for homeowners. Only one responded that replacement windows provided enough energy savings to be a good reason for replacement. Another responded it would provide better energy savings, but the extent of savings depended on the condition of existing windows, noting that some older windows were better than others. One contractor stated that replacement for the intent of energy savings was not a good reason due to payback period being too long to be considered worthwhile. This contractor also stated that the marketing for replacement windows to achieve energy savings was sometimes misleading.

Home inspectors provided a mixed range of responses pertaining to whether energy savings was a good reason for replacement. One responded that replacement windows were better for energy efficiency, but another responded that energy performance of windows wasn't a big issue, if there was good insulation in other locations. One stated that it wasn't cost effective to replace windows for energy savings.

Consensus among realtors was energy savings provided by new replacement windows was a selling feature and increased a house's market value. One realtor stated new replacement windows would help sell a house faster because the buying public have been taught to believe replacements provide energy savings.

Mail survey question 10: Environmental issues would influence your decision to keep or replace your windows.

The majority of homeowners, nearly 70 percent responded that environmental issues would influence their decision to keep or replace their windows [Fig. 15]. This majority was higher among homeowners who already had replacement windows, but was also a majority for those who still had all of their original windows.

Although the majority of homeowners responded that environmental issues would influence their decision to keep or replace their windows, the majority of interviewed

homeowners responded that they were not aware of any specific environmental concerns pertaining to windows. For example:

- No interviewees knew the meaning of embodied energy. However, many advocates of conservation currently stress that the embodied energy of existing wood windows should be a consideration which favours conservation.

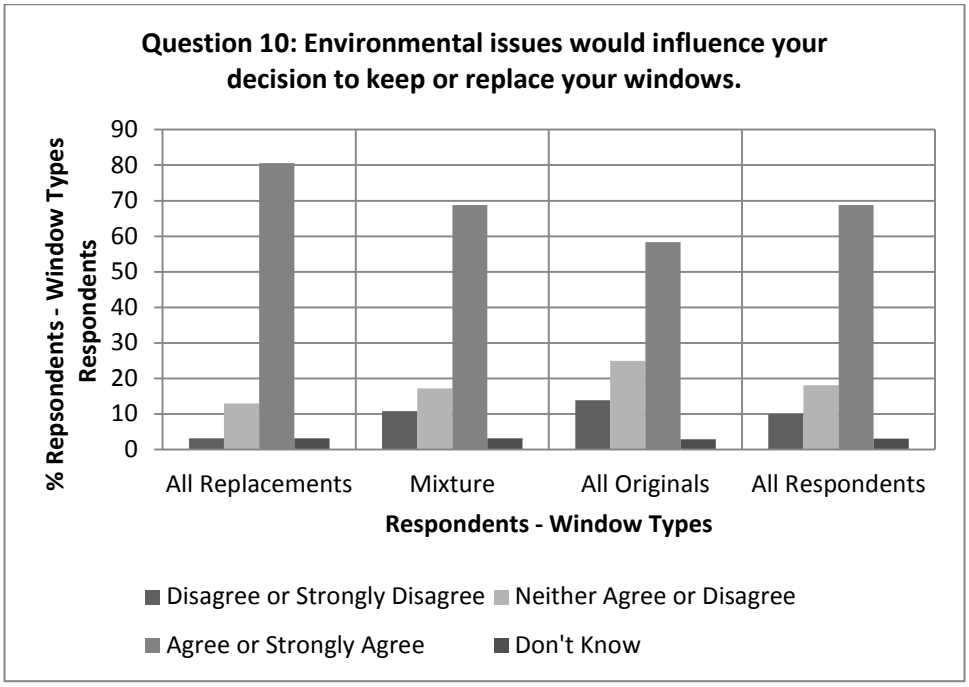


Figure 15: Response to Mail Survey Question 10

- No interviewees were aware that existing lead paint may be of concern when repairing windows.
- No interviewees were concerned that that replacement would put original windows in landfill sites, or replacements will also eventually end up in landfill sites. Ironically, one homeowner stated that wood windows would be environmentally friendlier in landfill, almost condoning discarding wood windows. Another interviewee disputed that vinyl windows would end up in landfill since both vinyl and glass materials are recyclable.

- Only interviewee 2 made a general comment about sustainability, stating future consumers will have to rely more on maintaining, reusing and recycling. Even this interviewee had replaced all their widows.

Concerning existing lead paint on old windows, window conservators responded that removal of lead paint during repair work wasn't a significant concern due to environmentally friendly procedures for lead paint removal. Window replacement contractors responded they didn't take precautions pertaining to lead paint when removing original wood windows.

Concerning windows going into landfill, window replacement contractors concur that most replaced original wood windows ended up in landfill. One contractor advised there was little market for recycled old windows beyond old sashes being recycled for reuse as interior decoration. All stated original glass, while recyclable, ended up in landfill due to there being no current market for recycled glass.

Maintenance and Operation

Responses to questions 11 through 16 pertain to a maintenance and operation theme. In question 19, many homeowners responded with a desire for less maintenance and easier operating windows as other reasons for replacing original wood windows. Many maintenance issues relate to reparability and extent of required maintenance. Many issues have multiple considerations. For example, even if wood windows are reparable, are skilled tradespeople available or are homeowners skilled enough to make repairs themselves?

Mail survey question 11: Original wood windows tend to be difficult to operate, such as opening and closing.

The majority of homeowners, nearly 80 percent, responded that original wood windows tend to be difficult to operate [Fig. 16]. This majority was higher among homeowners who already had replacement windows. It was also a majority for those who still had all of their original windows.

This survey question received the highest consensus among homeowners. Those interviewed responded that they have (or had) wood windows that were:

- Hard to lift open or close, often referred to as sticking windows.
- Heavy to lift open, referring to larger windows.

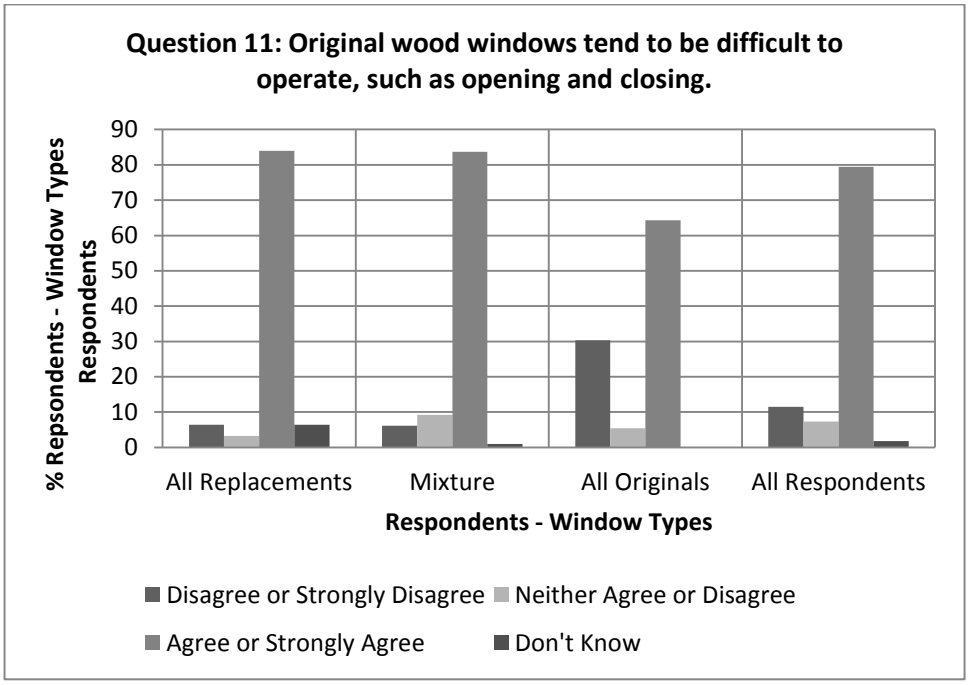


Figure 16: Response to Mail Survey Question 11

- Awkward to keep open, referring to sashes that drop like a guillotine.
- Non-opening, referring to windows that are painted shut.

Some of the common reasons for difficulty in opening and closing windows were:

- Some window openings were out of plumb due to structural settlement, causing difficulty in sliding window sashes up and down. In some cases, they just couldn't open their windows.
- Some windows had a heavy build-up of paint at window sash edges, causing difficulty in sliding window sashes up and down due to too much friction.

- Some windows had disconnected window sash cords and sash weights, causing difficulty in lifting and lowering larger window sashes due to weight. Not all single or double-hung windows had sash counter balances.
- Many windows were painted shut resulting from improper painting. Joints between window sash edges and adjacent windows members become sealed with paint. Ironically, in most of these instances, the interviewed homeowner didn't plan to fix the problem, instead accepting that their windows won't open. Some homeowners stated they accepted this deficiency as they no longer needed to open their windows, since they had air conditioning. In contrast, homeowners with replacement windows noted with pleasure that replacement windows were easy to operate.

Mail survey question 12: If your original wood windows required repair, (such as repair of rotted wood or replace glazing); it would be easy to make the repairs yourself.

The majority of homeowners, nearly 70 percent, disagreed that making repairs to their original wood windows would be easy to make by themselves [Fig 17].

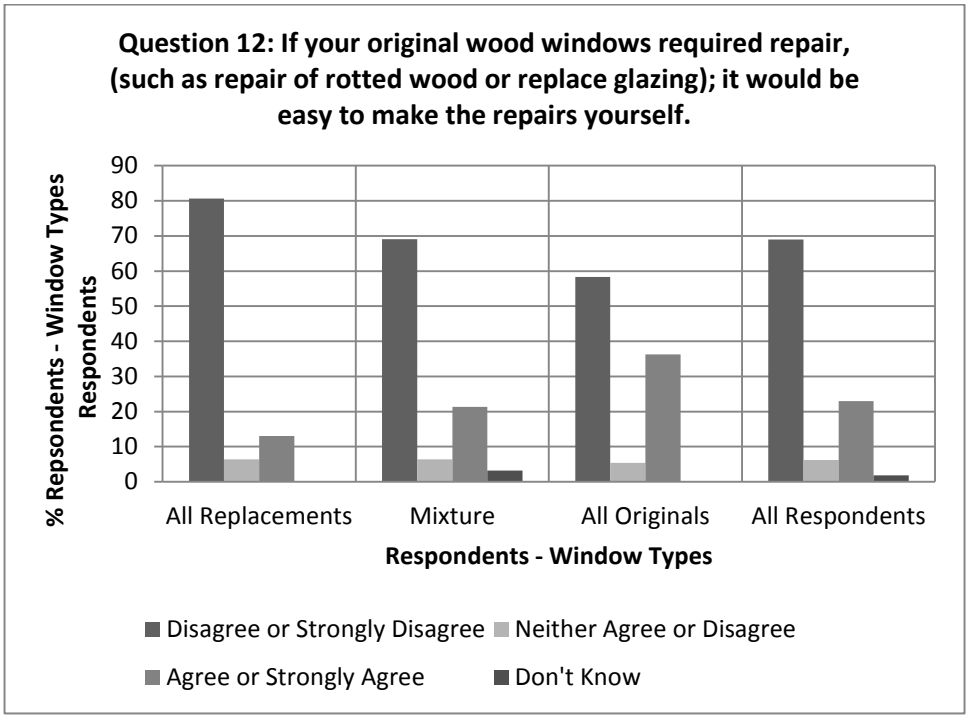


Figure 17: Response to Mail Survey Question 12

This majority was higher among homeowners who already had replacement windows. It was also a majority for those who still had all of their original windows.

The majority of homeowners interviewed stated they didn't have the necessary skills to make windows repairs. Only a few homeowners noted that they could do minor window work, such as repainting. Most indicated that making repairs by themselves is difficult. For example, one homeowner noted they had tried paint removal, but discovered it was too time consuming. Another homeowner who had wanted to reglaze a window discovered they couldn't buy traditional oil based putty.

Mail survey question 13: Installing new windows that do not require painting is a good reason to replace original wood windows.

Approximately one-half of the homeowners agreed that installing new windows that do not require painting is a good reason to replace their original wood windows [Fig. 18]. This response was higher among homeowners with replacement windows, but much lower among those who had all of their original windows.

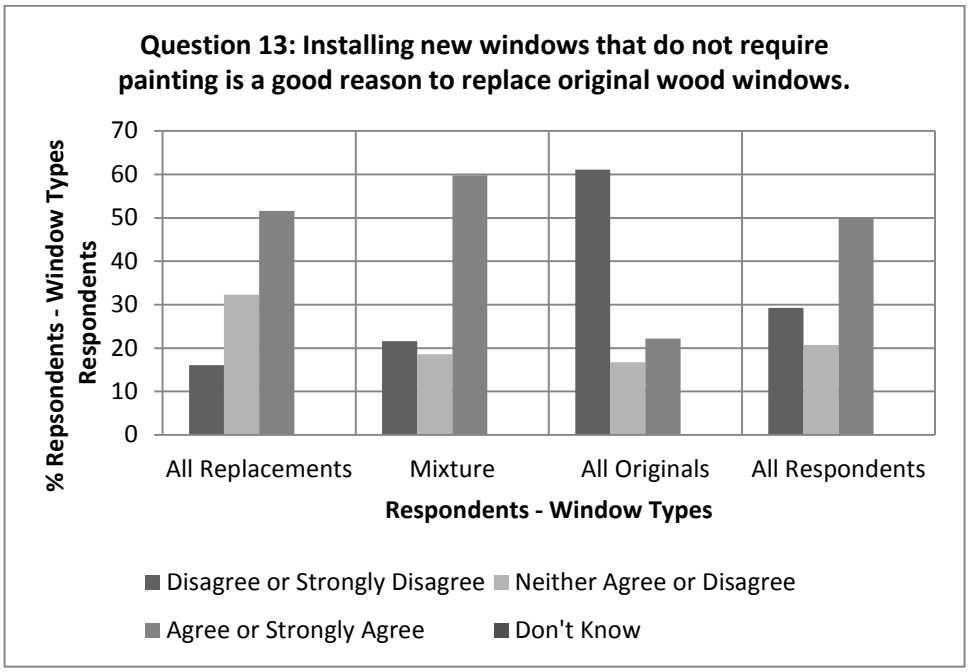


Figure 18: Response to Mail Survey Question 13

In contrast, the majority of interviewed homeowners disagreed having to periodically repaint wood windows was a good reason to replace original wood windows. Even the majority of homeowners who already had vinyl replacement windows disagreed that replacing original wood windows to eliminate the need for repainting was a good reason for replacement. Only one interviewee differed, stating that repainting was costly and time consuming. Other noteworthy homeowner comments pertaining to painting of wood windows were:

- Some homeowners have the skills to repaint by themselves.
- Some homeowners consider the maintenance of repainting worthwhile, provided the window is not deteriorated (rotted).
- Some homeowners like the opportunity to change paint colour.
- Some homeowners consider repainting less costly than replacement.
- However, some older homeowners appreciate not having to repaint, often meaning that older homeowners find maintenance more physically challenging than younger homeowners.

Mail survey question 14: Installing new windows that do not require seasonal removal of wood storm windows is a good reason to replace original wood windows.

The majority of homeowners, over 60 percent, responded that installing new windows that do not require seasonal removal of wood storm windows is a good reason to replace their original wood windows [Fig. 19]. However, in contrast, the majority of homeowners who have all original wood windows disagreed.

Traditionally, most wood storm windows are removed during spring and reinstalled in the fall. While installed storms reduce heat loss during the winter heating season, the removed storms allow for the prime windows to be opened for natural ventilation during the summer cooling season. Often removal of storm windows includes the opportunity to clean the exterior of the main window and install exterior window screens. Generally, this maintenance activity is disliked, especially among older homeowners, due to the physical labour required and safety concerns of working off extension ladders.

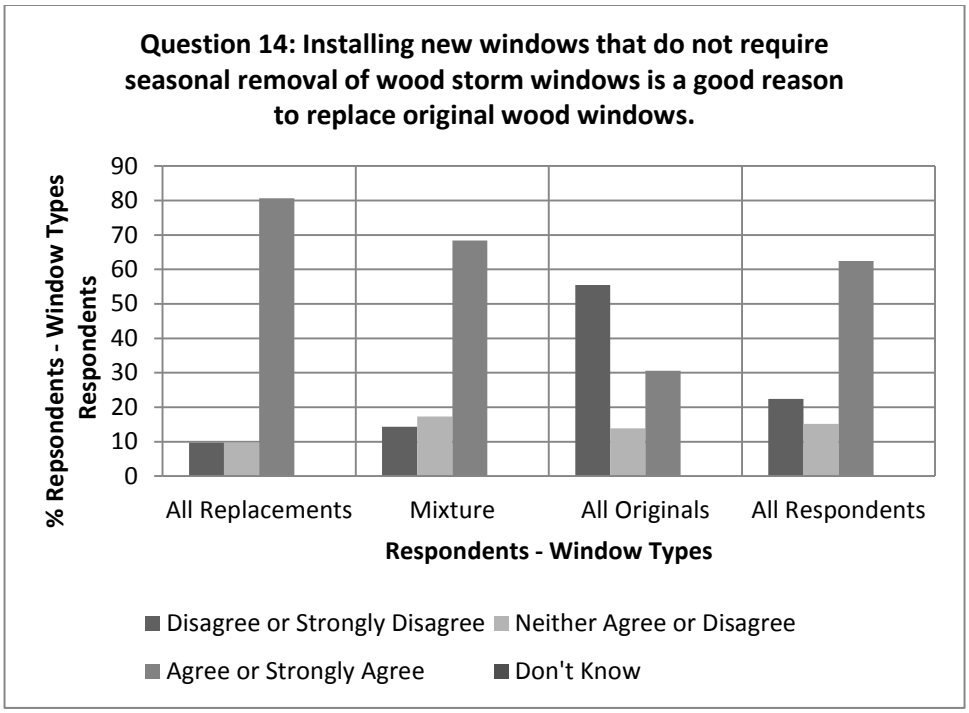


Figure 19: Response to Mail Survey Question 14

More homeowners consider eliminating maintenance of seasonal storm window removal as a greater reason to replace their original wood windows than having to periodically repaint. This response also concurs with response to question 19. More homeowners ranked elimination of storm window removal higher than eliminating repainting.

Interviewed homeowners also greatly differed in opinion between those with replacement windows and those with original wood windows. Those who had replacement windows noted lack of time and less maintenance was their rationale for replacement. Some homeowners also noted lack of storage space for storm windows during the summer. One homeowner mentioned insect screens on new windows were better than those available for existing windows.

Most interviewees with storm windows were not concerned about storm window removal. One homeowner noted they would hire someone, if necessary. Several homeowners advised removal was not a concern, as they kept their storm windows in place year round since they had central air conditioning. It was observed some other homeowners in the study area resolved the issue of storm window removal by installing top hinged operable

wood storm windows. It was also observed where portable air conditioners were installed with storm window in an open position. Some homeowners, including one of the interviewed homeowners, modified their storm windows with one pane altered to become a horizontal sliding sash panel combined with a window screen.

Interviewed window conservators advised seasonal removal of storm windows was a concern for many homeowners. All advised adjustable, operable tilt-out hardware could be installed to reduce the need for removal. None of the interviewed homeowners had this type of storm window, but when discussed, some expressed concerns that there wouldn't be sufficient ventilation or that they might blow off with a strong wind.

Mail survey question 15: Installing new windows that are easier to clean is a good reason to replace original wood windows.

The majority of homeowners, nearly 60 percent, responded that installing new windows that are easier to clean is a good reason to replace their original wood windows [Fig. 20]. However, in contrast, the majority of homeowners who had all original wood windows disagreed.

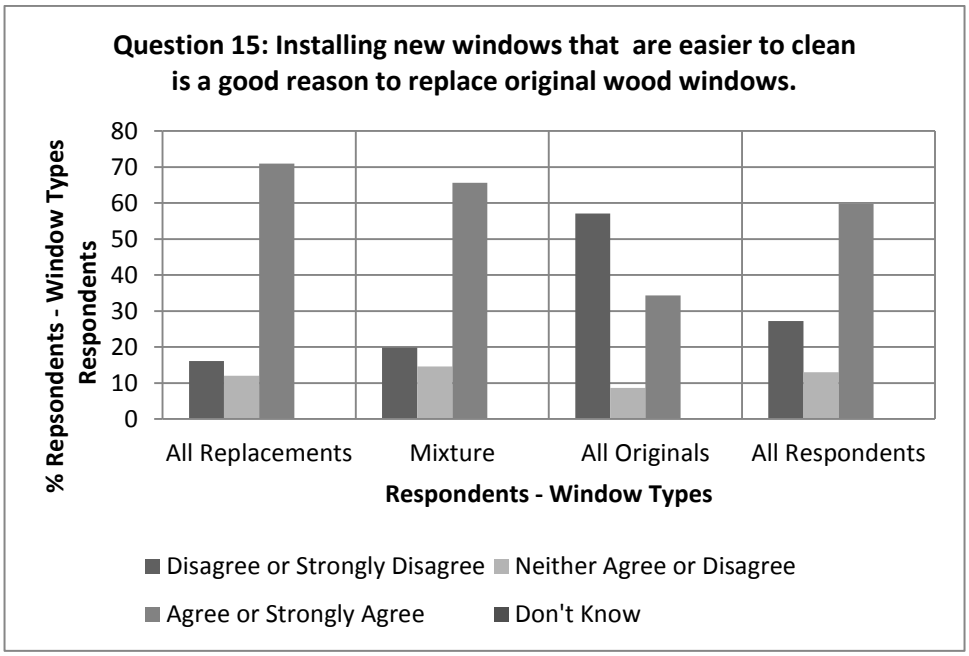


Figure 20: Response to Mail Survey Question 15

In general, new replacement windows are easier to clean than original wood windows and storms. For example, new double-hung replacement windows typically incorporate insulated glazed units in sashes that are designed to tilt-in for easier cleaning. Usually, one person can quickly clean both interior and exterior surfaces from the inside their house. However, cleaning an original wood window and storm is much more labour intensive. Unlike new sealed glazed units, cleaning older windows requires cleaning two inside and two outside surfaces, often divided by muntins. The two surfaces between the inside window and the storm are awkward or impossible to clean without removal of the exterior storm. Traditionally, windows were fully cleaned when storm windows were removed.

Cleaning windows and removal of storms for the summer cooling season are closely related maintenance activities. A similar number of interviewees responded that installing easier to clean windows is a good reason to replace original wood windows as those responding to seasonal removal of wood storms. However, in comparison in question 19, to replace windows for the reason of easier cleaning was identified less of a reason to replace original wood windows than for seasonal storm window removal.

Interviewed homeowners also differ in opinion between those who had replacement windows and those who had original wood windows. Most of the homeowners with replacement windows mentioned they really liked the feature of tilt-in sashes which provided easy access for cleaning. For example, one interviewee stated they could clean a window in approximately three minutes, implying they could clean all of their windows in approximately one hour as compared to planning a full day of traditional window cleaning. In opposition, all homeowners who still had original wood windows were of the opinion; they would prefer to pay the cost of hiring a window cleaner rather than replace their windows.

Window conservators advised cleaning original windows and storms can be difficult for many homeowners. However, sometimes this difficulty is caused by allowing windows to become non-operable through lack of maintenance. For example, it was mentioned that an operable double-hung window can have both surfaces between the inner window and the storm cleaned from inside the house without taking off the storm window. All surfaces can

be accessed, from the interior, but only if both sashes are operable. Another noted option, although not common, is to modify the inside sash stop to make it a removable sash stop, allowing sashes to be removable for cleaning. Window conservators were also in consensus, with many homeowners, that window cleaners could be hired if a homeowner couldn't clean their windows themselves.

Mail survey question 16: Finding a local contractor who can repair your original wood windows is easy.

Only approximately 25 percent of homeowners agreed that finding a local contractor who can repair their original wood windows is easy [Fig. 21] This response was higher among homeowners who had all original windows, and lower among homeowners who had all replacement windows.

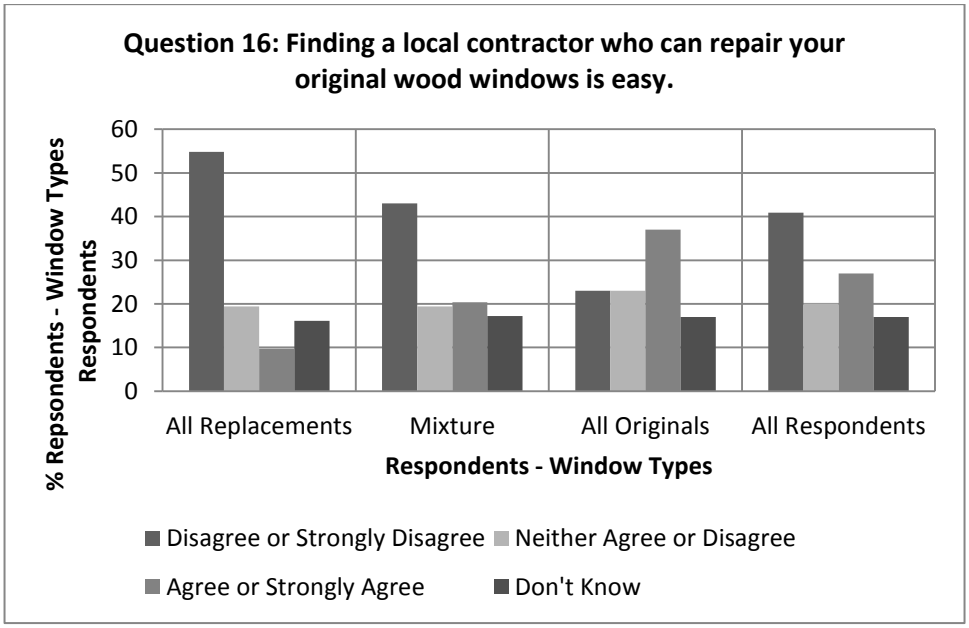


Figure 21: Response to Mail Survey Question 16

Previously in question 12, homeowners overwhelmingly indicated that the majority didn't have the necessary skills to make their own repairs. Given the large quantity of older homes with original wood windows in the study area, it would seem logical to expect that it would be easy to find a local contractor available to provide repair services. However, response was very mixed. A near majority, approximately 40 percent, indicated it would

be more difficult to find a contractor. This question had the highest number of “don’t know” responses in the survey.

The responses among interviewed homeowners also resulted with mixed responses. Only one-quarter of the interviewees indicated that it would be easy to find a local contractor. Several homeowners indicated insightful frustration in finding help to fix their windows. For example, one interviewee obtained a $400 estimate from a small local glazing contractor to fix one broken pane of glass. This was deemed far too expensive by the homeowner. Instead they decided to replace all their windows at a cost of $12,000.

While seeking out potential window conservators for interviews, it was discovered it actually would be very difficult for homeowners to obtain a local contractor who could repair their older wood windows. Locally, no contractors were found who would provide full repair services including both on-site and off-site work, such as on-site window assessment, on-site and in-shop repairs and refinishing. Locally, options for homeowners for window repair by others appeared to be limited to:

- Several building supply companies who had a staff member able to provide reglazing and screen repairs, but only if the homeowner brought the window sash to their place of business. No on-site services were available.
- Local painters who provide repainting, however this is not considered conservation work in the sense that house painters generally don’t repair windows.
- Local handypersons providing minor repairs. Several homeowners advised that in the past they had minor repair work done. However, none of these homeowners could remember who did the work.

Several homeowners were aware of local millwork shops. Several of these millwork companies built new wood windows, but none of them provided repair services. Three local shops were visited, with the following findings:

- One shop would only replicate original wood windows such as new sashes and storms, but only in-shop, thus requiring the homeowner to arrange removal, delivery, installation and finishing by themselves or by others.

- One shop builds new wood replacement windows and new storm windows, but not replications. They constructed new windows with similar appearance to older windows. Their windows incorporated sealed, double-glazing units with surface mounted wood muntins. This shop only supplied windows, thus requiring the homeowner to arrange for installation and finishing by others.
- One shop would build and install new replicated wood storm windows, but advised the cost was prohibitively high for most homeowners. Instead, they often recommended window replacement to homeowners.

Conservation work can include replicated wood windows. However, replication is normally considered acceptable only when original windows are deemed too deteriorated to repair. Preference in conservation is repair of original material in order to maintain authenticity. Of significance, all of the local millwork shop owners advised conservation was too cost prohibitive for most homeowners. Also they believe the local market for window repair was too small to provide repair services.

In contrast, the interviewed window conservators provide full older wood window conservation services to homeowners. The three interviewed were located at distances of approximately 80 to 100 kilometres from Stratford. None of these companies had worked in the study area and even the one located closest advised they didn't consider Stratford close enough to feasibly provide services. These window conservators also advised there were only a few other companies in Ontario providing window conservation repairs to older residential older windows, however:

- Most others were located further away in eastern Ontario.
- There were a few larger contractors offering windows conservation, but these companies preferred to pursue larger commercial and institutional projects.
- Painting companies offer minor repair services, but usually are not trained in proper conservation work. For example, it was mentioned some painters will use non-compatible auto body filler instead of proper wood filler to replace decayed wood.

In contrast, interviewed homeowners were also asked if they thought it would be easy to find a window replacement contractor. Most homeowners knew of local window replacement contractors. Most homeowners regularly receive marketing from window replacement companies.

Pertaining to deteriorated wood windows, window conservators noted one of their biggest challenges was convincing homeowners that deteriorated windows could actually be repaired. Window conservators were of the opinion that:

- Most homeowners are not aware that most deteriorated windows are reparable.
- In most cases, the extent of window deterioration is less than perceived by the homeowner. For example, often when a homeowner observes peeling paint they think their windows are in very poor condition.
- The extent of deterioration usually varies among the house's elevations, often varying due to varying weather exposures. This often results in less needed repair and less expense than perceived by the homeowner.
- Most homeowners don't regularly monitor or provide maintenance to their windows at a time when it would be most cost effective. For example, providing paint touch-ups as opposed to waiting when full repainting is needed.
- Most homeowners are not skilled enough to repair wood windows, concurring with homeowner's opinions.
- Other related trade contractors, such as finish carpenters and painters, are also not skilled at window repair.
- Many improper products are being used in wood window repair work because proper products such as linseed oil based glazing putties and paints are no longer available from local building supply retailers.
- Many homeowners haven't considered repair work can be done in phases to increase affordability.
- There are not enough skilled window repair contractors.

Given window replacement is the primary business of window replacement contractors; it might be assumed that they exaggerate the extent of deterioration of older wood windows

in order to influence a homeowner to replace windows. This may actually be the case with some window replacement companies, as noted by one window replacement interviewee. Their industry is very competitive and there may be less than reputable window contractors in the industry. However, the window replacement contractors in this study stated that they often found windows in houses built prior to the 1950s were in good condition, unless they had also been clad in aluminum or had aluminum screen windows. Extensive rotted wood tended to be found in many newer windows or in seriously neglected older windows. It was advised that older heartwood used in older windows tended to be better at resisting wood decay than softer woods used in newer wood windows. Consensus between both window conservators and window replacement contractors concluded that aluminum cladding of wood windows and aluminum storms often trapped moisture and led to wood rot. One replacement window contractor stated they recommended maintaining the original wood window, if the window is in good condition and if desired by the homeowner. All of the replacement contractors stated the two most common reasons they recommend homeowners to replace their windows is to improve energy performance and to reduce maintenance. Replacement contractors similarly concurred that homeowners are not skilled enough to replace their own windows.

Regarding window maintenance, all interviewed home inspectors are involved with providing advice on repair of older wood windows. Often they recommend low cost repairs, such as weather-stripping sashes, caulking frames and repainting. These home inspectors indicated no preference between repair of an existing window and replacement. One interviewee indicated that they often find the condition of both older wood windows and newer replacements in need of repair. Another interviewee stated it was often more cost effective to maintain older wood windows. Only one interviewee considered new replacements to be a better option, primarily for energy savings.

There was a mixture of responses from Heritage Stratford interviewees. The overriding consensus, higher cost of conserving original wood windows was the main reason for homeowners wanting to replace their windows. Other main reasons given for replacement included lack of homeowner knowledge about conservation, lack of available repair tradespeople and desire for less maintenance.

Cost and Economics

Many homeowners expressed differing opinions on the cost of conservation versus replacement. Some were adamant that replacement windows were less expensive while others were adamant that replacements would be more expensive.

The survey included two questions related to the cost of conservation. Question 17 pertains to the issue of conservation and market value. Question 18 pertains to the issue of future costs, similar to life-cycle costing.

Mail survey question 17: New windows will increase the market value of your house more than keeping and maintaining your original wood windows.

The majority of homeowners, nearly 55 percent, responded that new windows, instead of keeping their original wood windows, would increase the market value of their house [Fig. 22].

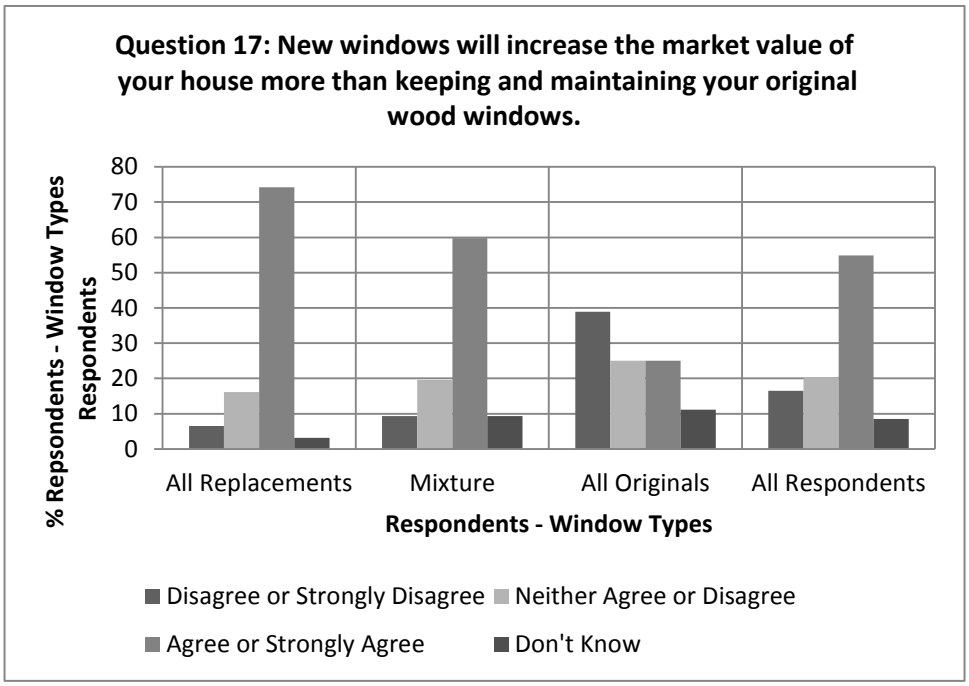


Figure 22: Response to Mail Survey Question 17

This response was higher among homeowners who already had all or some replacement windows, but less among homeowners who still had all original wood windows.

The majority of homeowners believe that new windows will increase the market value of their house. Although no homeowners identified the increase in market value as their first reason for replacement, approximately one-third of homeowners identified that increased market value was a major reason for replacement of windows. Even one-quarter of homeowners who still have all of their original wood windows agreed their house's market value would be higher with replacements.

Most interviewees who had replacements stated they expected their house value to be higher with replacements. Those interviewed, who had all original windows, tended to either disagree, believing the saleability of their house would improve if they kept their original windows due to heritage appearance, or simply that they didn't know.

One interviewee, with replacements, was of the opinion that realtors perpetuated the idea of increased market value, in which the public simply accepts, creating a cycle effect of influence without any real basis for the increased value. This may have some truth as interviewed realtors are of the opinion new windows increase the market value of an older house and promoted new windows as a selling feature. However, no market study was found to quantitatively demonstrate the monetary increase of market value based specifically on windows. Replacing windows to obtain increased market value may be true, but may not actually be a profitable investment. For example, $10,000 invested in replacement windows doesn't necessary mean $10,000 or more in increased market value.

Only, one realtor noted an exception. If a house had significant architectural value, such as a standout pre-1900s highly architecturally detailed Victorian era house, then original wood windows could contribute more to the market value.

Most realtors have no training in heritage, heritage architectural styles or conservation yet can influence homeowners to replace their windows.

Mail survey question 18: The future costs of maintaining (repairs and repainting) original wood windows would influence, or has influenced, your decision to keep or replace your original wood windows.

The majority of homeowners, over 50 percent, responded that future costs of maintaining original wood windows would or has influenced their decision to keep or replace their original wood windows [Fig. 23]. This response was higher among homeowners who already had all or some replacement windows, but less among homeowners who still had all original wood windows.

When considering replacing original wood windows, the majority of homeowners indicated that their decision would be influenced by future costs. In this circumstance, a homeowner is not only comparing the cost of proposed present work, but is also adding in the long term future costs. This determines whether maintaining original wood windows or replacing them is more costly in the long term.

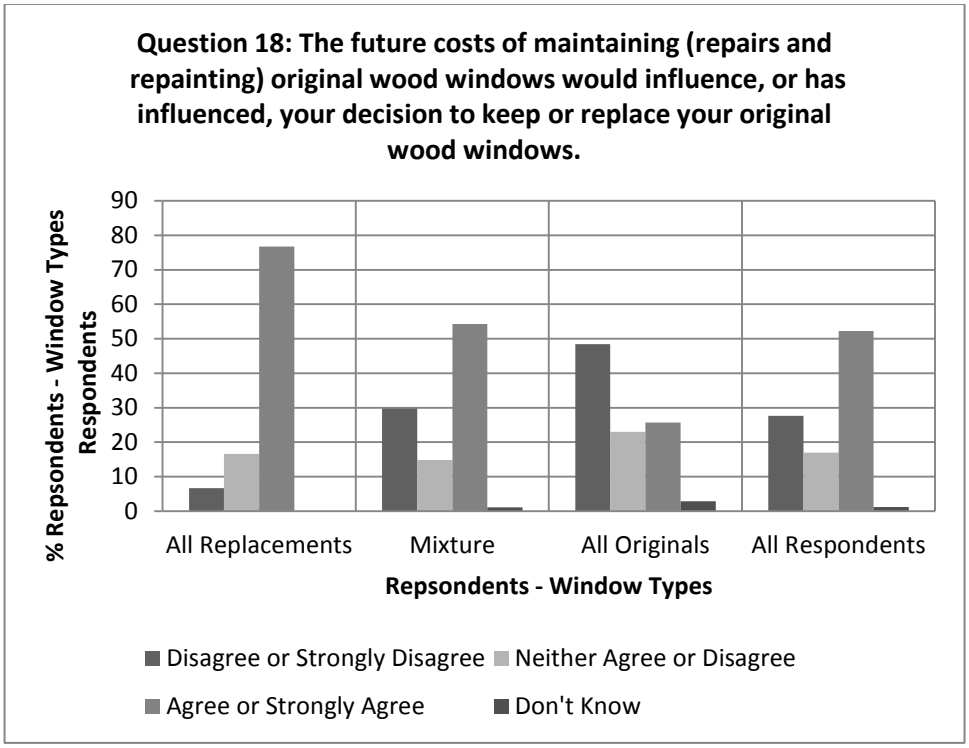


Figure 23: Response to Mail Survey Question 18

All homeowners, who already had replacement windows, were of the opinion that replacements would be less costly in the long term due to less or no future maintenance. Meanwhile most homeowners, who still had original wood windows, either didn't think it

would cost more to keep their windows, didn't know or didn't care to know, since they indicated they would never consider replacing their windows.

There were misunderstandings as to future long term costs. Some of these misunderstandings seem to involve cost items in which homeowners receive mixed messages or lack of message from other stakeholders, for example:

- **Future repainting of wood windows:** Two of the window conservators advised that if wood windows are initially refinished with linseed oil-based paints then future refinishing is a simple periodic rub down with linseed oil. This is considerable less future cost than repainting with the readily available commercial paints. Of concern, as advised by these conservators, is that linseed oil-based paints are more difficult for homeowners to obtain.
- **Future replacement of new replacement windows:** It was acknowledged by both window conservators and window replacement contractors that new replacement windows have limited life spans which will require the cost of future replacement. Both also acknowledge, including the interviewed home inspectors, that there have been many cases of poor quality new vinyl windows that have needed replacement in less than ten years. Conservators are of the opinion that most replacement windows are essentially a throwaway of homeowner's money. Replacement windows will eventually end up in landfill which also has associated environment cost consequences. However, the replacement window contractors advised that the life span of replacement windows, especially vinyl windows, have improved. One contractor advised that they can typically last 30 to 35 years, but if maintained, can last up to 50 years. This contractor disputed that vinyl windows are destined to be a throwaway building component, advising that many vinyl windows can be repaired and can be recycled.
- **Factoring in future energy cost savings:** Window replacement contractors, realtors and some home inspectors advise homeowners that they will save money on their yearly energy costs by replacing their older wood windows with more energy efficient new windows. Window conservators advise homeowners that this is simply not true. A well maintained, original wood window that is properly

weather-stripped and with a storm window, will perform equally well or sometimes better than most standard vinyl replacement windows.

Cost of Window Conservation

Several homeowners and stakeholders stated window conservation is too expensive. Members of Heritage Stratford advised that many homeowners, when faced with major window repairs, considered window replacement as their only affordable option.

To investigate, costing information was obtained through the interviews with the window conservators, window replacement contractors and homeowners.

All interviewed window conservators indicated the average cost of conservation (restoration) of a typical three foot (900 mm) wide by five foot (1,500 mm) high double-hung wood window was approximately $1,400. The range of cost was from a low of approximately $800 to a high of approximately $1,800 per window, but even higher if there was extensive repair on the window frame. Higher end cost includes full window restoration, including on-site or in-shop repair and refinishing. All conservators note, cost is dependent on the scope of required work. A detailed site assessment is needed in order to properly estimate the cost.

Several interviewees commented on the high cost of just replacing deteriorated old storm windows. One homeowner noted their recently replaced wood storm windows cost approximately $1,000 each. This price was based on storm windows of approximately three feet by five feet in dimension. One millwork company advised, just the cost of new wood storm windows is nearly the same cost installing new vinyl replacement windows. Much of the cost is attributed to extensive labour, involving site visits and in-shop construction. When discussed with one of the interviewed window conservators, they advised their price for new replacement wood storms was typically only in the range of $200 to $300, due to more efficient labour, given their expertise.

All interviewed window replacement contractors estimated an average cost of $900 to replace a typical three foot (900 mm) by five foot (1,500 mm) older wood window with a standard vinyl double-hung replacement window. However, investigation revealed

examples of higher cost replacement windows. For example, homeowner interviewee 5, who recently replaced their original wood windows, advised their standard vinyl replacement windows cost approximately $1,200 per window. More expensive, one window replacement contractor advised that a custom designed replacement vinyl window would cost up to $1,800. Custom designed vinyl replacement windows typically have shapes and profiles to provide a closer appearance to an original wood window. One homeowner's written comment provided an opinion regarding the cost of custom designed replacement windows.

> Replacing windows in an older home is a hard decision for people who wish to maintain a historic esthetic. The cost of replacement windows that mimic the original ones is astronomic and not practical for those on a budget. (Anonymous homeowner)

Other related costs issues indicated by stakeholders were:

- Many homeowners have little spare time or desire to be involved with window repairs. Whereas, window replacement can be done quickly, often in one or two days. Window repairs can take weeks and cause more inconvenience to homeowners. Homeowners prefer all work to be done at once, as opposed to spreading work over a longer period of time. Conservators advised phasing work makes conservation more affordable for homeowners with tight budgets.
- Obtaining a quote from a window replacement contractor can be quick. One interviewee advised that in one consultation they can take necessary measurements, discuss replacement options and provide a quote to the homeowner. In contrast, obtaining a quote from a window conservator can take much more time, due to necessary site assessment and extensive estimating of quantities of required work.
- Obtaining a quote from a window conservator is also difficult to obtain since there are few available windows conservators.
- Most window replacement contractors will arrange financing for replacements, which is attractive to many homeowners, conservators don't.

- Most windows replacement companies provide extensive warranties, sometimes including transferrable warranties, which are attractive to many homeowners.

5.3.3 Homeowner Mail Survey – Part B: Question Nineteen – Main Reasons for Window Replacement

Homeowners

Mail survey question 19: In your opinion, what is the main reason for replacing original wood windows with new windows?

Although many reasons were identified, the main reason homeowners gave for replacing original wood windows was to save on heating costs. The findings indicate to save on heating costs was ranked first by approximately 35 percent of homeowners, and identified by over 70 percent of homeowners as one of the main reasons for window replacement. Interviewed homeowners provided similar response, over 35 percent as the primary reason, and over 70 percent as one of the main reasons. Saving on heating costs is directly related to the energy performance of windows.

The second highest ranked reason, identified by 22 percent of homeowners, is to replace windows that are in poor physical condition. This reason was also identified by the majority of homeowners at nearly 55 percent as one of the main reasons for replacement. Interviewed homeowners provided lesser but relative results, 9 percent as primary reason and 46 percent as one of the main reasons. Poor physical condition refers to window components requiring repairs of rotted wood, deteriorated putty and broken glass.

The third highest ranked reason to replace, identified by nearly 10 percent of homeowners, is to make a house more comfortable. This reason was identified by the majority of homeowners, at nearly 55 percent, as one of the main reason for window replacement. Interviewed homeowners provided similar results, 18 percent as primary reason and 36 percent as one of the main reasons. Making a house more comfortable is related to energy performance, usually by reducing air leakage and draughts. When combined with saving on heating costs, better energy performance is overwhelmingly the most identified reason from homeowners on why they replace older wood windows.

Without ranking, many maintenance and operation issues are also identified as main reasons for replacement, including: at nearly 55 percent, having easier operating windows; at nearly 50 percent, eliminating seasonal removal of storm windows; at over 35 percent, eliminating repainting and at over 15 percent, for easier cleaning. Over 35 percent of interviewees identified easier cleaning as a main reason for replacement. Although homeowners responded to be more concerned about energy costs, less maintenance and easier operation are very important to them too.

Improved home security was also identified, by nearly 30 percent of respondents, as a main reason for replacement. Also significant, increased market value of their house was identified by over 30 percent of respondents as a main reason for replacement.

Window Conservators

Window conservators believe most original windows should be maintained and repaired. From their perspective, homeowners replace windows for two main reasons. The first reason is to obtain perceived greater than actual energy savings, as a result of misleading information from the window replacement industry. The second reason is to obtain a quick and easy fix to perceived window problems. Window conservators indicated that the window replacement industry greatly influence homeowners to replace windows through extensive marketing. Other mentioned reasons: perception of high repair costs, perception that windows can't be repaired, and in the past, financial incentives from government to replace windows for energy savings.

Window Replacement Contractors

Window replacement contractors' opinions of why homeowners replace windows were the same as listed by homeowners. The two main reasons were for energy savings and less maintenance. Other reasons listed: increased house value, better security, better safety, better sound control and better appearance. Two contractors identified energy savings as the main reason for replacement. However, one contractor advised energy savings was only a perceived reason, caused by their own industry's marketing. This contractor identified less maintenance as the main reason, including easy operable features, no storms to remove, no painting and ease of cleaning.

Heritage Stratford Committee

Interviewed members were asked to provide their opinions on window conservation pertaining to all older houses, even though their primary function is to advise on conservation of designated heritage properties. In contrast to other stakeholders, all members identified higher cost of conservation as the main reason homeowners would want to replace their windows. Other reasons identified were: lack of available tradespeople to do repair, less maintenance, replacement of non-functioning windows, safety of children, easier cleaning and lack of homeowner knowledge about conservation. One member stressed homeowners often rely on advice of their renovation contractor, which normally meant replacement.

5.3.4 Homeowner Mail Survey – Part B: Question Twenty – Main Reasons for Window Conservation

Homeowners

Mail survey question 20: In your opinion what would be the main reason for keeping and maintaining original wood windows?

The main reason given by homeowners for conservation of their windows is to maintain heritage character of their house. Over three-quarters of homeowners used statements related to maintaining heritage and original aesthetics. Homeowners used a diverse range of terms and phrases in describing these reasons. Representative samples of these statements include:

- “just looks right for this old home”
- “old windows look best with my house”
- “maintain the home’s original look”
- “maintain the original appearance”
- “keep the integrity of an older home”
- “maintaining the heritage value of a home”
- “they add character to an old home”
- “if you believe in value of original pieces of an older home”

- “maintain authenticity”
- “visual aesthetic consistency with original home”
- “if it’s a heritage home”
- “architectural integrity”

All interviewed homeowners, including those with replacement windows used similar statements in describing the main reason a homeowner would keep and maintain their original wood windows.

The second most stated reason, at over 15 percent, is they would keep windows if their windows were in good functioning condition, or as the old adage says, if it ain’t broke, don’t fix it.

The third most stated reason by homeowners, at nearly 10 percent, is they would keep their windows because maintaining them was less expensive than replacing them. Many homeowners were of the opposite opinion, that maintaining original wood windows is more expensive.

Other mentioned reasons for keeping and maintaining original wood windows, all at less than 1 percent, included:

- Original windows are reparable as opposed to new replacements. Replacements will have to be replaced again in future.
- For better resale value. This opinion is not shared by the majority of homeowners. More homeowners perceive increased market value from replacement windows.
- Wood windows are more environmentally friendly than vinyl windows.

Window Conservators

All window conservators identified the same main reason for window conservation as expressed by homeowners, to maintain heritage and aesthetics. They also used similar terms such as maintaining architectural appearance, maintaining architectural value and maintaining character-defining elements. Conservators stress maintaining original windows is integral to maintaining the architectural integrity of a house.

Window conservators identified other reasons for keeping and maintaining original wood windows, including:

- It is more cost efficient to maintain than replace.
- Wood windows can be repaired.
- Old windows are constructed better than new windows, referring to more durable heartwoods, such that many older windows have already lasted over a century.

Heritage Stratford Committee

All interviewed members were of the opinion that conservation of original wood windows, although not mandated, was important in all older houses regardless of designation. The main stated reason was to maintain original appearance.

CHAPTER 6 – ANALYSIS OF FINDINGS

6.1 Analysis of Findings

The research data presented in Chapter 5 focuses primarily on homeowners' opinions, supplemented with related opinions from the other stakeholders. Homeowner opinions are analysed following four themes: culture, energy and environment, maintenance and operation, and cost and economics.

Opinions expressed by many of the other stakeholders are also analysed through three additional themes: legal, marketing and knowledge.

In developing the mail survey there was concern for a potentially low response rate, resulting in a lack of data for quantitative analysis (de Leeuw, 2008). However, the mail survey response rate was over 36 percent, 166 out of the 450 distributed surveys. This high response rate provides sufficient data for analysis of the homeowner and other stakeholder opinions. This high response also implies a high level of interest among homeowners in research on the conservation of older residential wood windows.

Through analysis, a better understanding of the reasons for replacement or conservation became evident. This understanding leads to identification of barriers facing conservation of older residential wood windows, as presented in Chapter 7 – Discussion and Recommendations.

This research analysis is presented in two parts. First, a brief analysis based on the ongoing trend of window replacement. Second, an analysis based on the following themes: cultural, energy and environmental, maintenance and operation, cost and economics, legal, marketing, and knowledge.

6.2 Window Replacement Trend

Response to mail survey question 3 identifies that nearly 80 percent of the houses in the study area either have some or all replacement windows. Mail survey question 4, identifies that the majority of these replacements are vinyl windows.

This finding supports literature and general observation that there is a trend favouring window replacement in lieu of conservation. Given the possibility that there may be more vinyl replacement windows than remaining original pre-World War II wood windows, the trend appears to also favour ongoing window replacement with vinyl windows. This trend poses a strong challenge for the future of window conservation. However, even with the current extent of replacement, there are still a substantial number of remaining original pre-World War II residential wood windows. This number of original wood windows is even greater if houses and non-residential buildings located outside of the study area were included.

A brief extrapolation of the number of houses with original wood windows reveals:

- Given the study area contains approximately 2,700 older houses; there would be approximately 570 houses, 21percent of 2,700, that still have all of their original wood windows. Visual observation indicates that each of these older houses has a range of approximately 15 to 35 windows. Given an average of 25 windows per house; this equates to over 14,000 original wood windows.
- Unknown is the average number of original wood windows remaining in the houses with partial window replacement. But, if an estimate of 10 original wood windows per house were used, representing 40 percent of the average 25, there would be over 16,000 additional original wood windows. In total, there could be over 30,000 original wood windows remaining in the study area. Even if this number is over-estimated, this is still a substantial number of original wood windows.

Given that approximately 60 percent of the homeowners responded they had a mixture of original wood windows, storm windows and replacement windows, the trend of window replacement also includes selective replacement. This poses the question, why have many homeowners only replaced some of their windows? Interviews with several homeowners revealed the following reasons:

- Some homeowners replace windows based on prioritised maintenance and/or operational needs. For example, some homeowners replace only upper floor windows for easier maintenance. Generally, cleaning and storm window removal requires exterior ladder access which tends to be more difficult for older homeowners. Also, if original wood windows are difficult to open, then homeowners sometimes select upper floor windows for replacement to achieve easier operable windows to ensure natural ventilation for their bedrooms. In some instances, even an older house with central air conditioning will have warmer upper floor areas due to poor distribution of conditioned air. For example, homeowner interviewee 11 advised that their upper floor windows had been replaced to ensure easier operable windows because some of the original wood windows were difficult to open and some were painted shut. In their specific situation, a private residence with a bed and breakfast business, selective replacement satisfied the need of operable bedroom windows, while being more affordable for the homeowner than replacing all windows. In this particular house, a designated heritage property, the upper floor windows were replaced with new wood replacement windows with intent of obtaining similar appearance to the original wood windows.
- Some homeowners prioritise by only replacing existing windows they deem to be in poor condition.
- Some homeowners prioritise for energy savings, by only replacing windows in heated areas, not replacing windows in unheated spaces, such as unheated verandahs, sun rooms and attics. This was observed in many houses in the study area, including houses of two interviewed homeowners.
- Some homeowners prioritise by only replacing windows in finished living spaces, not in unfinished spaces such as basements.
- Some homeowners prioritise by keeping unique original windows, such as non-rectangular windows, windows with stain glass, windows with unique mouldings and windows with unique windowpane divisions. For example, many older houses have unique shaped windows at their main stairwells. Typically, in these cases, a replacement window with a similar appearance will not be available. In some

cases, even replacements to suit simple arched windows are not available. For example, interviewee 5 stated that their window supplier couldn't provide replacements to match their original arched top windows.

- In some instances, it wasn't selective replacement; instead the mixture resulted from newer windows installed in an addition while original windows remained in the original part of the house.

These examples of selective replacement resulted from issues of maintenance and operation, energy, appearance, and cost.

In analysis, selective replacement also leads to other questions. For example, if your neighbour replaces their windows, does this influence you to replace? Although this analysis doesn't address this question, due to intent of survey anonymity, it is possible a domino effect could be another reason for replacement and a barrier to window conservation.

Regardless if window replacement includes full or partial replacement, the trend of replacement will continue unless barriers to conservation are overcome. A few opinions optimistically expressed a future trend towards more conservation due to upcoming generations being more interested in sustainability. This implies as future generations become homeowners, a trend towards more window conservation may take place, but only if the barriers are reduced for upcoming generations of homeowners.

6.3 Analysis from Various Themes

In this section, data is analysed along seven themes: culture, energy and environment, maintenance and operation, cost and economics, legal, marketing and knowledge. This analysis is based examining the homeowner and other stakeholder opinions presented in Chapter 5 – Findings. Where noted, reference is made to the mail survey, interviews and the literature review. Also, where noted, additional opinions from other stakeholders, not included in Chapter 5 – Findings, are included to provide better context to these themes.

6.3.1 Cultural

Opinions given on cultural issues, heritage value and aesthetics, implies conservation of original wood windows is considered integral to maintaining the heritage character of a house. It also implies there is an intrinsic value to owning and maintaining an older home. This is evident by numbers that tell us that when you see an older house the chances are good the owner will have lived there for much longer than the average in the community as a whole.

As discovered, homeowners use a range of simple terms and phrases such as character and to look good, when expressing opinions related to window heritage and aesthetics. However, also as discovered, most homeowners were unable to describe what these terms and phrases mean. To verify, interviewed homeowners were asked if it would be easy to identify the character-defining elements of an older wood window. This is in reference to the *Standards and Guidelines for Conservation of Historic Places in Canada* where window conservation includes safeguarding character-defining elements of windows (Parks Canada, 2008). Character-defining elements include items such as original physical materials, window forms and shapes. It includes preserving original functional and decorative windows components such as sash profiles, muntin profiles and decorative trim. While a few homeowners mentioned original wavy glass, in general, most homeowners acknowledged they wouldn't be able to identify character-defining elements of a window. This lack of knowledge of window characteristics is a major problem when homeowners are comparing original wood windows to replacement windows. This implies that homeowners are more receptive of replacements than keeping their original windows, as they lack knowledge about the heritage aspects of their original wood windows. This was also evident from opinions given by window replacement contractors who advised homeowners won't be able to notice the difference between a custom designed vinyl window and an original from a curb view. This concern for conservation was reinforced by the comment from Heritage Stratford members in which they didn't have specific standards and guidelines to assist homeowners in being knowledgeable about window conservation.

Along with appearance, authenticity was also mentioned as a reason for maintaining original wood windows. Safeguarding authenticity is another key aspect of conservation, which essentially means maintaining the original wood and glass components of a window. Replacements do not maintain authenticity.

The majority of homeowners also thought their neighbourhood had heritage value. Opinions that their houses had heritage value imply a strong correlation between heritage value of a house and its neighbourhood. Surprisingly, none of the homeowners interviewed were even aware that their house was in a recognised heritage area as identified in the Official Plan. This implies that even if a neighbourhood's heritage is recognised by a municipality, it needs to be better known by the public. Promoting this could also contribute towards more window conservation.

Given most homeowners responded maintaining original appearance of their windows is important, and most also think their house has heritage value, it is apparent there is a strong relationship between house, window appearance, neighbourhood and conservation. Given the right circumstances and fewer barriers, there would be more wood window conservation.

6.3.2 Energy and Environmental

Energy

Homeowners indicated that saving on heating costs was the primary reason for replacing their windows. This is attributed to poor thermal performance, such as windows having a relatively low resistance to heat transfer compared to other exterior building assemblies. Associated with this lack of thermal performance is the desire to make a house more comfortable. Making a house more comfortable often means eliminating cold draughts, which are also associated with increased heating costs. The majority of replacement windows are vinyl windows. Their growth in popularity corresponds to the continued increase of energy costs since the 1970s oil crisis. This implies, when you see an older home with replacement windows, the homeowner probably thought their original wood windows were not energy efficient and replacing them would save lots of money.

There is a lot of marketing that advises homeowners that new replacement windows will provide advantageous energy savings. This leads to questioning the legitimacy of keeping these older wood windows. However, in the literature review, there are window performance studies that conclude a maintained original wood window with a storm window will provide energy performance similar to most standard replacement windows. This supports the implication that many homeowners are replacing windows based solely on perceived greater energy savings without knowing that a maintained original wood window will provide similar performance. This is very significant because the majority of homeowners responded they would prefer to keep their original windows if their older wood windows had an energy performance similar to replacement windows. This implies that if homeowners were more aware of thermal performance comparisons, there would be more window conservation.

Environmental

Discussions of environmental issues can be complex and far ranging. For example, how significant is the impact of weather-stripping an pre-World War II wood window on global warming? For sure there is an impact. Weather-stripping windows will reduce air infiltration, thus reducing energy use, thus reducing extra needed energy production, thus reducing carbon emissions. However, to analyse this in any depth is beyond the scope of this research. For simplicity, this analysis is limited to homeowners' responses as to whether environmental issues would be a consideration in a homeowner's decision on keeping or replacing windows.

Literature identifies related environment issues pertaining to embodied energy, sustainability, hazardous materials and landfill. These issues identify detrimental effects on the environment from window replacement. Given the trend of extensive window replacement with vinyl windows, it seems logical that few homeowners care about negative impacts. However, the responses from homeowners and other stakeholders pertaining to environmental issues tell us, homeowners are actually concerned about environmental issues, but severely lack understanding of environmental impacts pertaining to window replacement. If homeowners were more knowledgeable of window

related environmental impacts, there would be more consideration given to window conservation.

6.3.3 Maintenance and Operation

Many homeowners responded available new windows requiring less maintenance and easier operation were also major reasons for replacing original wood windows. There are many issues pertaining to maintenance and operation, such as reparability, ease of operation and extent of required maintenance. Many of these issues also have multiple considerations. For example, even if wood windows are reparable, are there available skilled tradespeople to repair them, or are homeowners skilled enough to make repairs themselves?

Although the primary response given for replacing original wood windows was to save on heating costs, if all the maintenance and operation reasons were a combined response, less window maintenance could conceivably be the overriding reason for window replacement. This would certainly be in agreement with one of the window replacement contractors who stressed less maintenance was the main reason homeowners replace windows.

The survey data provides insight into many of the maintenance and operation issues faced by homeowners when considering conservation of their older wood windows. In summary, responses from the majority of homeowners indicate:

- The majority of original wood windows are difficult to operate and need maintenance, implying installation of easier to operate new windows is desirable by many homeowners.
- The majority of homeowners think new replacement windows which don't require removal of wood storm windows, don't require painting and are easier to clean, are good reasons to replace their original wood windows. Multiple reasons creates a synergy for replacement, even if many of the individual reasons, such easier cleaning is not solely sufficient to induce a homeowner to replace their windows.
- The majority of homeowners are not skilled enough to do maintenance repairs by themselves, implying they would use the services of a window repair contractor, if

available. However, many homeowners think it is difficult to find a window repair contractor, and in most cases they would be correct.

Maintenance and operational issues create a lot of impetus for homeowners to replace their original wood windows. Further impetus, the highest ranking maintenance reason identified in survey question 19 was to replace windows that are in poor physical condition. This reason was ranked higher than to have easier operating windows, to eliminate seasonal removal of storm windows, to eliminate repainting and for easier cleaning. Examples of poor physical condition mentioned in the survey questions were repair of rotted wood and replacing glazing. Other examples of poor physical conditions are frame distortion causing poor operation, wood deterioration caused by insects, broken hardware and severely deteriorated paint finish requiring full paint removal. Although these other examples were not specifically listed in the survey questions, the significance is that if a homeowner thinks their older wood windows are in poor condition they will likely think they need replacement. Many homeowners believe minor deterioration is a reason for replacing windows. This implies a lack of knowledge among homeowners pertaining to the feasibility of repairing windows. This also implies fewer homeowners would replace if they had a better understanding of how to maintain their original windows.

On the other hand, even if a homeowner is knowledgeable, unless they have resources, such as time and enough skill to do their own at window repairs, they may still replace their windows. This is also because the odds are they will live in an area not serviced by a window conservation contractor.

In summary, most homeowners are poorly informed about maintaining their older wood windows. Also, available resources are limited, such as knowledge about window maintenance, access to proper repair materials and access to skilled window repair contractors.

6.3.4 Cost and Economics

Issues of cost and economics overlap with the other themes when analysing reasons why homeowners are considering conserving or replacing older wood windows. These reasons can range from the simple, such as the cost of maintenance to fix a broken window; to the complex, such as the economic impact to a local economy; to even the more complex, such as the future economic impact on society from global warming. As this study is primarily focused on homeowners, the analysed research data is based only on direct costs to a homeowner.

Window Conservation and Replacement Costs

There is no dispute, as per obtained cost data, the cost of major repairs to original wood windows can be more expensive than the initial cost of installing standard vinyl replacement windows. However, if only minor repairs are needed then the cost will be less than replacement. It is also apparent that custom designed replacement windows can be more expensive than conservation work. All of these generalisations are based on having skilled contractors do the work. If a homeowner is able to do their own repair work, then the cost of conservation will be significantly less, as they will only pay for necessary materials.

A difficulty facing conservation is the varying opinions of comparative future costs. Responses from interviewed homeowners were mixed. All homeowners, who already had replacement windows, were of the opinion that replacements would be less costly in the long term due to less or no future maintenance. The implication is these homeowners would choose replacement. Some homeowners, who still had original wood windows, thought it would be less costly to maintain their windows; however, others didn't know or didn't care to know. Those who didn't care to know reasoned they didn't need to know because they would never consider replacing their windows. For advocates of conserving windows, this a double edge sword, good that many homeowners are attached to their old windows, but not so good because many homeowners do not know long term costs and many do think replacement will be less costly.

Given window conservators also advise it is difficult to convince homeowners that window conservation is beneficial from long term costing, these mixed opinions imply many homeowners make decisions with minimal cost information or incorrect cost information. This is substantiated by window energy studies that conclude long term future costs favour window conservation (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). However, when discussed with homeowners, none were aware of these studies, implying that if this information was known to homeowners, there would be more window conservation.

One shortcoming of these window energy studies pertaining to life-cycle costing is most of them don't factor in upfront repair costs, if needed. The goal of some of these studies is only to provide a comparative cost analysis of the thermal performance, such that some studies assume the original wood windows are already in a good state of repair. However, upfront repair costs can significantly influence a homeowner's decision to keep or replace their original wood windows. As advised by members of Heritage Stratford, many homeowners state the cost of repairing their original wood windows is too expensive as compared to window replacement. This comparison takes place when a homeowner is faced with major repairs. For example, a homeowner may need to repair rotted bottom sash rails, which may require full window restoration. The cost of these conservation repairs could exceed the cost of replacement and the homeowner may decide this is enough of reason to replace their windows.

The above implies, if a homeowner is making a decision to either repair or replace their windows based on cost, given a tight budget, most will replace their windows with standard vinyl windows. However, if a homeowner desires to maintain window appearance, repair could be less costly that replacing with custom designed replacements.

All of this implies that even when the cost of repair including long term maintenance should favour conservation, homeowners may not be aware. To further investigate, a discussion was also held with one of Canada's leading experts in window conservation, with over 25 years' experience in construction, consulting, and educating the public. Their opinion, similar to the three interviewed windows conservation contractors, was that a key

problem facing windows conservation is the perception conservation is more expensive. They agreed the cost for full immediate restoration will usually be more expensive than new window replacements. However, extensive conservation work is rarely needed on all windows. They advised homeowners need to start with a conservation plan, to determine the extent of initial conservation work required and a schedule that suits a homeowner's budget. This should be followed by a maintenance plan to ensure costly future repairs are avoided. However, one of the additional problems is convincing homeowners that they should be willing to pay for consulting services of a window conservator to prepare a conservation plan, which would provide better options and affordable approaches.

Market Value

It is a safe assumption homeowners prefer a higher market value for their house. Even if repair costs and long term maintenance costs favour conservation, homeowners may replace their windows in order to increase market value. Given homeowners often upgrade their houses with the intent of increasing market value for future resale; it is common knowledge that certain upgrades sell houses, such as renovated kitchens and bathrooms. It is also common when an older house with new replacement windows is for sale; these new windows are identified as one of the key selling features. This implies that many homeowners perceive window replacement as a good investment.

Other Economic Benefits

As mentioned, this cost and economics analysis focuses only on direct costs to the homeowner. However, as revealed in the literature review, window conservation provides other economic benefits, such as economic spinoff to the local economy. Although homeowners and the other stakeholders were not questioned about this economic issue, one window conservator suggested this would be worthy of further study. Of interest, interviewee 1 provided an opinion that window conservation is about people working and generating economic growth focused on labour, where window replacement is more about product than associated jobs. The implication is that an increased focus on the relationship of labour and economics would favour conservation.

6.3.5 Legal

From a legal perspective, related government legislation, or sometimes lack of legislation, can influence a homeowner's decision to either practise window conservation or replace windows.

Ontario Building Code

As noted in the literature review, there are window standards for new windows. For example, new windows in Ontario have to perform to Canadian Safety Association (CSA) window standards for airtightness, water tightness and wind load resistance. Other requirements pertain to items such as glass type, resistance to forced entry and energy performance. It is common that new windows include recognised energy performance labelling such as Energy Star.

Existing original wood windows do not have to meet these standards for new windows. Even if they met current standards, they are not tested to these standards. Conservation of existing original wood windows is considered a maintenance activity which is not governed by the Ontario Building Code. This was confirmed by discussion with the local building department.

This implies the Ontario Building Code is not a barrier to conservation of older wood windows. However, standards for new windows can be a marketing influence for more window replacement. For example, one realtor advised they promoted energy savings associated with Energy Star rated replacement windows.

Ontario Heritage Act and Related Standards

The Ontario Heritage Act (OHA) provides legislation with the intent of recognising and encouraging conservation. The OHA and many other related heritage standards and planning tools have been enacted to ensure properties with recognised heritage value are maintained to certain standards due to the opposing trend to physically alter heritage elements, such as replacing original wood windows. However, the OHA and many other heritage standards normally only apply to designated heritage properties or designated

heritage conservation districts. In this study, these heritage regulations and standards don't apply to the vast majority of properties. Only a few respondents owned a designated property. Interviewed Heritage Stratford members even advised, while preferred, window conservation cannot be enforced. Adding further confusion, homeowner interviewee 11, owner of a designated property, stated that their windows had to be preserved yet they had replacement windows.

As noted under the cultural theme, one of the referenced standards on conservation is the *Standards and Guidelines for the Conservation of Historic Places in Canada*. Generally, this standard only applies to designated properties and sometimes only those receiving government grants. This standard defines conservation as the safeguarding of character-defining elements. Few interviewees could describe their window's character-defining elements or knew what this meant. Surprisingly, even interviewed Heritage Stratford members wished there were simple windows conservation guidelines to provide information to homeowners. This sentiment was also expressed by one window replacement contractor, who advised they could never get a clear understanding from Heritage Stratford on window conservation requirements.

The implication is the lack of enforcement of window conservation on designated properties, lack of jurisdiction on the majority of properties having heritage value, confusion of what standards actually mean and lack of understandable guidelines are contributing factors as to why many homeowners replace their windows.

Heritage Planning Regulations

As noted, the research study area is identified as a heritage area in the City's Official Plan. Although not defined in the Official Plan, the implication is that every pre-World War II house and neighbourhood in this research study has recognised heritage value. However, the Official Plan only addresses that new integrated construction needs to respect existing heritage resources. There is nothing that clarifies how to maintain this existing heritage area's value, including existing original wood widows. This implies that one of the reasons for window replacement is lack of useful regulations and guidelines for conservation of heritage artifacts in heritage areas.

There are many planning tools that could be better utilised to promote and assist in windows conservation, such as strengthening official plans, additional zoning by-laws requirements, and better use of site plan controls, better guidelines for conservation for designated properties, establishing heritage character areas and developing local property standards for conservation.

Government Financial Incentives

Some discussions on heritage conservation focus on the need of financial incentives to assist conservation. As noted, under the costing and economic perspective, conservation can exceed the cost of window replacement. There are some programs with limited financial assistance for conservation, but usually are offered only to designated properties. One homeowner interviewee noted that a heritage grant would allow them to do more conservation work, but no grants are currently available. In contrast, one homeowner interviewee advised that past financial incentives to replace their windows for energy savings had influenced them to replace their original wood windows. This implies government financial incentives can be both a reason for conservation or replacement depending on the type of funding.

6.3.6 Marketing

The consensus of window conservators is that the influence of marketing by the window replacement industry is one of the main obstacles to conservation of original wood windows. Window conservators advised that the window replacement industry spends vastly more on marketing than the window conservation industry. Without in-depth research into the extent of each industry's marketing and the influence that marketing can create, this claim still seems logical based on comments from homeowners:

- The majority of interviewed homeowners advised they receive a lot of advertising from both regional and local window replacement companies, including regular newspaper advertisements, door-to-door solicitation and phone solicitation.
- In contrast, no interviewed homeowner had ever received advertising or solicitation for repair of their old wood windows.

Two of the interviewed window replacement contractors advised that they relied on a wide range of advertising and marketing methods, including advertising flyers, newspaper advertisements, telephone yellow pages, job-signs, participating in local home shows, internet and marketing from word of mouth referrals. One interviewee noted that most of their business came from word of mouth referrals, with little need for other marketing.

Windows conservators advised they were all small businesses with limited resources for expensive marketing. However, most of them also indicated that limited competition from other conservators reduced their need for marketing. They advised available work within their own local areas usually exceeded their service capacity. Essentially, they were busy providing window conservation services to homeowners who would be least influenced to replace their windows. Most of their current marketing consisted of word of mouth and access through web sites. Also, all periodically participate in public events such as speaking to public groups on window conservation. These events help to market themselves, their industry, as well as providing a source of public education on window conservation. All of the conservators were of the opinion there was a potential market for more window conservation, but their industry, as a whole, needs to market more. They all remarked marketing information must include accurate information about both conservation and window replacement.

Most conservators were of the opinion the window replacement industry markets using misleading information. Even one of the window replacement contractors noted marketing of energy savings was sometimes misleading. A review of samples of local advertisements for one local window replacement company demonstrates that ambiguous statements could influence an unknowledgeable homeowner. For, example, one testimony quoted, “recently I had most of my windows and doors replaced ….my energy costs were reduced by 30-40 %” (anonymous). In reality this could be correct; however the testimony did not provide any information about the condition of the replaced existing windows. For example, it could be comparing new replacement windows to older windows without storm windows. The concern expressed by window conservators is marketing influences homeowners to believe they will save significantly on their heating costs, even when their own situation may be different. Given homeowners indicated the main reason they replace

windows is to save on heating costs and there is extensive replacement, implies the window replacement industry has very successful marketing. Even if only some information is misleading, this becomes a barrier to window conservation.

6.3.7 Knowledge

This theme is included in the analysis because it identifies a common issue found throughout the other themes. Most opinions point to a lack of knowledge among homeowners and many other stakeholders about window conservation as a key reason why many homeowners replace their windows.

Consensus among window conservators is that the majority of homeowners are not knowledgeable about original wood windows. This consensus seems to be supported by the analysed homeowner and stakeholder responses included in the other themes, for example:

- **Cultural:** Most homeowners can't describe character-defining elements of older wood windows beyond the simplest of terms.
- **Energy:** Most homeowners are not aware of the comparative energy performance of a maintained older wood window.
- **Environmental:** Most homeowners are not aware of any environmental issues pertaining to windows.
- **Maintenance:** Most homeowners don't know how to repair older wood windows.
- **Cost:** Most homeowners don't know the costs to repair an older wood window.

In contrast, most of the window replacement contractors were of the opinion homeowners are knowledgeable about new windows due to the extensive information accessible on the internet. One interviewee noted more homeowners are becoming knowledgeable about custom design replacement windows providing a close appearance to original windows. This implies homeowners who are considering replacement may be even more inclined to replace due to marketed information they find on new windows on the internet.

There is also a lot of information about conservation of windows on the internet. Information about window conservation tends to be primarily located on American web sites. There is a wide range of information and a lot of web sites focused on the benefits of conservation. Some sites include instructional videos on methods of repair for do-it-yourself (DIY). However, there are not a lot of Canadian web sites pertaining to window conservation; this may be a contributing factor to window replacement. One conservator advised all you have to do is Google the word restoration to find lots of information on window conservation. Even differing terminology is a contributing problem for finding information on conservation. In Canada, the common term used for older wood window repair work is conservation, however in the United States the common term is restoration. These words are often interchanged, however an internet search using the phrase "wood window conservation" turns up few web sites as compared to the phrase "wood window restoration".

Consensus among window conservators is better education for homeowners will lead to more appreciation and desire for homeowners to conserve their original wood windows. Even though all interviewed conservators indicated they give talks to the public about conservation, since there are few conservators, this is limited public education. These conservators were of the opinion there is need for more public education coming from other sources, including municipalities. Larger municipalities often have heritage planners and tend to be better sources of information on conservation. In this case study, the interviewed members of the heritage advisory committee noted they lacked guidelines for informing the public about window conservation and homeowners were not knowledgeable about window issues. One window replacement contractors even expressed frustration at the lack of information available from the municipality pertaining to heritage conservation requirements.

It is evident there is also a lack of conservation knowledge among realtors and home inspectors. Neither realtors nor home inspectors receive formal training pertaining to heritage or conservation of older wood windows. One realtor advised they had attended a short seminar given by a local archivist on architectural styles, which convinced them that some older windows have heritage value. This realtor wished there was more available

heritage education. Another realtor actually noted that they were trained not to discuss conservation work with clients when a property has a heritage designation. There was concern of legal liability in the case of informing a client incorrectly about what alterations they could make on their house. This implies lack of knowledge among other stakeholders is a barrier to conservation.

Lack of knowledge among homeowners and many other stakeholders implies there would be more wood window conservation if more resources for information were made available to homeowners and other stakeholders.

CHAPTER 7 – DISCUSSION AND RECOMMENDATIONS

7.1 Discussion and Recommendations

The data obtained through the mail survey and subsequent interviews clearly identifies reasons leading to either window conservation or window replacement. The analysis of the data reveals why many homeowners don't conserve their original pre-World War II wood windows. Given homeowners will continue the trend of window replacement; this implies that there are barriers to the conservation of older residential wood windows. To address these barriers, this chapter will:

- Identify the barriers to window conservation.
- Discuss the potential market for more conservation.
- Give recommendations to reduce barriers and increase window conservation.

7.2 Barriers to Window Conservation

The analysis of opinions given by homeowners and other stakeholders for window replacement, explored through various themes, leads to the identification of barriers to the conservation of these older residential wood windows. As discovered, there are many reasons to consider when choosing to replace windows or conserve original wood windows. Most reasons leading to not conserving older wood windows result from two main barriers: lack of knowledge about conservation and lack of resources for conservation. Other barriers include lack of legal support, lack of marketing and lack of conservation cultural values. The following is a list of barriers with a brief explanation from corresponding reasons and themes.

Barrier: Lack of Knowledge

For example, survey responses identified the primary reason for window replacement was a homeowner's desire to save on their energy costs. Analysis indicates while homeowners may perceive high savings, there is lack of understanding that window conservation can be more cost effective than window replacement. This lack of understanding stems from a

lack of knowledge about older wood windows which creates a major barrier for window conservation.

Several areas lacking in knowledge are:

- **Energy:** Most homeowners and many other stakeholders do not know original wood windows provide energy savings similar to new replacement windows. This is evident by the majority of respondents indicating a preference to keep their windows, but responding the primary reason for window replacement is for energy savings. Similarly, realtors promote replacement windows due to a perceived energy savings.
- **Maintenance and Operation**: Homeowners are not knowledgeable about the maintenance and repair of older wood windows. Most homeowners don't know wood windows are very reparable or how to repair a window. Most homeowners don't know of upgrades that can make maintenance easier, such as operable wood storm windows.
- **Cultural:** Most homeowners and many other stakeholders are not knowledgeable about the character-defining elements of original wood windows. Most homeowners appreciate heritage, but have no depth of knowledge of their windows. The majority responded heritage and appearance were the main reasons for keeping and maintaining original wood windows. However, most homeowners would have a difficult time describing the heritage differences between an original wood window and a custom designed vinyl window.
- **Cost and Economics:** Most homeowners are not knowledgeable about the costs of keeping and maintaining original wood windows. Cost is a major factor in a homeowner's decision to keep or replace windows. In many instances, the cost of major repairs to older wood windows will be more expensive than the cost of replacement; however often the opposite is true.
- **Environmental:** Most homeowners are not knowledgeable about environmental impacts pertaining to window conservation. If homeowners were more knowledgeable they would keep more original wood windows.

Barrier: Lack of Resources

Many of the reasons given for replacing windows stem from a lack of resources. Lack of many types of resources cause barriers to window conservation such as:

- **Maintenance and Operation:** There is a shortage of skilled window conservators. Based on the location, a majority of homeowners will not be able to have an old wood window repaired unless they do it themselves. However, it is also evident that most homeowners are not knowledgeable or skilled enough to do their own repairs.
- **Maintenance and Operation:** Even if a homeowner could repair their own windows, they would have difficulty in obtaining proper repair materials. Typically, local retail building supply companies do not carry window upgrade and repair products, with the exception of items for minor repairs.
- **Cost and Economics:** In some cases, homeowners will not have the necessary funding for window repairs. Lack of money may cause homeowners to not repair windows, making conservation more prohibited. Also, there is a lack of financial incentives, which could assist in more conservation. Alternatively, lacks of funds, makes window replacement seem more affordable, especially with available financing through most windows replacement companies.
- **Knowledge:** Lack of knowledge can stem directly from a lack of resources or the difficulty in obtaining knowledge. Even though there are many web sites, seminars and workshops where homeowners can learn about window conservation, they tend not to be local resources.

Barrier: Lack of Legal Support

When building conservation is enforceable, regulations and standards tend to apply only to designated heritage properties. However, regulations and standards can lack clarity and be open to interpretations that don't necessarily lead to conservation. Evidence from this research study showed that:

- Window conservation was preferred, but not mandatory.

- The City's Official Plan identified the research study area was a heritage area, but there were no guidelines implying how conservation should be applied.
- There is a lack of clear guidelines pertaining to window conservation.
- In some instances, some regulations favour replacement. For example, in the recent past, Ontario provided energy cost rebates for replacement windows. One interviewee responded their decision to replace their windows was influenced by an energy rebate.

Barrier: Lack of Marketing

Marketing for conservation of original wood windows lags behind marketing for new replacement windows. All homeowners received regular advertisements from window replacement companies. However, none of the homeowners received any sort of marketing from window conservation companies.

Some stakeholders are of the opinion there isn't a market for conservation. Evidence from this research study suggests otherwise:

- The consensus among window conservators is the potential for more window conservation, which requires more marketing from their industry. Individually, they have limited resources for marketing.
- Provided some of the other barriers can be overcome, there are still thousands of existing original wood windows that will require repair and maintenance services.

Barrier: Lack of Conservation Values

Given the majority of homeowners believe their house has heritage value and keeping original wood windows is important for appearance, it would seem logical that there would be a strong culture of conservation. However, it appears homeowners are still part of a society that doesn't embrace conservation. One window conservator stated most current homeowners have a lifestyle that leaves no extra time for such things as conservation. If repair work is needed on windows, replacement tends to be favoured due to the speed and least inconvenience to homeowners.

Of interest, one homeowner, who ironically had replaced their windows, stated in the future consumers will have to conserve more. Also of interest, one of Canada's most experienced window conservators noted some homeowners, even those who live in old houses, just like new windows, but optimistically noted that the newer generation seems to be moving away from a throw away culture.

Not a Barrier: Interest in Heritage

Fortunately, for window conservation's sake, the research indicates many homeowners have a keen interest in their house's heritage. Many homeowners are also very attached to their original wood windows. Given the majority of homeowners think keeping older windows are important, and their houses and neighbourhoods have heritage value, it would appear there is a potential market for more window conservation. The challenge is to overcome the barriers.

7.3 Potential Market for Window Conservation

A Case for Window Conservation

It was noted by window conservator interviewee 1; even with eight employees they couldn't meet the demand for window conservation within their service area. Similarly, window conservator interviewee 2 indicated that as a sole practitioner they could absolutely make a full time living in window conservation. Although there are only a few window conservation specialists in Ontario, it appears they have been successful in developing the market for window conservation within their own areas.

In contrast, representatives of several Stratford area millwork shops and building supply companies advised there was no real market for window conservation services because it was too expensive unless done by the homeowner. However, the do-it-yourself approach is limited, as revealed most homeowners don't have the skills for window conservation.

This leads to the discussion, if the barriers to wood window conservation were overcome, could there be a potential market for more window conservation in more locations?

To examine this, a scenario using the case study area is considered. The objective is to determine if there are a sufficient number of original wood windows in the study area to support the services of a window conservator. In Chapter 6, it was estimated there were approximately 570 houses still with all of their original wood windows, over 14,000 windows. Current labour costs for window conservation or window replication ranges from $40 to $50 per hour as advised by window conservator interviewee 2 and one of the local millwork shops. For simplicity, this equates to an approximate yearly income for one conservator of between $80,000 and $100,000, based on a 40 hour work week. The average cost for restoring a double-hung window is approximately $1,400, in which approximately 80 to 95 percent of this cost will be labour (Leek, 2009). Using an income of $100,000 per year and an average labour cost of $1,200 per window, translates to the conservation of approximately 80 windows per year to support one full time window conservator. Given the average older house has an average of 25 windows; this translates to conserving the windows on approximately three to four houses a year.

Even if the above numbers are over or underestimated, the significance in these numbers is that it represents one window conservator could make a full time living each year by only working on approximately one-quarter of one percent of the number of original wood windows within the study area. Using a 40 year career period, one full time window conservator could only repair approximately 10 percent of the current existing original wood windows in their entire working lifetime.

Regardless of other variables that could have been included in the above scenario, such as ratio of billable hours to actually hours worked, it is reasonable to conclude a larger potential market exists provided barriers to conservation work are overcome.

A follow up discussion with window conservator interviewee 2, pertaining to market and barriers, provided a quote that supports this discussion.

> If you understand window conservation and can explain it to people they usually will go that route. You are correct in the sense that there are many barriers as you know, so maybe it's best to start with education. (Window conservator 2)

There are similar circumstances in many communities. Most communities have older neighbourhoods with many pre-World War II houses with original wood windows. Most communities like Stratford, won't have a local contractor who provides wood window conservation services. There are literally thousands of underserviced homeowners of these older houses with original wood windows. It is a conclusion; if some of the barriers were reduced there would be a lot more window conservation work underway.

7.4 Recommendations

One of the objectives of this research study is to provide recommendations to professionals in the field of conservation for more effective conservation strategies. Having identified five barriers, these recommendations are meant to help reduce these barriers, leading to more window conservation. Given there are already professionals in window conservation working to break down barriers, as evident from the three window conservator interviewees, it would be presumptuous to assume research based on one case study will provide all necessary recommendations to solve the problem facing window conservation. The following are five recommendations intended to address the major barriers identified in this study. These recommendations will support and validate the existing efforts to break down barriers to the conservation of older residential wood windows.

1. **Education for Homeowners:** Provide more education about window conservation to homeowners. The data clearly indicates most homeowners of pre-World War II houses are interested in their house's heritage and windows, but they lack knowledge about their windows. This education needs to be specific, to go beyond a superficial appreciation of windows. Access to education needs to be simple and local, possibly through more local workshops given through a municipality's planning department. Homeowners need to know more about conservation of windows from all perspectives, including cultural, energy, environment, maintenance and costs. Consensus among window conservators is that education is the key to more conservation.

2. **Education for Other Stakeholders:** The data also clearly indicates many stakeholders who can influence a homeowner to replace their windows have little or no training in conservation. This was evident among window replacement contractors, home inspectors, realtors and heritage advisory committee members. For example, if the majority of realtors advise homeowners that new windows are a good investment to increase market value, then conservation is unlikely. As with homeowners, access to education needs to be simple and local. It was evident most of the local window replacement contractors had a background in general construction. Ironically, one had a background in repairing older windows. Given the right motivation, it is not unconceivable even an established local window replacement contractor would provide window conservation services provided barriers were reduced creating a greater demand.
3. **Further Case Studies:** Related to education is the need for several other relevant studies. This recommendation may seem redundant. For example, if homeowners were made aware of existing energy performance studies, there should be more conservation. However, many of these studies are focused only on energy comparisons. They don't take into account potentially needed repairs, instead assuming that the original wood window is in good condition. There is a need for a local demonstrative field case study that clearly demonstrates to homeowners a comparison between window conservation and window replacement, including energy and all conservation costs. Other studies which would assist in reducing barriers, a study to better show the local economic benefits to the community and a study to show the effectiveness of low cost upgrades to existing original windows, such as hinged, tilt-out wood storm windows that allow ventilation without storm window removal.
4. **Better Marketing:** Compared to window replacement companies, there is limited marketing from the window conservation industry. This is understandable, considering the limited size of the residential window conservation industry and the areas they currently service. Given that none of the homeowners in this study had ever received any advertising for window repair services, it stands to reason

that increased marketing would help reduce barriers. Better marketing will also educate homeowners.

5. **Supportive Regulations:** In Ontario relevant legislative requirements tend to focus on heritage properties designated under the Ontario Heritage Act. This is not to diminish the importance of the Ontario Heritage Act, which designates many of the best examples of local heritage houses while giving them a measure of protection. As discovered, window conservation is preferred but not mandated on all designated properties. This study reveals most homeowners and many other stakeholders are of the opinion all older houses and older neighbourhoods have heritage value, and original wood windows are integral to this heritage value. More supportive heritage planning regulations have a role in window conservation. For example, in this study, the Official Plan recognises the study area as heritage area, but the guiding principles are vague. One guiding principle is to protect heritage resources, but another is to upgrade existing buildings for energy conservation. Given the lack of knowledge of older windows, this could be interpreted such that heritage can be protected while replacing windows. Heritage planning regulations need to be supplemented with clear standards and guidelines that are readily available to homeowners. It is evident homeowners are not aware of any standards. For example, even when homeowners were made aware of the recognised *Standards and Guidelines for the Conservation of Historic Places in Canada*, none of them could identify character-defining elements of older windows.

These five recommendations directly address the barriers of lack of knowledge, lack of legal support, lack of marketing and lack of conservation cultural values. More education and studies are imperative in addressing the lack of window conservation knowledge and values among homeowners and influential stakeholders. Indirectly, better education and more studies will also address the barrier of lack of resources. One of the main shortages of resources is the acute shortage of skilled window conservators. More education is needed to develop more skilled window conservators. More education among homeowners and other stakeholders will also help to create a stronger market for window conservation. Increased knowledge and increased resources go hand in hand. Better

informed homeowners will increase the demand for window conservation. Increased knowledge will improve the culture of conservation, hopefully encouraging more people of all ages to want to practise conservation.

7.5 Application of Conservation to a Broader Window Venue

Although this research has focused on conservation of pre-World War II residential wood windows, analysed themes presented in this study could be applicable to a broader range of windows. In consideration, the main reason identified for window conservation pertains to recognising windows for their cultural heritage value. Criteria to determine cultural heritage value of properties in Ontario is included in the Ontario Heritage Act. Similarly heritage value is defined in Canada's *Standards and Guidelines for Conservation of Historic Places in Canada.* Windows can contribute to a property's cultural heritage value or considered heritage value on their own for a variety reasons, such as aesthetic, craftsmanship, technical and/or associations (Ontario Heritage Act, 2009; Parks Canada, 2008).

Several instances where this thesis research could also be applicable to a broader window venue are:

- It would make logical sense that application of this thesis could apply directly to wood windows of pre-World War II commercial and industrial buildings. For example, within the study area there are several older multi-storey buildings that previously were the backbone of the City's earlier furniture manufacturing district, such as 163 King Street, Stratford, ON, shown in figure 24.
- It would also make logical sense that application of thesis could apply to post-World War II residential houses, particularly to Victory Style houses. Victory houses, typically were small, one and half storey, low-cost houses built to accommodate demand for housing employees of industry during World War II and for returning veterans. These houses were built in large quantities, in communities across Canada in the late 1940s and the 1950s (Blumenson, 1990). Most of these houses had wood windows with wood storms. Most of these houses were located

in new neighbourhoods, with street layouts similar to modern subdivisions, often with winding streets. In many communities these Victory houses and their neighbourhoods are being recognised for their heritage value. For example, in Kitchener, there is a designated conservation district consisting of a neighbourhood of Victory houses. In Stratford there are significant number of Victory houses, many grouped into one larger neighbourhood.

- Not as obvious, some modern buildings are now being considered as meeting criteria for cultural heritage value. For example, could a 1970s suburban bungalow house and/or their windows be considered as heritage value? For example, could aluminum windows or even vinyl windows representing technical manufacturing of the late 1900's have heritage value? Following established heritage guidelines and policies it is very conceivable that these too will someday be studied for heritage value. In this situation the research design of this thesis pertaining to window conservation could be applicable to many other post-World War II windows and possibly future windows.

Figure 24: Example of Older Industrial Building with Original Wood Windows

CHAPTER 8 – SUMMARY AND CONCLUSIONS

8.1 Overview

Conservation of a community's heritage resources is an objective stated in most planning policies. The loss of heritage resources is a significant cultural heritage planning problem. Windows are considered an important heritage resource; however window replacement has become an ongoing trend. As Leeke (2009) noted, each year thousands of original residential wood windows are unnecessarily replaced and sent to landfill. This trend affects thousands of older houses, in most communities. Given that lost heritage resources goes against public heritage planning policy, it is important to determine the reasons and barriers to the conservation of these older residential wood windows.

This study's hypothesis is: if window conservation provides many benefits, but the trend is window replacement, then there must be barriers to the conservation of original wood residential windows. This hypothesis leads to this study's prime research question: are there barriers to the conservation of pre-World War II residential wood windows, and if so, what are they? The answer will provide homeowners and professionals a better understanding of the merits of window conservation, which should lead to more window conservation.

This study identifies the main reason homeowners replace original wood windows is to save money, primarily on heating costs. However, as surmised by Carroon (2010), homeowner decisions are often based on preconceived ideas rather than based on sound rationale. This lack of rationale is supported by literature indicating that the overall cost of window replacement is more costly (Baker, 2012; Ellsworth & Kinney, 2008; James et al, 1996; Shirley et al., 2010).

In addition, keeping and maintaining a house's original wood windows is a more environmentally sustainable approach than window replacement. From a conservationist perspective, older wood windows are very reparable, even when a window's condition appears otherwise to most homeowners. Window conservation is a sustainable approach to help maintain the heritage value of houses, neighbourhoods, and communities.

Windows provide both an aesthetic and functional role in a house. Historically, windows provided day lighting, views, and natural ventilation. In British influenced North America, the most common house window type was a single-glazed, double-hung wood window. In colder climates, like Canada, wood storm windows were also installed to reduce heat loss. As noted by Leeke (2009), window construction remained largely unchanged until the late 1940s. Original house windows were built, repaired and maintained with simple basic materials such as wood, glass, putty and paint. As with many consumer products, the post-World War II era brought changes in window construction and repair. Traditional conservation, repair and maintenance, gave way to window replacement. For example, in the 1960s, many wood storm windows were replaced by aluminum storm windows. In the 1970s, the concern for energy conservation gave way to a growing window replacement industry. Currently, window replacements are now dominated by vinyl windows.

8.2 Literature Review

There is extensive literature supporting the importance of conservation of original pre-World War II wood windows. Examination of this literature reveals several interconnected themes: cultural, energy and environmental, maintenance and operation, cost and economics, and legal.

From a cultural perspective, these older wood windows constitute a significant physical element contributing to an older house's cultural heritage value. Many conservationists consider maintaining older wood windows are instrumental to providing an older house with its beauty and character (Fram, 1988; Furlan, 2012; Leeke, 2009; Louw, 2007; Meany, 2008). As pointed out by Parks Canada (2008) and other heritage organisations, all components of an original wood window should be conserved. Original wood windows are culturally important as physical reflections of societies past technical advancements, such as early glass manufacturing.

Culturally, conservation has several challenges to overcome. First, heritage value is difficult to measure in comparison to other variables, such as energy performance. In simple terms, cultural heritage is hard to equate in dollar value. In most instances, heritage

value of a window can only be described in terms of a priceless intangible (Shirley et al., 2010). Second, heritage value has usually focused only on the best examples of heritage artifacts. This has been reinforced by heritage destinations of the best examples of architectural house styles. Vernacular houses have rarely been considered worthy of contributing to cultural value, although this is starting to change. Third, often the heritage relationship between a house and its own windows is not well understood by homeowners, even though, as pointed out by Furlan (2012), windows are part of the overall heritage fabric of a building.

From an energy and environmental perspective, conservation of these older wood windows makes good sense. Thermally, windows are the weak point in a houses exterior envelope. The concern among homeowners is a perception that older windows waste energy dollars. Carroon (2010) states window replacement often takes place for perceived reasons. Many window energy performance studies conclude that a weather-stripped older wood window combined with a storm window is as effective in energy performance as most standard replacement windows (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). A local current case study by Kyles (2014) demonstrates an example of a restored window outperforming a replacement in both conductive and infiltrative thermal performance. Related to energy performance, there are more cost effective strategies on reducing a house's energy consumption than replacing windows. For example, adding more attic insulation (Fram, 1988; National Trust for Heritage Preservation, 2009b). Also related to energy performance, environmental literature indicates window replacement is counterproductive as it ignores the advantage of maintaining the embodied energy of existing wood windows (National Trust for Historic Preservation, 2009a; National Trust for Historic Preservation, 2009b; Shirley et al., 2010). Environmental literature also concludes that maintaining durable older wood windows will keep non-environmentally friendly vinyl windows from inevitable future landfill disposal (Furlan, 2012; National Trust for Historic Preservation, 2009a).

From a maintenance and operation perspective, these older wood windows do require routine maintenance. As stated by Osterhoudt (2009), many homeowners will find window replacement attractive due to less maintenance and easier operation. However, as

pointed out in literature sources, original wood windows are more durable and have far longer lifespans than new replacement windows. As noted by Furlan (2012), many older windows are over 100 years old, and if maintained can easily last another 100 years. This durability far exceeds the typical 25 to 35 year lifespan of a typical replacement window. Meany (2008) typically notes there are common window repairs in conservation work, such as replacement of broken sash ropes, replacement of cracked window panes, and wood repair. To many homeowners this repair work is perceived as expensive. However, as noted by Fram (1988), the real problem that leads to expensive conservation work tends to be lack of preventative maintenance. Primary preventative maintenance includes periodical repainting to prevent moisture intrusion into the wood substrate, to prevent wood decay. Required periodic maintenance to maintain easy operational older windows is an obstacle to window conservation.

From a cost perspective, the energy studies also conclude that replacing a maintained, weather-stripped, older wood window combined with a storm window cannot be justified from a cost perspective (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010). The life-cycle cost, with any potential energy cost savings factored in, creates an unjustifiable payback (National Trust for Historic Preservation, 2009a; Shirley et al., 2010). One missing variable in many of these energy studies is the effect of upfront window repair cost, if needed. These studies can be misleading to the potential full cost of conservation. To make a more conclusive argument for window conservation, further study and evaluation using additional repair cost scenarios is warranted. Further evaluation should not be a concern for conservation, as literature also suggests that inclusion of costs for window conservation is often less costly than new window replacements (Leeke, 2009).

From a larger economic perspective, literature also indicates that window conservation is beneficial to a community's local economy. Repair work, including periodic repainting requires more local labour than required for replacement windows. These results in more money distributed locally.

Legally, there are planning policies and heritage legislation to encourage conservation. Official plans include policies for maintaining heritage resources. Some policies tend to be vague on specifics. For example, Stratford's Official Plan identifies the older residential neighbourhoods are part of a heritage area, but doesn't provide specifics of its heritage value (City of Stratford, 1993-2013). Also, Stratford's heritage resource policies tend to focus on heritage properties designated under the Ontario Heritage Act. The Ontario Heritage Act provides a measure of protection for heritage resources, but it represents only a small fraction of a community's houses. As a result, local heritage policies are limited in reference to windows and the majority of pre-World War II houses. A further result, standards, such as those outlined in Parks Canada (2009), *Standards and Guidelines for the Conservation of Historic Places in Canada* pertaining to window conservation are rarely considered. Other municipalities, such as Kingston, provide more progressive options for heritage recognition of groups of houses including entire neighbourhoods. For example, one option is recognising cultural heritage character areas (City of Kingston, 2013). Overall, a legal framework is in place to support windows conservation, but in most cases the framework provides policy lacking in specifics.

8.3 Conclusions from the Exploratory Research

The literature review concludes window conservation is beneficial and there is little justification for window replacement. However, a trend of window replacement persists, typically with new vinyl replacement windows. This implies many stakeholders must not be aware of the literature supporting the benefits of conservation over the benefits of replacement. Since homeowners ultimately decide window replacement or conservation, it was determined that valuable conclusions could be made by studying the opinions of homeowners. Exploratory research was structured to obtain credible data by using systematic and random sampling (Patton, 2002). Stratford, Ontario was used as a representative case study. Homeowners within Stratford's pre-World War II residential neighbourhoods were surveyed and interviewed. To provide a credible triangulation of data analysis, other stakeholders having direct influence on those homeowners were also interviewed. Interviewees included local windows replacement contractors, local realtors, local home inspectors, and members of the local heritage advisory committee. Although

no local window conservation specialists were found, the closest window conservators were interviewed. A cursory review of the study area revealed a diverse range of heritage neighbourhoods, houses and original wood windows. Similar diversity can be found in many other older communities.

The literature review, exploratory research data findings, analysis of findings, identified barriers, discussions and recommendations lead to the following conclusions.

There are barriers to the conservation of pre-World War II residential wood windows. The barriers can be summarised into two main categories: lack of knowledge and lack of resources. Other barriers include lack of legal support, lack of marketing and lack of conservation values.

There is a strong interest in heritage among homeowners, and it appears there is potential for more window conservation.

The analysis, supported by the data findings and literature, concludes that window conservation, keeping and maintaining older wood windows, is integral to maintaining the cultural heritage value of a house. This is supported by the majority of homeowners who responded that the main reason for keeping original wood windows is to maintain the heritage appearance of a house. Although it was evident that many homeowners were knowledgeable about the heritage of their house, few had a comprehensive understanding of what conservation of wood windows meant. For example, few homeowners could describe character-defining window elements. Although there is interest, homeowners lack knowledge of these cultural window assets. Lack of knowledge is a major concern because a prime benefit of window conservation is maintaining cultural heritage value. Many homeowners lack enough knowledge to consider heritage value the overriding reason to keep their original wood windows.

Similarly, homeowners are not knowledgeable about energy performance of older wood windows. Most homeowners do not know that a maintained older wood window can be as effective in energy performance as most new replacements. Homeowners overwhelmingly responded they would prefer to keep their original wood windows if this was true. Not

only do many energy studies demonstrate similar energy performances (Baker, 2012; Ellsworth & Kinney, 2008; Shirley et al., 2010), these studies conclude it is not justifiable to replace these older wood windows due to unrealistic long payback periods. This is a major concern; many original wood windows are being replaced for mistakenly perceived energy savings.

Homeowners are concerned about environmental issues, but again, they are not aware of environmental issues pertaining to windows. Interviewed homeowners were not aware of window issues pertaining to embodied energy, sustainability, hazardous materials, and landfill.

Perceived less maintenance and easier operating windows is a strong lure for homeowners to replace their windows. The analysis suggests a combination of maintenance items, such as easier operating windows, no need to remove storm windows, easier cleaning, and no need of painting may be more influential in homeowners replacing their windows than from perceived energy savings. The majority of homeowners know from experience that older windows are often difficult to operate. This difficulty often results from lack of maintenance. However, there is also a lack of knowledge and skill among homeowners for maintaining their older wood windows. Lack of, or poor maintenance tends to lead to poorly operating windows and more expensive future conservation repairs. For example, it was found that many double-hung wood windows were painted shut from improper maintenance.

Homeowner knowledge of costs associated with conservation is limited. Many perceive window conservation as more expensive than window replacement. The cost of conservation work depends on estimating the scope of required work. In many instances, conservation work can be less expensive than window replacement. However, in many locations, obtaining an estimate for conservation work is nearly impossible since there are few window companies providing conservation services. On the other hand, homeowners can quickly obtain estimates for window replacement from a multitude of companies. For some homeowners, cost of conservation isn’t even considered. For example, some homeowners replace windows for perceived increase in market value of their house.

There is a lack of resources for window conservation. The collected data indicates that most homeowners are not knowledgeable or skillful enough to perform their own window repairs. However, at the same time, there are few skilled conservation specialists available to provide needed conservation services. For example, in the case study there were no local persons or companies that could provide conservation services in Stratford. If a homeowner was skilled enough at do-it-yourself (DIY), they would also have difficulty in finding proper repair materials.

Is there really a preference for window replacement over window conservation?

The answer to this is a qualified no. The trend for window replacement suggests yes, and this is a response from some homeowners. However, the data analysis, supported by literature, suggests that if the majority of homeowners where more knowledgeable about older windows and had better access to resources, there would be a preference for window conservation. This was clearly indicated among homeowners who stated they would prefer to keep their original wood windows if these windows provided energy savings similar to new replacement windows.

Overcoming the barriers to window conservation is crucial for developing a larger window conservation market. Extrapolation of survey data clearly indicates there is potential for a larger conservation market. For example, within the study area, one window conservator could spend a life-time on window conservation and only work on a small percentage of the houses.

To overcome the barriers to conservation, several recommendations are suggested. Homeowners need to be better educated about pre-World War II wood windows, including information on cultural, energy, environmental, maintenance and cost issues. Other stakeholders who have direct influence also need to be better educated. For example, realtors need training on cultural window heritage, as they promote replacement for increased market value.

Better strategic marketing from the window conservation industry is needed. In competition, the window replacement industry, markets extensively and greatly influence homeowners.

Heritage planning policies need to be strengthened, and to include a broader range of heritage resources. There appears to be the beginning of a paradigm shift for inclusion of all pre-World War II houses in heritage planning, including common vernacular houses. In the case study, this could mean better recognition of the heritage area's houses by designating entire older residential neighbourhoods as Cultural Heritage Character Areas. In this particular situation the Official Plan would need to include additional heritage policy.

Further study in the area of window conservation is needed. While this study concludes that there are barriers to windows conservation, and provides recommendations to reduce these barriers, there are further studies that would increase knowledge on the benefits of window conservation. For example, further research on conservation costs is needed. The cost of repair is an influence on a homeowner's decision to conserve, and additional case studies, including all energy and costing variables would provide information for better informed decision making. These costs combined with consideration given to cultural heritage value will reduce barriers to conservation of pre-World War II residential wood windows.

There is hope for window conservation. The majority of homeowners responded their house had heritage value, their windows were important to their house's appearance, and their neighbourhood had heritage value. This demonstrates homeowners have an understanding of the roots of cultural heritage that are needed to spark more window conservation, but they need more knowledge and resources. The current trend of vinyl window replacement is also a sign of the current lack of conservation values. However, as many professionals in the window conservation industry optimistically predict, there will be a shift of preference towards conservation in future generations.

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APPENDICES

Appendix A – Mail Survey and Interview Questionnaires

Appendix A includes:

- Homeowner Window Mail Survey
- Homeowner Interview Questionnaire
- Window Conservator's Questionnaire
- Window Replacement Contractor's Questionnaire
- Home Inspector's Questionnaire
- Realtor's Questionnaire
- Heritage Stratford Member's Questionnaire

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Homeowner Window Mail Survey

At some point in time, most owners of older houses are faced with the decision to either conserve (keep and maintain) their original wood windows or replace them with new windows. This survey is to assist in identifying reasons why homeowners may choose to replace their wood windows instead of keeping and maintaining them.

PART A: GENERAL INFORMATION ABOUT YOUR HOUSE AND ITS WINDOWS

1. Are you the owner or tenant of this house?
   - ☐ Owner
   - ☐ Tenant

2. How many years have you lived in this house?
   _____ years (approximate)

3. Does your house have?
   - ☐ All of its original wood windows including all of its original wood storm windows
   - ☐ All of its original wood windows and some of its original wood storm windows
   - ☐ All of its original wood windows and aluminum storm windows
   - ☐ A mixture of original wood windows, storm windows, and replacement windows
   - ☐ All replacement windows
   - ☐ Other_____

4. If all or some the original windows in your house have been replaced, what type are they?
   - ☐ Wood windows (or wood with cladding)
   - ☐ Vinyl windows
   - ☐ Aluminum windows
   - ☐ Fiberglass windows
   - ☐ Other _____
   - ☐ Not applicable

Part B: YOUR OPINIONS ABOUT YOUR HOUSE AND YOUR WINDOWS

Please circle the number that in your opinion best answers the following statements or check don't know.

5. Your house has heritage value.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

6. The residential neighbourhood, in which your house is located, has heritage value.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

7. Keeping and maintaining original wood windows is important to the appearance of an older house.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

8. Replacing original wood windows will improve, (or has improved), the appearance of your house.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

9. If original wood windows provided energy savings similar to new replacement windows; you would prefer to keep your original wood windows instead of replacing them.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

10. Environmental issues would influence your decision to keep or replace your windows.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

11. Original wood windows tend to be difficult to operate, such as opening and closing.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

12. If your original wood windows required repair, (such as repair of rotted wood or replace glazing) it would be easy to make the repairs yourself.

1	2	3	4	5	□
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

13. Installing new windows that do not require painting is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

14. Installing new windows that do not require the seasonal removal of wood storm windows is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

15. Installing new windows that are easier to clean is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

16. Finding a local contractor who can repair your original wood windows is easy.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

17. New windows will increase the market value of your house more than keeping and maintaining your original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

18. The future costs of maintaining (repairs and repainting) original wood windows would influence, or has influenced, your decision to keep or replace your original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

19. In your opinion, what is the main reason for replacing original wood windows with new windows? You may check more than one reason, and, you may rank in order from 1 (main reason), 2 (2nd main reason), etc.

Ranking	Reason
_____	□ To make your house look better
_____	□ To save on heating costs
_____	□ To make a house more comfortable (e.g. less drafty)
_____	□ To replace windows that are in poor physical condition (e.g. rotted wood)
_____	□ To have easier operating windows (e.g. easier to open and close)
_____	□ To eliminate repainting
_____	□ To eliminate seasonal removal of storm windows
_____	□ For easier cleaning
_____	□ To provide better UV (Ultra Violet Light) protection
_____	□ To reduce outside noise
_____	□ To improve home security
_____	□ To increase the value of your house (e.g. resale value)
_____	□ Lack of skill to repair old windows by yourself
_____	□ Lack of window contractors who can repair old windows
_____	□ Other (list reason) _____
	□ No, there is no reason I would replace my original wood windows

20. In your opinion what would be the main reason for keeping and maintaining original wood windows? You may list more than one reason.

    Reason(s):
    _____
    _____

END OF SURVEY

Thank you for participating in this survey. After you have completed, please fold and insert this survey into the self-addressed stamped return envelope and mail back. If you have any additional written comments pertaining to this topic please write below.

It is my intent to interview several home owners on this thesis topic. If you would be willing to participate in a short home interview at your convenience, please provide your contact information below, or email me at rbean@uwaterloo.ca. This would provide additional valuable data for my university thesis.

□ Yes, I would be interested in learning more about conservation (maintaining/repairing) of older wood windows.

Name: _____
Address: _____
Phone Number: _____
E-mail: _____

Additional Comments:

_____

_____

_____

_____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi Structured Interview Questions

Homeowner Interview Questionnaire

At some point in time, most owners of older houses are faced with the decision to either conserve (keep and maintain) their original wood windows or replace them with new windows. This survey is to assist in identifying reasons why homeowners may choose to replace their wood windows instead of keeping and maintaining them.

PART A: GENERAL INFORMATION ABOUT YOUR HOUSE AND ITS WINDOWS

1. Are you the owner or tenant of this house?
   - ☐ Owner
   - ☐ Tenant

2. How many years have you lived in this house?
   _____ years (approximate)

3. Does your house have?
   - ☐ All of its original wood windows including all of its original wood storm windows
   - ☐ All of its original wood windows and some of its original wood storm windows
   - ☐ All of its original wood windows and aluminum storm windows
   - ☐ A mixture of original wood windows, storm windows, and replacement windows
   - ☐ All replacement windows
   - ☐ Other_____

   What types of windows do you have? Example: double hung, sliders, fixed

   Describe:
   _____
   _____

4. If all or some the original windows in your house have been replaced, what type are they?
   - ☐ Wood windows (or wood with cladding)
   - ☐ Vinyl windows
   - ☐ Aluminum windows
   - ☐ Fiberglass windows
   - ☐ Other _____

Describe more detail: eg: glazing types, double hung etc.

_____

_____

Part B: YOUR OPINIONS ABOUT YOUR HOUSE AND YOUR WINDOWS

Please circle the number that in your opinion best answers the following statements or check don't know.

5. Your house has heritage value.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Reason: _____
Is heritage value important? _____

6. The residential neighbourhood, in which your house is located, has heritage value.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Reason: _____

7. Keeping and maintaining original wood windows is important to the appearance of an older house.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Reason: _____

8. Replacing original wood windows will improve, (or has improved), the appearance of your house.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Reason: _____

9. If original wood windows provided energy savings similar to new replacement windows; you would prefer to keep your original wood windows instead of replacing them.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Reason: _____

Discuss performance of existing windows and replacements:

_____

10. Environmental issues would influence your decision to keep or replace your windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss environmental issues (e.g. landfill, toxic materials):

_____

_____

11. Original wood windows tend to be difficult to operate, such as opening and closing.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

12. If your original wood windows required repair, (such as repair of rotted wood or replace glazing) it would be easy to make the repairs yourself.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

13. Installing new windows that do not require painting is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

Discuss potential for changing colours: _____

14. Installing new windows that do not require the seasonal removal of wood storm windows is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

15. Installing new windows that are easier to clean is a good reason to replace original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

16. Finding a local contractor who can repair your original wood windows is easy.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

Discuss finding a replacement contractor: _____

Discuss marketing influences: _____

17. New windows will increase the market value of your house more than keeping and maintaining your original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss why? _____

18. The future costs of maintaining (repairs and repainting) original wood windows would influence, or has influenced, your decision to keep or replace your original wood windows.

1	2	3	4	5	☐
Strongly Disagree	Disagree	Neither Agree Or Disagree	Agree	Strongly Agree	Don't Know

Discuss future (life cycle) costs:

_____

19. In your opinion, what is the main reason for replacing original wood windows with new windows? You may check more than one reason, and, you may rank in order from 1 (main reason), 2 (2nd main reason), etc.

Ranking	Reason
_____	☐ To make your house look better
_____	☐ To save on heating costs
_____	☐ To make a house more comfortable (e.g. less drafty)
_____	☐ To replace windows that are in poor physical condition (e.g. rotted wood)

Ranking	Reason
_____	□ To have easier operating windows (e.g. easier to open and close)
_____	□ To eliminate repainting
_____	□ To eliminate seasonal removal of storm windows
_____	□ For easier cleaning
_____	□ To provide better UV (Ultra Violet Light) protection
_____	□ To reduce outside noise
_____	□ To improve home security
_____	□ To increase the value of your house (e.g. resale value)
_____	□ Lack of skill to repair old windows by yourself
_____	□ Lack of window contractors who can repair old windows
_____	□ Other (list reason) _____
	□ No, there is no reason I would replace my original wood windows

20. In your opinion what would be the main reason for keeping and maintaining original wood windows? You may list more than one reason.

    Reason(s):

    _____

    _____

Additional Comments:

_____

_____

_____

_____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi-Structured Interview Questions

Window Conservators Questionnaire (Contractor and/or Consultant)

Part A: General Information about Interviewee and Their Work

1. Company Type: (Conservation Consultant or Conservation Contractor)
   _____
2. Position: _____
3. How long have you been involved with Conservation of Wood Windows?
   _____
4. What is your background in Conservation of Wood Windows?
   _____
5. What portion/percentage of your conservation work is with residential houses?
   _____
6. What portion of your conservation work is with designated heritage houses?
   _____
7. Does your work include all aspects of conservation/repair/painting wood windows?
   _____
8. What portion of your conservation work is with wood windows?
   _____
9. Do you (or can you) make a living/full time work in conservation of wood windows?
   _____

Part B: Opinions on Conservation of Wood Windows

10. What is/are the main reason(s) that you think original wood windows should be conserved?

    Main Reason:
    _____

Other Reasons:

_____
_____

11. What are the main reasons you think home owners replace their original wood windows as opposed to conservation/repair of their wood windows?

    Main Reasons:

    _____
    _____
    _____

12. What are the main problems you have in convincing owners to conserve their windows?

    _____
    _____
    _____

13. How do you address an owner's concern that annual removal of wood storm windows is difficult?
    _____

14. How do you address an owner's concern that old wood windows are harder to clean?
    _____

15. Are there many people/companies providing wood window conservation/repair work for the residential market?
    _____

16. Do you think there is potential market for more window conservation?
    _____

17. Do you think conservation of wood windows is important in older houses even if they are not designated as heritage buildings?
    _____

18. Do you think homeowners are knowledgeable about their windows?
    _____

19. Do most home owners regularly maintain their windows?
    _____

20. Do you think many homeowners are skilled enough to conserve their own windows (DIY)?
    _____

21. Do you think aluminum storm windows are a viable alternative to wood storm windows?
    _____

22. Energy: Do you know if a properly repaired wood window and wood storm will provide the same thermal performance as a new replacement window?
    _____

23. Maintenance: How often should wood windows be repainted?
    _____

24. What is the typical condition of wood windows that you are asked to investigate?
    _____

25. Costs: On a typical house, what is the typical of cost for conservation of a wood window? Example a 3 ft x 5 ft double hung windows with a wood storm

    Wood Repair: _____
    Reglazing: _____
    Weather Stripping: _____
    Paint Removal: _____
    Lead Removal: _____
    Painting: _____

26. How can a house owner find your contact information?
    _____

27. How do you market your business?
    _____

28. Do you need better marketing?
    _____

29. How do you compete against the window replacement industry?
    _____

30. What needs to be done to encourage more conservation of wood Windows

    _____
    _____
    _____
    _____

Other Items discussed:

_____

_____

_____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi-Structured Interview Questions

Window Replacement Contractors Questionnaire

Part A: General Information about Interviewee and Their Work

1. Position: _____
2. How long have you been involved with Replacement Windows?
   _____
3. What is your background in Replacement Windows?
   _____
4. What portion/percentage of your work is with older residential houses that still have original wood windows?
   _____

Part B: Opinions on Replacement Windows and Conservation of Wood Windows

5. What are the main reasons home owners replace their original wood windows as opposed to conservation/repair of their wood windows?

   Main Reasons:
   _____
   _____
   _____

6. What is/are the main reason(s) you recommend replacement?

   _____
   _____

7. What is the most common type of replacement windows you propose?
   Frame/Sash type: _____
   Operational type: _____
   Glazing type: _____
   Colour: _____
   Other features: _____

8. What is the most common type of replacement windows system?

   Full window replacement c/w removal of old frames: _____
   Replacement maintaining old frames: _____

9. What do you advise homeowners if they have concerns about heritage value of their old windows?

   _____

10. Would you, or when would you advise a homeowner to keep/maintain their existing windows?

    _____

11. How competitive is your window replacement market?

    _____

12. Do you have any concerns about heritage advocates?

    _____

13. Do you think homeowners are knowledgeable about their windows?

    _____

14. Do you think many homeowners are skilled enough to replace their own windows (DIY)?

    _____

15. Do new replacement windows provide enough improved energy savings to make replacement for energy reasons a good reason to replace windows?

    _____

16. Do you recycle the old wood windows or dispose?

    _____

17. Do you have to take precautions against old Lead Paint when removing windows?

    _____

18. What is the typical condition of most wood windows when asked to propose replacement windows?

    _____

19. Costs: On a typical house, what is the typical of cost of a window replacement Example a 3 ft x 5 ft double hung windows with a wood storm

    Full replacement _____
    Replacement using existing frame _____

20. Costs: Do homeowners usually buy low end, middle or high end replacement windows?

    _____

21. Costs: Is the cost to replace windows typically less than maintain/repair of existing wood windows?

    _____

22. What is the typical life span of new replacement window?
    _____

23. Are there items that need maintenance on a replacement window?
    _____

24. Do homeowners paint vinyl replacement widows?
    _____

25. How do you market your business?
    _____

26. Do you think the window replacement industry gets unfairly criticized by those who advocate heritage conservation?
    _____

Other Items discussed:

_____

_____

_____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi-Structured Interview Questions

Home Inspectors Questionnaire

Part A: General Information about Interviewee and Their Work

1. How long have you been involved with home inspections?
   _____

2. What portion/percentage of your home inspection work is with older residential houses?
   _____

Part B: Opinions on Conservation of Wood Windows

3. Does your training in home inspections include information on older homes and heritage issues?
   _____

4. Does your training in home inspections include information on windows?
   _____

5. Does your training in home inspections include information on old wood windows?
   _____

6. Do you consider existing older windows or replacement windows to be better?
   _____

7. If an older house has original wood windows what are some of the typical repairs/upgrades you have advised?
   _____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi-Structured Interview Questions

Realtors Questionnaire

Part A: General Information about Interviewee and Their Work

1. Position: _____
2. How long have you been a Realtor?
   _____
3. What portion/percentage of your real estate work is with older residential houses?
   _____

Part B: Opinions on Conservation of Wood Windows

4. Does your training in real estate include information on older homes and heritage issues?
   _____
5. Does your training in real estate include information on windows?
   _____
6. Does your training in real estate include information on old wood windows?
   _____
7. Do you consider existing older windows or replacement windows to be more valuable to the market value of an older house?
   _____
8. If an older house has new replacement windows do you promote this as a selling feature?
   _____

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BARRIERS TO THE CONSERVATION OF OLDER RESIDENTIAL WOOD WINDOWS

Master's Thesis – Semi-Structured Interview Questions

Heritage Stratford Members Questionnaire

Opinions on Conservation of Wood Windows

1. If an owner of a designated heritage property wants to replace their windows do they have to get approval?
   _____

2. Has the Heritage Advisory Committee had to deal with the issue of wood window conservation versus window replacement?
   _____

3. Does the Heritage Advisory Committee think that conservation of original wood windows is important in a designated house? If so, for what reasons.
   _____

4. Does the Heritage Advisory Committee think that conservation of original wood windows is important in an older house that is not a designated property? If so, for what reasons.
   _____

5. What are the Heritage Advisory Committee's typical recommendations for dealing with original wood windows?
   _____

6. Does the Heritage Advisory Committee use standards and guidelines for property owners to follow for dealing with windows? (example – Parks Canada's "Standards and Guidelines for the Conservation of Historic Places in Canada")
   _____

7. Do you find owners knowledgeable when discussing issues relating to their windows?
   _____

8. If a property owner proposes replacement, what are the main reasons given for this? (example - have any home owners wanted to replace their windows with vinyl windows for energy savings)
   _____

9. Stratford's Official Plan identifies all of the older residential neighbourhoods are part of Stratford's "Heritage Area". Do you consider these older residential neighbourhoods as having heritage value? _____

10. Stratford's Official Plan identifies all of the older residential neighbourhoods are part of Stratford's "Heritage Area". Do you consider all older houses having heritage value and not just designated properties?

    _____

11. If you consider older residential neighbourhoods and their houses having heritage value, would you consider that conservation of original wood windows important to a neighbourhood?

    _____

12. What would you consider is the main reason(s) homeowners may not want to conserve their original wood windows? (examples – cost, lack of knowledge, lack of tradespeople, new windows require less maintenance, lack of appreciation of original)

    _____

    _____

    _____

Appendix B – Survey and Interview Responses

The following are:

- B1: Tabulated responses from the 166 homeowner window mail surveys.
- B2: Summary of responses from the 11 homeowner interviews.
- B3: Summary of responses from the three window conservator interviews.
- B4: Summary of responses from the three window replacement contractor interviews.
- B5: Summary of responses from the three home inspector interviews.
- B6: Summary of responses from the three realtor interviews.
- B7: Summary of responses from the three Heritage Stratford committee member interviews.

B1 Tabulated Responses from the 166 Homeowner Window Mail Surveys

PART A: GENERAL INFORMATION ABOUT YOUR HOUSE AND ITS WINDOWS

1. Are you the owner or tenant of this house?

	# of respondents	% of respondents
Owner	163	98.2
Tenant	3	1.8
Total # of respondents to question 1	166	100.0

2. How many years have you lived in this house?

	# of respondents	% of respondents
0 - 5	37	22.4
6 - 10	33	20.0
11 - 15	23	13.9
16 - 20	23	13.9
21 - 25	12	7.3
25 - 30	12	7.3
31 - 35	9	5.5
36 - 40	4	2.4
Over 40 years	12	7.3
Total # of respondents to question 2	165	100.0
Average number of years Least # of years Greatest # of years	16.9 7 under 1 year 89 years	

3. Does your house have? (windows type)

	# of respondents	% of respondents
All original wood windows and wood storms	17	10.3
All original windows and some wood storms	15	9.0
All original wood windows and alum storms	4	2.4
Mixture of wood windows, storms and replacements	98	59.4
All replacement windows	31	18.8
Other	0	0.0
Total # of respondents to question 3	165	100.0

4. If all or some the original windows in your house have been replaced, what type are they?

	# of respondents	% of Respondents*
Wood windows (or wood with cladding)	15	10.5
Vinyl windows	102	70.3
Aluminum Windows	24	14.4
Fiberglass windows	2	1.8
Sub-total	143	100.0
Other	4**	
Not Applicable	24	
Total # of responses to question 4	171***	
*Note: % based on sub-total - comparison of wood, vinyl, aluminum, fiberglass window replacement types. **Note: Other types identified were not actual window types. ***Note: total # of responses exceeds 166 surveys due to several respondents included more than one type of replacement window.		

Part B: YOUR OPINIONS ABOUT YOUR HOUSE AND YOUR WINDOWS

5. Your house has heritage value.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	4	4.1	2	5.5	6	3.7
Disagree	8	25.7	13	13.4	0	0.0	21	12.8
Neither Agree or Disagree	6	19.4	19	19.6	2	5.5	27	16.5
Agree	9	29.0	38	39.2	7	19.4	54	32.9
Strongly Agree	5	16.2	20	20.6	22	61.3	47	28.7
Don't Know	3	9.7	3	3.1	3	8.3	9	5.4
Totals question 5	31	100.0	97	100.0	36	100.0	164	100.0

6. The residential neighbourhood, in which your house is located, has heritage value.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	1	3.2	2	2.1	1	2.9	4	2.4
Disagree	4	12.9	8	8.2	2	5.5	14	8.5
Neither Agree or Disagree	7	22.6	8	8.2	2	5.5	17	10.4
Agree	13	41.9	56	57.8	15	41.6	84	51.2
Strongly Agree	3	9.7	20	20.6	14	39.0	37	22.6
Don't Know	3	9.7	3	3.1	2	5.5	8	4.9
Totals question 6	31	100.0	97	100.0	36	100.0	164	100.0

7. Keeping and maintaining original wood windows is important to the appearance of an older house.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	# of respondents
Strongly Disagree	0	0.0	5	5.1	1	2.9	6	3.7
Disagree	8	26.7	19	19.7	0	0.0	27	16.6
Neither Agree or Disagree	12	40.0	20	20.6	4	11.0	36	22.1
Agree	8	26.7	39	40.1	8	19.4	55	33.7
Strongly Agree	2	6.6	14	14.5	23	66.7	39	23.9
Don't Know	0	0.0	0	0.0	0	0.0	0	0.0
Totals question 7	30	100.0	97	100.0	36	100.0	163	100.0

8. Replacing original wood windows will improve, (or has improved), the appearance of your house.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	4	4.3	11	30.6	15	9.3
Disagree	1	3.2	25	26.5	10	27.7	36	22.4
Neither Agree or Disagree	9	29.1	18	19.1	5	13.9	32	19.9
Agree	14	45.2	32	34.0	6	16.1	52	32.3
Strongly Agree	7	22.5	11	11.8	3	8.3	21	13.0
Don't Know	0	0.0	4.3	4	1	2.9	5	3.1
Totals question 8	31	100.0	94	100.0	36	100.0	161	100.0

9. If original wood windows provided energy savings similar to new replacement windows; you would prefer to keep your original wood windows instead of replacing them.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	2	2.1	1	2.7	3	1.8
Disagree	6	19.4	14	14.6	1	2.7	21	12.9
Neither Agree or Disagree	7	22.6	8	8.3	5	13.9	20	12.4
Agree	15	48.3	41	42.7	5	13.9	61	37.4
Strongly Agree	3	9.7	28	29.2	24	66.8	55	33.7
Don't Know	0	0.0	3	3.1	0	0.0	3	1.8
Totals question 9	31	100.0	96	100.0	36	100.0	163	100.0

10. Environmental issues would influence your decision to keep or replace your windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	# of respondents
Strongly Disagree	0	0.0	4	4.3	3	8.5	7	4.4
Disagree	1	3.2	6	6.5	2	5.4	9	5.6
Neither Agree or Disagree	4	13.0	16	17.2	9	24.9	29	18.1
Agree	17	54.8	42	45.2	14	38.9	73	45.7
Strongly Agree	8	25.8	22	23.6	7	19.4	37	23.1
Don't Know	1	3.2	3	3.2	1	2.9	5	3.1
Totals question 10	31	100.0	93	100.0	36	100.0	160	100.0

11. Original wood windows tend to be difficult to operate, such as opening and closing.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	0	0.0	2	5.4	2	1.2
Disagree	2	6.4	6	6.1	9	24.9	17	10.3
Neither Agree or Disagree	1	3.2	9	9.2	2	5.4	12	7.3
Agree	16	51.6	45	45.9	15	41.6	76	46.1
Strongly Agree	10	32.4	37	37.8	8	22.7	55	33.3
Don't Know	2	6.4	1	1.0	0	0.0	3	1.8
Totals question 11	31	100.0	98	100.0	36	100.0	165	100.0

12. If your original wood windows required repair, (such as repair of rotted wood or replace glazing) it would be easy to make the repairs yourself.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	13	41.9	19	20.2	8	22.7	40	24.8
Disagree	12	38.7	46	48.9	13	35.6	71	44.2
Neither Agree or Disagree	2	6.4	6	6.4	2	5.4	10	6.2
Agree	4	13.0	17	18.1	9	24.9	30	18.7
Strongly Agree	0	0.0	3	3.2	4	11.4	7	4.3
Don't Know	0	0.0	3	3.2	0	0.0	3	1.8
Totals question 12	31	100.0	94	100.0	36	100.0	161	100.0

13. Installing new windows that do not require painting is a good reason to replace original wood windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	4	4.1	9	24.9	13	7.9
Disagree	5	16.1	17	17.5	13	36.2	35	21.4
Neither Agree or Disagree	10	32.3	18	18.6	6	16.7	34	20.7
Agree	8	25.8	38	39.2	5	13.9	51	31.1
Strongly Agree	8	25.8	20	20.6	3	8.3	31	18.9
Don't Know	0	0.0	0	0.0	0	0.0	0	0.0
Totals question 13	31	100.0	97	100.0	36	100.0	164	100.0

14. Installing new windows that do not require the seasonal removal of wood storm windows is a good reason to replace original wood windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondent	% of respondents
Strongly Disagree	0	0.0	3	3.0	5	13.9	8	4.8
Disagree	3	9.7	11	11.3	15	41.6	29	17.6
Neither Agree or Disagree	3	9.7	17	17.3	5	13.9	25	15.2
Agree	17	54.8	46	47.0	8	22.3	71	43.0
Strongly Agree	8	25.8	21	21.4	3	8.3	32	19.4
Don't Know	0	0.0	0	0.0	0	0.0	0	0.0
Totals question 14	31	100.0	98	100.0	36	100.0	165	100.0

15. Installing new windows that are easier to clean is a good reason to replace original wood windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	1	3.2	6	6.3	4	11.4	11	6.8
Disagree	4	12.9	13	13.5	16	45.7	33	20.4
Neither Agree or Disagree	4	12.0	14	14.6	3	8.6	21	13.0
Agree	15	48.4	43	44.8	11	31.4	69	42.6
Strongly Agree	7	22.6	20	20.8	1	2.9	28	17.2
Don't Know	0	0.0	0	0.0	0	0.0	0	0.0
Totals question 15	31	100.0	96	100.0	35	100.0	162	100.0

16. Finding a local contractor who can repair your original wood windows is easy.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	2	6.5	11	11.8	4	11.5	17	10.7
Disagree	15	48.3	29	31.2	4	11.5	48	30.2
Neither Agree or Disagree	6	19.4	18	19.4	8	23.0	32	20.1
Agree	3	9.7	16	17.2	12	34.1	31	19.5
Strongly Agree	0	0.0	3	3.2	1	2.9	4	2.5
Don't Know	5	16.1	16	17.2	6	17.0	27	17.0
Totals question 16	31	100.0	93	100.0	35	100.0	159	100.0

17. New windows will increase the market value of your house more than keeping and maintaining your original wood windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	3	3.1	4	11.1	7	4.3
Disagree	2	6.5	8	8.2	10	27.8	20	12.2
Neither Agree or Disagree	5	16.1	19	19.6	9	25.0	33	20.1
Agree	16	51.6	41	42.3	6	16.7	63	38.4
Strongly Agree	7	22.6	17	17.5	3	8.3	27	16.5
Don't Know	1	3.2	9	9.3	4	11.1	14	8.5
Totals question 17	31	100.0	97	100.0	36	100.0	164	100.0

18. The future costs of maintaining (repairs and repainting) original wood windows would influence, or has influenced, your decision to keep or replace your original wood windows.

	All Replaced		Mixture		All original		Total	
	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents	# of respondents	% of respondents
Strongly Disagree	0	0.0	1	1.1	3	8.6	4	2.5
Disagree	2	6.7	27	28.7	14	39.8	43	27.1
Neither Agree or Disagree	5	16.6	14	14.8	8	23.0	27	17.0
Agree	17	56.7	33	35.1	8	22.8	58	36.5
Strongly Agree	6	20.0	18	19.2	1	2.9	25	15.7
Don't Know	0	0.0	1	1.1	1	2.9	2	1.2
Totals question 18	30	100.0	94	100.0	35	100.0	159	100.0

19. In your opinion, what is the main reason for replacing original wood windows with new windows? You may check more than one reason, and, you may rank in order from 1 (main reason), 2 (2nd main reason), etc.

Note: The following summary of question 19 is broken into 2 tables: # of responses ranked as 1st main reason and # of responses identified as one of the main reason.

Question 19 - # of responses ranked as 1st main reason

Reason	# of responses	% of Respondents**
To make your house look better	5	3.0
To save on heating costs	57	34.8
To make a house more comfortable	16	9.8
To replace windows that are in poor physical condition	36	22.0
To have easier operating windows	15	9.1
To eliminate repainting	6	3.7
To eliminate seasonal removal of storm windows	8	4.9
For easier cleaning	3	1.8
To provide better UV (Ultra Violet Light) protection	1	0.6
To reduce outside noise	1	0.6
To improve home security	1	0.6
To increase the value of your house	2	1.2
Lack of skill to repair old windows by yourself	2	1.2
Lack of window contractors who can repair old windows	0	0.0
Other	0	0.0
No, there is no reason I would replace my original wood windows	21	12.8
Total # of responses*	174	
Total # of respondents to question 19	164	
*# of responses exceed # of respondents due to several multiple 1st main reason rankings **% based on 164 respondents Note: Total % exceeds 100% to some respondents include multiple responses		

Question 19 - # of responses identified as one of the main reason

Reason	# of responses	% of Respondents**
To make your house look better	43	26.2
To save on heating costs	121	73.8
To make a house more comfortable	88	54.0
To replace windows that are in poor physical condition	90	54.9
To have easier operating windows	90	54.9
To eliminate repainting	60	36.6
To eliminate seasonal removal of storm windows	81	49.4
For easier cleaning	27	16.5
To provide better UV (Ultra Violet Light) protection	34	20.1
To reduce outside noise	26	15.9
To improve home security	48	29.3
To increase the value of your house	50	30.5
Lack of skill to repair old windows by yourself	38	23.2
Lack of window contractors who can repair old windows	23	14.0
Other*	7*	4.3
No, there is no reason I would replace my original wood windows	21	12.8
Total # of responses	847	
Total # of respondents to question 19**	164	
*Other reasons identified: To obtain gov't incentive grants (1) To obtain better view of outside (1) Contractors too busy for small jobs (1) Cost of maintenance (1) Lead paint contamination (1) To replace previous poor replacements (1) To have window that has blinds (1) **% based on 164 respondents Note: Total % exceeds 100% due to multiple response from some respondents		

20. In your opinion what would be the main reason for keeping and maintaining original wood windows? You may list more than one reason.

    Note: Question 20 allows for open ended response. The following is a summary broken into categories.

Reason	# of responses	% of Respondents*
For Heritage and/or Aesthetics Reasons: including better appearance on older home, maintaining heritage and original appearance, maintaining character of the house, maintaining unique windows, heritage designated, preference for wood	119	77.3
Less costly to maintain, too costly for replacements	13	8.4
Existing windows function well, no need to replace	26	16.9
Wood windows are repairable, new will have to be replaced	1	0.6
Better resale market value	1	0.6
Environmentally less toxic than vinyl	1	0.6
No reason for keeping and maintaining	9	5.8
Total # of responses	170	
Total # of respondents to question 20	154	
*% based on 154 respondents Note: Total % exceeds 100% due to multiple response from some respondents		

Additional Comments:

Approximately 25 percent of respondents added additional comments to their survey responses. The following is a paraphrased list of homeowner comments. These comments have been summarised into categories of responses.

Response Category	Additional Comments - Response Categories: 1. Merit of thesis research 2. Comments on Maintenance and Operation 3. Government concerns 4. Investment value 5. Marketing 6. Cost 7. Difficulty in replication 8. Aesthetics 9. Energy
1	Can see value in thesis for info for homeowners who are sentimental/emotionally tied to keeping their houses in condition intended by the designer

Response Category	Additional Comments - Response Categories: 1. Merit of thesis research 2. Comments on Maintenance and Operation 3. Government concerns 4. Investment value 5. Marketing 6. Cost 7. Difficulty in replication 8. Aesthetics 9. Energy
2	Learned how to maintain windows from dad, passed onto kids, some storms are hinged, but don't need to be removed due to A/C, many replaced wood storms with aluminum when they came out due to weight and need of ladder to replace
2	Restored, new cords, minimal glass replacement, remedies for sticky windows
3	Concerned/fear of being bullied by heritage committee dictating what I do with my old house
2	Replaced some windows due to 2nd storey – storms being a big issue
2,9	New windows are more energy efficient, easy to change, easy to maintain, no painting and finding material to replace or repair old windows is hard to find
2,4	Older homeowners are concerned for ease of maintenance, younger homeowners are concerned with investment value
5	No one sells window replacements as aggressively as vinyl/aluminum replacements
6,9	Would like to replace with wood that replicates, more energy efficient – but expensive
7	Originals were long gone, replacing to match old difficult to find
6	Decisions need to be case by case, replacement cost in wood is expensive
6,8	If I could replace I would like windows that look like the original but without storms
6,8	Expensive but worth replacing with new wood windows to match appearance
2,6	Concerned over cost of maintaining windows
8	Replacement window that echoed original
8	Replaced with wood windows with authentically divided thermal panes – love them
8	Owner is a museum conservator – interested of cultural property
2,9	Difficulty in cleaning by train yard, wished original windows had been maintained – beautiful dental molding, had incentive for replacement – with energy audit
2	4 storey house (#1 reason was no more storm windows)
6,7,8	Difficulty in replacing arch windows and expensive
6	Concerned with expensive restoration
7	Replaced windows – couldn't find someone to mimic shape and style of original
6,8,9	Careful to find vinyl replacement windows that look like the originals – trade-off between heritage and efficiency
5,8	Influenced by edifice magazine – heritage marketing

Response Category	Additional Comments - Response Categories: 1. Merit of thesis research 2. Comments on Maintenance and Operation 3. Government concerns 4. Investment value 5. Marketing 6. Cost 7. Difficulty in replication 8. Aesthetics 9. Energy
2	Recently painted house, no intent to replace, have a couple of vinyl windows upstairs
2	Have restored a number of windows – age and health is most important consideration
8	Always been conservationists
2	Crucial decision is when windows in poor condition – long term value of vinyl is higher than wood
2	Time and physical energy to maintain windows is an issue – 2 days per window
1,8	Survey is timely, feel responsible to maintain a well know heritage home
6	Cost to replace windows far more expensive than adding alum storms
8	Windows were large part of reason I bought house, would like to replace alum storms with wood
2,9	Assume that prevailing opinion is new windows makes for less maintenance and more energy efficient
2,6	Will be less value to have wood if selling, hard to find people to fix windows
2,8	Want to maintain and work on windows soon
2	Lead issue, host black mould, dangerous – slam close
8	Sad that most curved top windows in neighbourhood get replaced with top flat windows, replaced some aluminum windows with vinyl that look more like originals
3	Restoring old windows creates a lot of unneeded hassles for business owners
2,7	Found a Mennonite window maker who made storms
6	Cost of replacement that mimic originals are astronomically expensive, just not practical for those on budget
2,7	In process of fixing windows – if you know anyone who can fix windows let me know
2,7,8	Like to replace aluminum storms with wood storms but don't know suppliers
2 8	Hard to remove upper level storms, operable windows are stiff, issue with screens, lots of painted shut windows, hard to clean – want to replace for less maintenance Replacement look better than peeling paint
4	Don't consider home as a heritage home (but noted heritage value), if home was more valuable would consider restoring

B2 Summary of Responses from the 11 Homeowner Interviews

PART A: GENERAL INFORMATION ABOUT YOUR HOUSE AND ITS WINDOWS

1. Are you the owner or tenant of this house?

	# of homeowners interviewed
Owner	11
Tenant	0

2. How many years have you lived in this house?

	Responses
Group A: houses with replacement windows	Group A average: 7.2 years
Interview 1	13
Interview 2	5
Interview 3	7
Interview 4	8
Interview 5	3
Group B: houses with original windows	Group B average: 32.6 years
Interview 6	27
Interview 7	17
Interview 8	23
Interview 9	83
Interview 10	13
Group C: houses with mixture of replacement and original windows	
Interview 11	3

3. Does your house have? (window type)

	Responses
Group A	Houses with replacement windows
Interview 1	All replacement windows
Interview 2	All replacement windows
Interview 3	All replacement windows
Interview 4	All replacement windows
Interview 5	All replacement windows
Group B	Houses with original windows
Interview 6	All original wood windows and wood storms What types of windows do you have? Describe: Typically single hung, 2/2
Interview 7	All original wood windows, some wood storms, some aluminum storms What types of windows do you have? Describe: Typically single hung (possibly double hung), windows have operable sash cords/weights. Wood storms typically on ground floor, aluminum storms on second floor. House has 20+ windows.

	Responses
Interview 8	All original wood windows and wood storms What types of windows do you have? Describe: Mixture of types but predominately single hung, evidence of sash pulleys – none are operational. Some special windows such as a "piano window", some windows have leaded panes. Of note are approximately a dozen windows surrounding a 2nd floor sun room. House has 30 + windows. Residence is also a Bed and Breakfast.
Interview 9	All original wood windows and wood storms What types of windows do you have? Describe: Typically, single hung (may have been double hung) c/w wood storms. Note: some newer wood casement windows on later rear addition.
Interview 10	All original wood windows and wood storms What types of windows do you have? Describe: Typically, single hung (may have been double hung) c/w wood storms. Note: Original part of house has all original wood windows. Later rear addition has newer windows. Majority of windows are original wood windows/wood storms. Note: house has some newer reused wood windows on rear house addition.
Group C	Houses with mixture of replacement and original windows
Interview 11	Mixture of original wood windows and replacements What types of windows do you have? Describe: Original on ground floor - typically single hung (possibly double hung) – most are painted shut and not operable. Existing ground floor windows have wood storms; some wood storms have been replaced to match original storms at approximately $1000 each, by local contractor. Note: early photo shows original house without storm windows, storms may have been a later installation.

4. If all or some the original windows in your house have been replaced, what type are they?

	Responses
Group A	Houses with replacement windows
Interview 1	Vinyl: Describe: Typically double hung, double glazed, possibly tilt in (not sure). Muntins mounted on inside of sealed glazing units, vinyl, and white in colour. Note: windows were replaced by previous owner. One original window remains – trefoil window at front house gable.
Interview 2	Vinyl: Describe: Typically double-hung, tilt sash windows, 1/1, white
Interview 3	Vinyl: Note: House still retains original wood windows at front sun porch and front ground floor window. What types of windows do you have? Describe: Typically Double Hung, tilt sash, white, 1/1
Interview 4	Vinyl: Describe: Typically double-hung, double-glazed, tilt- in, 2/2, coloured finish. Muntins mounted on outside – pattern to reflect original windows. Owner refers to muntins as caning.
Interview 5	Vinyl: Describe: Typically, double-hung, tilt sash windows, 1/1, white
Group B	Houses with original windows
Interview 6	N/A

	Responses
Interview 7	N/A
Interview 8	N/A
Interview 9	N/A
Interview 10	N/A, Note: house has some newer reused wood windows on rear house addition. Windows appear to be clad wood windows/single hung. Reused windows from Restore.
Group C	Houses with mixture of replacement and original windows
Interview 11	Wood: Replacements are custom made wood windows, single hung, tilt in, double glazed with interior/exterior muntins and screen on bottom sash. Replacements are located on second floor - were replaced by previous owner at a cost of approximately $25,000 for approximately 12 windows. Intent was to replace 2nd floor original windows with operable window with same appearance as original windows due to heritage of the house.

Part B: YOUR OPINIONS ABOUT YOUR HOUSE AND YOUR WINDOWS

5. Your house has heritage value.

	Responses
Group A	Houses with replacement windows
Interview 1	Strongly Agree: Reason: Designated, constructed 1870s, good example of Ontario Brick Ontario Cottage. Is heritage value important? Yes, designated. Interested in hearing about previous owners, one story is pertaining to person who was born in the house.
Interview 2	Disagree: Reason: Too much of the heritage details are missing. Is heritage value important? Yes, would have liked if more original details where remaining. Note: homeowner has investigated the history of the house: year of construction (1912), had record of past ownership, knew who was first owner and their occupation (train conductor).
Interview 3	Agree: Reason: Built 1903 and was one of City's "kit" houses. Is heritage value important? Yes
Interview 4	Agree: Reason: Constructed 1870s, early Stratford brick house, good example of Ontario Gothic Farmhouse style. Original owner was a surgeon – has ACO plaque on house (Architectural Conservancy of Ontario). Is heritage value important? Yes, very interested in the heritage of the house. Interest in heritage developed during childhood.
Interview 5	Strongly Agree: Reason: Yes, 1899, Victorian Era, wood framed carpenter's Ontario Cottage, blue collar worker's house. House has many of its original materials/finishes. Is heritage value important? Yes, the character of the old building is important, exterior and interior. Note: homeowner is very knowledgeable about the style and materials of the house. Example: homeowner advised on differences in types of Ontario Cottages.
Group B	Houses with original windows

	Responses
Interview 6	Strongly Agree: Reason: Designated, constructed 1867, early workers framed house. Designation includes windows identified as early example of 2/2 windows. Is heritage value important? Yes, very interested in the heritage of the house and includes both interior and exterior.
Interview 7	Strongly Agree: Reason: Designated Heritage Property, 1870, Victorian Gothic Revival Is heritage value important? Yes, maintaining its character is important to the homeowners.
Interview 8	Agree: Reason: House is an Edwardian Classical 4 square style, built in 1911. Once used as a church manse. Is heritage value important? Not particularly important to current homeowner, but has investigated its history at local archive, and have tried to maintain original appearance of the house.
Interview 9	Strongly Agree: Reason: Constructed 1890s. House is well built brick house, has many of its original old features – including interiors. House was built by grand-father and has been owned by same family since being built.
Interview 10	Strongly Agree: Reason: Constructed 1860s, early Stratford brick house – originally a farmhouse. Has had well known people living in house - e.g.: Duke Ellington lived in house while working for the Theatre. Is heritage value important? Yes, very interested in the heritage of the house. Employed as a museum conservator.
Group C	Houses with mixture of replacement and original windows
Interview 11	Strongly Agree: Reason: Designated Heritage Property, 1873, Victorian era, Italianate style. History includes prominent owners, example former mayor. Is heritage value important? Yes, important to keep and maintain beautiful craftsmanship in this house that no longer exists in newer houses, examples: wood trim work and plaster work. Besides being a private residence it is also a Bed and Breakfast and the heritage aspects of the house are part of the appeal.

6. The residential neighbourhood, in which your house is located, has heritage value.

	Responses
Group A	Houses with replacement windows
Interview 1	Disagree: Reason: Neighbourhood has a mix of houses with many newer houses. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 2	Strongly Disagree: Reason: Neighbourhood has lost too much of its visual heritage appearance. Example - many of the houses have lost their original architectural details, example – many brick houses have had siding installed. Also newer houses have been built in the neighbourhood. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 3	Agree: Reason: One of many houses in a row that where built from "catalogue house kits" for employees of the train industry. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.

	Responses
Interview 4	Don't Know: Reason: There is a mix of house ages the neighbourhood, don't know if this would be considered as heritage area. Not aware that house is within the area that the City's official plan identifies as a Heritage Area.
Interview 5	Agree: Reason: Yes, neighbourhood has many houses of unique character and is a good example of a blue collar railway worker's neighbourhood. This neighbourhood fondly reminded owner of the blue collar neighbourhood that they grew up in Toronto. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Group B	Houses with original windows
Interview 6	Strongly Agree: Reason: Neighbourhood has many older houses. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 7	Strongly Agree: Reason: There are many older houses with diversity of styles. Also the neighbourhood is a good example of older neighbourhood property development – development over time with older houses on large lots, with later infill houses as opposed to a suburb development. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 8	Agree: Reason: Yes, there are other houses in neighbourhood that have heritage designation and the neighbourhood has many interesting older houses. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 9	Strongly Agree: Reason: Yes, it is one of the oldest neighbourhoods in City. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Interview 10	Strongly Agree: Reason: Majority of the neighbourhood houses of some of City's oldest houses. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.
Group C	Houses with mixture of replacement and original windows
Interview 11	Strongly Agree: Reason: There are many beautiful older homes in neighbourhood. Note: homeowner not aware that property is located in an area that City's official plan identifies as a heritage area.

7. Keeping and maintaining original wood windows is important to the appearance of an older house.

	Responses
Group A	Houses with replacement windows
Interview 1	Agree: Reason: Older looking windows are important, but replications are acceptable. Replacements on this house were installed by previous owner. Homeowner doesn't like the appearance of the narrow square muntin bars that are installed inside of double glazing of their vinyl replacement windows.
Interview 2	Agree: Reason: Yes, if the windows are maintained they will be valued for the appearance.
Interview 3	Neither Agree or Disagree: Reason: Yes, kept original windows at front of house for curb appeal, but replace others for practical reasons of less maintenance and easier operation of replacement windows.
Interview 4	Agree: Reason: Yes, to keep the character of the house, however, replaced windows for compromise reasons – maintenance and operation reasons (easier to clean, operate). Design of replacement windows sympathetic with style of original windows – such as muntin locations – typically for 2 over 2 pane pattern.
Interview 5	Agree: Reason: Yes, although it was decided to replace the original windows with new vinyl windows, it was found that many window replacement companies don't replicate the original appearance – in which the homeowner considered important. If the original windows had been in good condition it would have been preferable to keep the originals - ensuring maintaining the original appearance. Example: the original windows had arched top windows; which unfortunately weren't included in the replacements.
Group B	Houses with original windows
Interview 6	Strongly Agree: Reason: Yes, aesthetically important in general. For this house it is part of reason for heritage designation.
Interview 7	Agree: Reason: Yes, wood windows just "fit" the older house – both interior and exterior. Example: appropriate with older wood trim, wood floors. "Fits" the style and era of the house with high windows that fill interior with light.
Interview 8	Strongly Agree: Reason: To maintain the original appearance. The original windows blend in well and suit the look of the house.
Interview 9	Strongly Agree: Reason: Yes, important part of the appearance.
Interview 10	Strongly Agree: Reason: Yes, helps in keeping the original look of the house. Original windows "fit" the house. Difficult to specifically identify what "fit" means.
Group C	Houses with mixture of replacement and original windows
Interview 11	Agree: Reason: Keeping the original is important, especially the shape and form. Not as concerned if it is the actually original wood – new wood windows that are close replications that are similar in appearance are suitable. Other materials such as aluminum or vinyl wouldn't be suitable for a heritage house.

8. Replacing original wood windows will improve, (or has improved), the appearance of your house.

	Responses
Group A	Houses with replacement windows
Interview 1	Neither Agree or Disagree: Reason: Never saw the original window. Opinion is based that replacement windows may improve appearance depending on the condition of the original windows.
Interview 2	Strongly Agree: Reason: Replacement windows did improve the appearance. Provided a uniform appearance. The existing windows were a mixture of windows, generally in poor condition – some were clad in aluminum, some rotted, some were older vinyl windows, and some glass panes were painted black. Homeowner would have preferred to have kept the original windows if they had all existed and been in good condition, but they were not. Some windows still had decorative window moldings which they liked. Complete replacing of this mixture of existing windows provided a more uniform/better looking appearance.
Interview 3	Agree: Reason: Replacements improved the appearance due to the poor condition of most of the existing windows. Kept the original style of 1 over 1 vertical slider windows.
Interview 4	Neither Agree or Disagree: Reason: Original windows where in poor condition. Many of the existing wood windows also had older aluminum storm windows that were also in poor condition. Overall, the new replacement windows provides a better uniform appearance than the previous windows.
Interview 5	Disagree: Reason: Replacements don't necessarily improve the appearance. Replacement windows in this house were not able to replicate the original arched tops of the original windows – would have liked to have matched original appearance, but original windows where in poor condition and cost to repair would not have been affordable.
Group B	Houses with original windows
Interview 6	Strongly Disagree: Reason: Prefer the appearance of the original wood windows; don't think vinyl would look right, example: vinyl windows would have different size of profiles.
Interview 7	Agree: Reason: Replacing the second floor aluminum storms with wood storms will improve the appearance.
Interview 8	Strongly Disagree: Reason: New windows will stand out too much – most are too white in colour.
Interview 9	Disagree: Reason: No, do not want to replace, original wood windows are better for appearance.
Interview 10	Disagree: Reason: No, replacements, unless replicated, would not improve the appearance – would not "fit" in with the house's heritage appearance. The existing windows are in good condition.
Group C	Houses with mixture of replacement and original windows
Interview 11	Neither Agree or Disagree: Reason: Would improve if the existing windows were in poor condition and if closely replicated, example; have replaced rotted wood storms.

9. If original wood windows provided energy savings similar to new replacement windows; you would prefer to keep your original wood windows instead of replacing them.

	Responses
Group A	Houses with replacement windows
Interview 1	Agree: Reason: Yes, provided windows are in good condition. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Interview 2	Strongly Agree: Reason: Yes, there would be no reason to replace for energy savings as there would be little savings. Discuss performance of existing windows and replacements: There were no existing wood storms, only had some aluminum storms. Had an energy audit and had incentives to replace which was a major influence for complete replacement. Homeowner wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Interview 3	Agree: Reason: Yes, provided they were in good condition. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Interview 4	Disagree: Reason: No, replacement windows provided other benefits – example easier to clean. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Interview 5	Strongly Agree: Reason: Yes, there would be no reason to replace them provided that they were in good condition. Discuss performance of existing windows and replacements: Homeowner noted that the replacement windows had fully insulated frames and considered their windows energy efficient. Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Group B	Houses with original windows
Interview 6	Strongly Agree: Reason: Yes, there would be no reason to replace. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.
Interview 7	Strongly Agree: Reason: Absolutely Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.

	Responses
Interview 8	Agree: Reason: Yes, but replacement is not a consideration – homeowner wants to maintain the original windows for appearance. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window. Note: homeowner relocated from a colder winter climate and think their windows provide a comfortable interior.
Interview 9	Strongly Agree: Reason: Wood windows are better for energy than replacements. No need to replace. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window. Owner believed wood windows are better than replacements prior to discussing.
Interview 10	Strongly Agree: Reason: No reason to replace. Discuss performance of existing windows and replacements: Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window. However, owner advised awareness of energy performance and that there were other ways of saving energy – owner advised that adding more attic insulation would be more effective for better energy performance than replacing windows.
Group C	Houses with mixture of replacement and original windows
Interview 11	Strongly Agree: Reason: There would be no reason to replace. Discuss performance of existing windows and replacements: Existing ground floor windows are draughty, have installed sealant. New second floor replacement windows perform better and have screens for cooling. Wasn't aware of studies that indicated that well maintained original wood window c/w storm maybe similar to the energy performance of a replacement window.

10. Environmental issues would influence your decision to keep or replace your windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Agree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows. Not aware of the term embodied energy.
Interview 2	Neither Agree or Disagree Discuss environmental issues (e.g. landfill, toxic materials): Not aware of concerns pertaining to windows, however, if windows were put in landfill, wood windows would be better for landfill. Not aware of the term embodied energy.
Interview 3	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Aware of issues of landfill concerns. Not aware of term embodied energy.
Interview 4	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows. Not aware of the term embodied energy.

	Responses
Interview 5	Strongly Agree: Discuss environmental issues (e.g. landfill, toxic materials): Owner was aware of environmental issues, and of opinion that there is no reason for either original windows or vinyl windows to go into landfill, for example: PVC is recyclable. Not aware of the term embodied energy.
Group B	Houses with original windows
Interview 6	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows. Not aware of the term embodied energy.
Interview 7	Neither Agree or Disagree:: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows. Not aware of the term embodied energy.
Interview 8	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of concerns pertaining to windows. Not aware of the term embodied energy.
Interview 9	Agree: Discuss environmental issues (e.g. landfill, toxic materials): Original wood windows are better. Not aware of the term embodied energy.
Interview 10	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows, but appreciate environmental issues – example: windows installed on rear addition where recycled windows. Not aware of the term embodied energy.
Group C	Houses with mixture of replacement and original windows
Interview 11	Neither Agree or Disagree: Discuss environmental issues (e.g. landfill, toxic materials): Not aware of any specific environmental concerns pertaining to windows. However, have kept/stored the original 2nd floor widows, with intent that they can be salvaged for reuse. Not aware of the term embodied energy.

11. Original wood windows tend to be difficult to operate, such as opening and closing.

	Responses
Group A	Houses with replacement windows
Interview 1	Disagree: Discuss why? Opinion based on past experience in which homeowner had maintained their wood windows such that they were not difficult to operate.
Interview 2	Agree: Discuss why? Some are usually tight/hard to open, some are usually painted shut.
Interview 3	Neither Agree or Disagree: Discuss why? Some worked, some didn't.
Interview 4	Strongly Agree: Discuss why? Sashes often drop which is a safety concern. Aluminum storms were not operating properly – a lot of aluminum storms where from the 1960s and needed replacing. Some wood windows not opening due to past house settlement – window openings where out of square.
Interview 5	Strongly Agree: Discuss why? Examples: too many layers of paint, some painted shut. Some caused by structural movement causing openings and windows to become out of square.
Group B	Houses with original windows
Interview 6	Strongly Agree: Discuss why? Downstairs windows are painted shut. Some of the upper windows sticking and hard to open.
Interview 7	Disagree: Discuss why? Homeowner has maintained their windows, sash/balances are operational. With air conditioning a lot of the windows are not opened – less of an issue.
Interview 8	Agree: Discuss why? Some of the larger single hung windows are heavy to lift. Note: Original sash cords/weights are not operational.
Interview 9	Disagree: Discuss why? Not an issue, rarely open windows.
Interview 10	Strongly Agree: Discuss why? Some of house's windows are difficult to open, some painted shut, some don't stay open, some sticking. Note: Original sash cords/counter balances not operational.
Group C	Houses with mixture of replacement and original windows
Interview 11	Strongly Agree: Discuss why? Ground floor windows have all been painted shut, would prefer if they were operational.

12. If your original wood windows required repair, (such as repair of rotted wood or replace glazing) it would be easy to make the repairs yourself.

	Responses
Group A	Houses with replacement windows
Interview 1	Disagree: Discuss why? No, don't have the skills.
Interview 2	Strongly Disagree: Discuss why? Don't have the skills and physical strength for this work.
Interview 3	Neither Agree or Disagree: Discuss why? Have skills to do some window repairs (such as reglazing) and repainting.
Interview 4	Strongly Disagree: Discuss why? No, don't have the skills. Repair work, such as paint removal, is very time consuming.
Interview 5	Disagree: Discuss why? Don't have the skills. Also, repair products such as oil based glazing putty are not available.
Group B	Houses with original windows
Interview 6	Agree: Discuss why? Yes, homeowners have "handyperson" skills and think repairs could be done.
Interview 7	Disagree: Discuss why? No, don't have the skills.
Interview 8	Disagree: Discuss why? Don't have the skills to make repairs.
Interview 9	Disagree: Discuss why? Never have had to repair, but would hire someone as not able to do this work.
Interview 10	Disagree: Discuss why? No, don't have the skills.
Group C	Houses with mixture of replacement and original windows
Interview 11	Strongly Disagree: Discuss why? No, don't have the skills.

13. Installing new windows that do not require painting is a good reason to replace original wood windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Disagree: Discuss why? Not a good reason, in previous home, homeowner had replaced original windows with matching wood windows, and didn't have a concern about painting. However, due to getting older, can appreciate not having to paint windows in future on this house. Discuss potential for changing colours: not discussed.
Interview 2	Disagree: Discuss why? Not a good reason, if you had good wood windows it would be a worthwhile to paint/maintain. Discuss potential for changing colours: yes, better option for choosing a colour.

	Responses
Interview 3	Neither Agree or Disagree: Discuss why? Not an issue for homeowner has experience and ability to repaint. Experience in past as painter – houses typically need painting approximate every 10 years, but varies. Discuss potential for changing colours: not discussed.
Interview 4	Strongly Agree: Discuss why? Ongoing painting is costly and time consuming. Discuss potential for changing colours: not discussed.
Interview 5	Neither Agree or Disagree: Discuss why? Not a good reason, if original windows were in good condition it would be a worthwhile to paint/maintain. Although homeowner doesn't like house painting, homeowner knows others that would paint them. Discuss potential for changing colours: not discussed
Group B	Houses with original windows
Interview 6	Strongly Disagree: Discuss why? No, money saved by not replacing will offset cost of painting. Coloured vinyl windows will fade. Discuss potential for changing colours: Like the option to change colour if repainted.
Interview 7	Disagree: Discuss why? Less cost to repaint than replace windows. Discuss potential for changing colours: yes, very appropriate for some house styles.
Interview 8	Disagree: Discuss why? No, want to maintain appearance of the original windows. Discuss potential for changing colours: Not discussed.
Interview 9	Disagree: Discuss why? Not an issue of concern - would hire a painter. Discuss potential for changing colours: Not discussed.
Interview 10	Disagree: Discuss why? Don't think having to repaint wood windows is good enough reason to replace them. Discuss potential for changing colours: Yes, wood windows permit changes in colour and this is important for some house styles.
Group C	Houses with mixture of replacement and original windows
Interview 11	Disagree: Discuss why? Replacements that don't have to be painted, such as vinyl, just wouldn't look right. Discuss potential for changing colours: Important, this house has frames and sash with different colours.

14. Installing new windows that do not require the seasonal removal of wood storm windows is a good reason to replace original wood windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Agree: Discuss why? Yes, for less yearly maintenance. Note: in previous house, replaced with double glazed wood windows, without storms.
Interview 2	Agree: Discuss why? Yes, don't have available time to remove storm windows, would have to hire a handyperson to do this work.
Interview 3	Agree: Discuss why? No storage space for storing storm windows.
Interview 4	Strongly Agree: Discuss why? This house has a lack of suitable storage space. Would also have to hire someone for seasonal removal.
Interview 5	Neither Agree or Disagree: Discuss why? Not a good reason if original windows were in good condition. House had a mixture of aluminum storms and wood storms. Wood storms had no screens – new windows have screens which work well.
Group B	Houses with original windows
Interview 6	Strongly Disagree: Discuss why? Not an issue - have air conditioning and don't need to remove storms in summer.
Interview 7	Neither Agree or Disagree: Discuss why? Storms can be removed at same time as cleaning windows. Discussed that there is hardware to tilt storms outwards – concern about sufficient amount of ventilation.
Interview 8	Disagree: Discuss why? No, have air conditioning and do not need to remove. Also have modified a storm window in bedroom to incorporate a sliding glazed panel on one pane with a screen incorporated on outside.
Interview 9	Disagree: Discuss why? Not an issue of concern – leave storms on, could hire someone to remove if needed.
Interview 10	Disagree: Discuss why? Not an issue, house is air conditioned – leave storms on.
Group C	Houses with mixture of replacement and original windows
Interview 11	Disagree: Discuss why? Don't remove the storms on a seasonal basis. Mentioned that there are storms that can be made operational – tilt out. Homeowner concerned that these could be dangerous if there is a strong wind.

15. Installing new windows that are easier to clean is a good reason to replace original wood windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Neither Agree or Disagree: Discuss why? Not if existing windows are in good condition. Accept cost of hiring window cleaner.
Interview 2	Strongly Agree: Discuss why? Yes, really love the convenience of cleaning tilt in windows.
Interview 3	Agree: Discuss why? Tilt-in windows are much easier for cleaning.
Interview 4	Agree: Discuss why? Much easier to clean - replacement windows tilt in for cleaning.
Interview 5	Neither Agree or Disagree: Discuss why? Not a good reason to if original windows were in good condition, however, easier cleaning was an influence - new replacement window take about three minutes to clean. Note: original windows had a shorter top sash, meaning that the bottom sash couldn't be raised full height. New windows have equal top and bottom sashes that make cleaning very easy.
Group B	Houses with original windows
Interview 6	Strongly Disagree: Discuss why? No, can pay someone to clean windows.
Interview 7	Disagree: Discuss why? No, hiring a window cleaner is reasonable (reasonable cost).
Interview 8	Neither Agree or Disagree: Discuss why? Homeowner uses a cleaning service for windows and has no desire to replace windows.
Interview 9	Disagree: Discuss why? Not an issue of concern – can hire someone to clean when needed.
Interview 10	Neither Agree or Disagree: Discuss why? Still able to clean them, but realise older people have more difficulty in cleaning old windows.
Group C	Houses with mixture of replacement and original windows
Interview 11	Disagree: Discuss why? Importance of appearance of original windows are more important – wouldn't replace just for easier cleaning. Homeowner uses a window cleaning service twice a year in which storms come off and reinstalled after cleaning. Added expense but would not consider replacing windows even though 2nd floor replacements tilt in and are easier to clean.

16. Finding a local contractor who can repair your original wood windows is easy.

	Responses
Group A	Houses with replacement windows
Interview 1	Neither Agree or Disagree: Discuss why? In past, in Toronto, were able to find local contractor. In Stratford found contractor to repair wood door, not sure about windows. Discuss finding a replacement contractor: N/A, but assume easy as there are many advertised contractors. Discuss marketing influences: have receive lots of flyers for window replacement, but not an issue as windows have already been replaced.
Interview 2	Neither Agree or Disagree: Discuss why? N/A Discuss finding a replacement contractor: Not difficult to find. Discuss marketing influences: Not discussed.
Interview 3	Disagree: Discuss why? Don't know of contractors who repair. Discuss finding a replacement contractor: Not a problem. Discuss marketing influences: Lots of marketing for replacement, none for repair of originals.
Interview 4	Disagree: Discuss why? Have experience in house renovations – lots of time involved finding someone. Discuss finding a replacement contractor: contractor used for window replacement was also used for other house renovation work. Discuss marketing influences: decisions were made with involvement of our renovation contractor. There is a lot of marketing for replacement windows – flyers, sales reps, phone solicitation.
Interview 5	Strongly Disagree: Discuss why? Difficult to find from past experience. Found a glazing contractor to replace one broken pane at this house at a cost of $400. Homeowner determined it would be too expensive to consider repair/maintaining existing windows. Discuss finding a replacement contractor: Many replacement contractors available, however, not all have same abilities or provide same options. Decided on window replacement contractor who was both manufacturer and installer, and who provided a transferable lifetime warranty. Discuss marketing influences: Lots of replacement flyers for replacement, no marketing for maintaining windows.
Group B	Houses with original windows
Interview 6	Agree: Discuss why? Yes, if replacement in wood, but no if repairing windows. Discuss finding a replacement contractor: Wouldn't consider finding a replacement contractor. Discuss marketing influences: Lots of flyers, sales reps, phone solicitation for replacement. No marketing for repair.
Interview 7	Don't Know: Discuss why? Haven't tried to find a contractor to make repairs. Would like to have new wood storms – don't know where to find a supplier. Discuss finding a replacement contractor: N/A Discuss marketing influences: Not discussed.

	Responses
Interview 8	Neither Agree or Disagree: Discuss why? Haven't had to find a contractor to make major repairs, have used a local person to make minor repairs – e.g.: modified storm to include a screen. Discuss finding a replacement contractor: N/A Discuss marketing influences: Have had inquires about replacement windows – more in the past. Replacement advertisements are received regularly, but not interested in replacement.
Interview 9	Agree: Discuss why? Existing windows are in good condition, assume can find a contractor if needed for minor repairs if needed. Discuss finding a replacement contractor: N/A Discuss marketing influences: Lots of marketing (flyers) for replacement.
Interview 10	Disagree: Discuss why? Never had to repair, but think it would be difficult. Discuss finding a replacement contractor: N/A Discuss marketing influences: Not aware of marketing influences for replacement.
Group C	Houses with mixture of replacement and original windows
Interview 11	Agree: Discuss why? Have used a local contractor for other interior wood work and storm window replacement; assume they can do window repair work if needed. Discuss finding a replacement contractor: N/A – replaced windows done by previous owner. Discuss marketing influences: Have received marketing calls for replacement, none for repair.

17. New windows will increase the market value of your house more than keeping and maintaining your original wood windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Disagree: Discuss why? Windows were not an issue in buying this house, would have purchased with either original or replacements. Don't think type of windows has significant effect on market value as much as other house items
Interview 2	Strongly Agree: Discuss why? Yes, given experience in selling previous houses, potential buyers usually ask how old the windows are with the understanding that newer windows provide higher market value.
Interview 3	Agree: Discuss why? Yes, new windows, new roofing, new kitchens… sell houses. Relators help push this, public agrees – becomes a cycle of influence.
Interview 4	Agree: Discuss why? Think this is true.
Interview 5	Strongly Agree: Discuss why? Yes, certain house features, including newer windows increase market value. Even better value due to the transferable lifetime window warranty for these windows.
Group B	Houses with original windows
Interview 6	Disagree: Discuss why? Not for this heritage house – would only appeal to those who would want to keep the windows.

	Responses
Interview 7	Don't Know: Discuss why? Don't know, haven't considered this item.
Interview 8	Neither Agree or Disagree: Discuss why? Haven't considered, believe old windows are part of the house appearance/value.
Interview 9	Don't Know: Discuss why? Haven't dealt with this item.
Interview 10	Don't Know: Discuss why? Haven't dealt with this item.
Group C	Houses with mixture of replacement and original windows
Interview 11	Neither Agree or Disagree: Discuss why? Not sure, would think the original windows are an integral part of the heritage and value of the house. Possibly yes, if the windows are close replications.

18. The future costs of maintaining (repairs and repainting) original wood windows would influence, or has influenced, your decision to keep or replace your original wood windows.

	Responses
Group A	Houses with replacement windows
Interview 1	Agree: Discuss future (life-cycle) costs: Yes, believe it would.
Interview 2	Strongly Agree: Discuss future (life-cycle) costs: Yes, the newer vinyl replacements will have less maintenance, last a long time and less costly over time.
Interview 3	Neither Agree or Disagree: Discuss future (life-cycle) costs: Hard to know from a long term cost.
Interview 4	Strongly Agree: Discuss future (life-cycle) costs: Yes, replacement windows don't have ongoing maintenance/painting costs that will be involved with wood windows. Replacements will also reduce energy costs. Long term cost for replacement will be less than keeping and maintaining originals - which were in poor condition and would have been costly to repair.
Interview 5	Strongly Agree: Discuss future (life-cycle) costs: Yes, if the long term cost of maintaining windows was less, would consider, however, it was determined that the initial cost to fully repair was not affordable. Note: Cost of replacement of approximately 10 windows was approximately $1,200 per window at a total cost of approximately $12,000.
Group B	Houses with original windows
Interview 6	Strongly Disagree: Discuss future (life-cycle) costs: No, would not consider replacing the original windows, period.
Interview 7	Neither Agree or Disagree: Discuss future (life-cycle) costs: Haven't considered as homeowner has no intention of replacing.
Interview 8	Neither Agree or Disagree: Discuss future (life-cycle) costs: Haven't considered, never considered replacing.
Interview 9	Disagree: Discuss future (life cycle) costs: Don't really know, don't care, want to keep original windows.

	Responses
Interview 10	Agree: Discuss future (life-cycle) costs: Believe that original wood windows are durable – "built to last" – and won't cost more to keep them.
Group C	Houses with mixture of replacement and original windows
Interview 11	Don't Know: Discuss future (life cycle) costs: Repair of original windows would be costly, but, alternate replacement is also costly due to the type of windows that would be considered acceptable – similar wood windows. With preference to maintain existing ground floor windows, have taken approach of repair over time, for affordability – example: replacing storm windows over several years, not all at once.

19. In your opinion, what is the main reason for replacing original wood windows with new windows? You may check more than one reason, and, you may rank in order from 1 (main reason), 2 (2nd main reason), etc.

	Responses
Group A	Houses with replacement windows
Interview 1	Ranking 1 To eliminate seasonal removal of storm windows 2 To make a house more comfortable
Interview 2	Ranking 1 To save on heating costs 2 To make your house look better 3 To make a house more comfortable 4 For easier cleaning 5 To increase the value of your house
Interview 3	Ranking 1 To save on heating costs 2 To make a house more comfortable 3 To eliminate seasonal removal of storm windows
Interview 4	Ranking 1 Other (list reason) cost of repairs vrs replacement 1 To replace windows that are in poor physical condition 2 Lack of skill to repair old windows by yourself 3 Lack of window contractors who can repair old windows 4 To eliminate repainting 5 To save on heating costs 6 To eliminate seasonal removal of storm windows 6 To improve home security 7 For easier cleaning 7 To increase the value of your house
Interview 5	Ranking 1 To make a house more comfortable 2 To save on heating costs 3 To eliminate repainting 4 To reduce outside noise
Group B	Houses with original windows
Interview 6	No, there is no reason I would replace my original wood windows

	Responses
Interview 7	Ranking 1 To save on heating costs 2 Lack of skill to repair old windows by yourself 2 Lack of window contractors who can repair old windows 3 To eliminate repainting 4 For easier cleaning
Interview 8	Ranking 1 To save on heating costs 2 To replace windows that are in poor physical condition 3 For easier cleaning
Interview 9	No, there is no reason I would replace my original wood windows
Interview 10	Ranking 1 To replace windows that are in poor physical condition 2 To eliminate seasonal removal of storm windows 3 To save on heating costs 3 To make a house more comfortable
Group C	Houses with mixture of replacement and original windows
Interview 11	Ranking 1 To replace windows that are in poor physical condition 2 To have easier operating windows 3 To save on heating costs 4 To make a house more comfortable

20. In your opinion what would be the main reason for keeping and maintaining original wood windows? You may list more than one reason.

	Responses
Group A	Houses with replacement windows
Interview 1	Reason(s): We prefer original windows from an aesthetic perspective. We like the authentic look of original. Unfortunately our windows had been replaced before we bought. Re: window appearance/beauty: Asked homeowner if it would be easy to identify the *character-defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Difficult to identify.
Interview 2	Reason(s): Beauty and use of material that man cannot make. Re: window appearance/beauty: Asked homeowner if it would be easy to identify the *character-defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Difficult to identify.
Interview 3	Reason(s): Appearance of original wood windows is superior to most replacements. Re: window appearance/beauty: Asked homeowner if it would be easy to identify the *character-defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Difficult to identify.
Interview 4	Reason(s): Architectural consistency with rest of the house.
Interview 5	Reason(s): To maintain the original look, vinyl is often not able to mimic arches or details. Re: window appearance: Asked homeowner if it would be easy to identify the *character-defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Homeowner noted that shape/style of windows was an important character defining element. Another example would be if the window had stained glass.
Group B	Houses with original windows

	Responses
Interview 6	Reason(s): The heritage value of the property. The windows in our house are one the 1st examples of 4 pane windows (1867) in the area. This house is designated historical under the Ontario Heritage Act.
Interview 7	Reason(s): To maintain the character of the house. The windows are an integral part of the house from the style, age, and materials (wood and glass) – the original windows "fit" the house - new replacement windows, unless they were wood replications wouldn't be appropriate. Re: window appearance/beauty: Asked homeowner if it would be easy to identify the *character defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Difficult to identify.
Interview 8	Reason(s): appearance Original wood windows blend in and suit the original house better than new replacement windows – most vinyl windows would visually stand out too much – most are too white in colour. It is difficult to describe meaning of appearance or "character defining characteristics" as mentioned in standards for conservation.
Interview 9	Reason(s): To maintain appearance.
Interview 10	Reason(s): Heritage value, and to maintain the original look of the house.
Group C	Houses with mixture of replacement and original windows
Interview 11	Reason(s): My house is a Heritage House and windows must be preserved as original as possible. Requirements of preservation are quite strict, stricter if there are heritage grants involved, however, no grants available. Re: window appearance/beauty: Asked homeowner if it would be easy to identify the *character defining elements* of an old wood window as referred to in Canadian standards and guidelines for conservation work. Difficult to identify.

Additional Comments:

	Responses
Group A	Houses with replacement windows
Interview 1	Replaced windows in a previous "Arts and Crafts" house with Marvin wood frame windows. We loved them! They had authentically divided panes and were thermo panes. We love old homes and the windows are key to keeping the look.
Interview 2	Cleaning! Upper level would be impossible to clean by train yard. Wish our windows had been well maintained. There was some beautiful dental molding on some of them, but alas we had 1970s aluminum, some vinyl, some rotted, some painted closed and the glass painted black…. So with energy audit we had incentive to replace them. I do love the ease of motion and option to open the top pane to circulate air and safety on top level of the house with little children. Expect in future, society and consumers in general will have to reduce their overall consumption and will have to reuse and conserve more, which is applicable to windows.
Interview 3	Would have liked to have kept original windows, but replaced for what would be considered practical reasons – low maintenance, better operable windows, easier cleaning. Didn't investigate repairing or cost to repair, most of the existing windows were in state of disrepair and seemed too far gone to be practically repaired. Kept one original front window for appearance and also several single glazed windows at front unheated front porch where energy performance was not a concern. These single glazed porch windows are within homeowner's ability to repair.

	Responses
Interview 4	I was careful to find replacement windows that "look" like the originals – double hung with exterior caning. It was a trade-off between heritage and efficiency. Homeowner stressed that decision to replace windows was a compromise between heritage and the benefits of replacement windows: cost, energy, and easier maintenance and operations (examples: no painting, easier cleaning, and easier operating). Homeowner was very knowledgeable on the heritage of the house and took measures to select replacement windows to maintain the style of the original windows – double-hung, muntins on outside of glass to better simulate the exterior appearance.
Interview 5	Having just replaced my windows one year ago, I looked for someone to mimic the shape and style of my old single pane windows, but was unsuccessful. I really wanted to maintain the arched rounded top profile but couldn't. Actually, was able to find a replacement contractor that could provide rounded top profile, but was too costly, and wasn't homeowner's preferred contractor. Cost of repair was the major factor in deciding to replace all the house windows – based on preliminary estimate to replace one pane of glass at $400 it was determined that repair wasn't a feasible option. Other benefits, such as lower maintenance, made decision to replacement easier. It was also noted that it took only one day to replacement the windows and this was done on a cold winter day.
Group B	Houses with original windows
Interview 6	Homeowner stressed that the value of the heritage windows outweighs any convenience that a replacement window would provide, example easier cleaning. Homeowner accepts that maintenance is required. Homeowner likes the idea that they are helping to maintain heritage for future generations. Homeowner can identify character defining elements of their windows – examples: the original glass with its imperfections, width of wood sash members and muntin divisions. Homeowner suggested that repair and maintenance of windows would be a good business for a semi-retired carpenter who could provide this service at a lower labour cost.
Interview 7	The upstairs storms have been replaced with old aluminum ones. I would like to rip them off and replace with wood storms and screens but don't know where to find suppliers. Also need screens for downstairs. Some windows have original glass so hesitant to replace/update these. Also have experience with conservation in England, where conservation requirements tend to be more stringent, including windows. In this house's heritage designation, windows are not mentioned – vague as to what conservation requirements would be.
Interview 8	One time in past did receive pricing on replacement windows – thought it was too expensive.
Interview 9	No additional comments
Interview 10	Discussed conservation standards - issue of conservation of *character-defining elements.* Same as comment of "fit" in question 7, it is difficult to identify what character defining items are.
Group C	Houses with mixture of replacement and original windows
Interview 11	No Additional comments

B3 Summary of Responses from the Three Window Conservator Interviews

Part A: General Information about Interviewee and Their Work

1. Company Type: (Conservation Consultant or Conservation Contractor)

   Interview 1 Response: Conservation/Restoration contractor.
   Interview 2 Response: Heritage Conservation Specialist – Consultant and contractor.
   Interview 3 Response: Both.

2. Position:

   Interview 1 Response: Owner (eight employees).
   Interview 2 Response: Owner (No employees)
   Interview 3 Response: Project Manager with six employees.

3. How long have you been involved with Conservation of Wood Windows?

   Interview 1 Response: Seven years, primarily restoration in past five years.
   Interview 2 Response: Five years.
   Interview 3 Response: Ten years.

4. What is your background in Conservation of Wood Windows?

   Interview 1 Response: Grew up in a 1800s house, worked for grandfather who was a contractor, trained in finish carpentry, and developed an interest in older buildings.
   Interview 2 Response: Finish carpenter, window restoration training at Willowbank under mentoring of Craig Sims.
   Interview 3 Response: As a conservator.

5. What portion/percentage of your conservation work is with residential houses?

   Interview 1 Response: 90 percent.
   Interview 2 Response: One-third with residential.
   Interview 3 Response: 25 to 30 percent, but varies by year.

6. What portion of your conservation work is with designated heritage houses?

   Interview 1 Response: 25 percent.
   Interview 2 Response: 75 percent of residential is with designated heritage houses.
   Interview 3 Response: re residential houses it is approximately 90 percent.

7. Does your work include all aspects of conservation/repair/painting wood windows?

   Interview 1 Response: Yes, including masonry and plaster as these materials are often affected by window work.
   Interview 2 Response: Yes.
   Interview 3 Response: Yes.

8. What portion of your conservation work is with wood windows?

   Interview 1 Response: 80 to 90 percent.
   Interview 2 Response: 80 percent.
   Interview 3 Response: approximately 50 percent, but varies by year.

9. Do you (or can you) make a living/full time work in conservation of wood windows?

   Interview 1 Response: Yes, currently has eight employees and cannot meet demand.
   Interview 2 Response: Yes, absolutely.
   Interview 3 Response: Difficult to make a living just by window conservation. As a building conservation company, we have to diversify our range of conservation work. Due to the overhead costs, such as insurance, safety, our other conservation work sometimes subsidises our residential window work.

Part B: Opinions on Conservation of Wood Windows

10. What is/are the main reason(s) that you think original wood windows should be conserved?

    Interview 1 Response: Main Reason: to maintain the architectural appearance of a house, windows are the significant contributors to the house appearance
    Other Reasons: Economics – more cost efficient to maintain than replace, wood windows are reparable.
    Interview 2 Response: Main Reason: to maintain the architectural value of a house.
    Other Reasons: Value of the original materials - old wood is typically better wood.
    Response: Main Reason - to maintain the character defining elements of the building.
    Other Reasons: Original wood windows are better – such as: better constructed, better aesthetic qualities including the old glass which has often has character defining features.

11. What are the main reasons you think home owners replace their original wood windows as opposed to conservation/repair of their wood windows?

    Interview 1 Response: Main Reason: Influence from window replacement marketing.
    Interview 2 Response: Main Reason: Easier than repairing, a replacement contractor can replace windows in an entire house in a couple of days. Marketing resources of replacement contractors/industry is large and influential. Another reason is that many homeowners are intimidated by the technical repairs that sometimes are needed – this is where better education for homeowners is needed.
    Interview 3 Response: Main Reason: Easy and quick solution – example: replace windows in an entire house in 2 days. Other reasons: previous energy incentives; inoperable/stuck sash, don't believe windows can be fixed, perception of high cost to repair and homeowner's unwillingness to repair windows in phases. In other cases, homeowners are looking for a quick fix and do not plan to stay in their homes.

12. What are the main problems you have in convincing owners to conserve their windows?

    Interview 1 Response: overcoming the influence of replacement marketing, that old windows can be fixed.
    Interview 2 Response: convincing that original windows can be as good as replacement windows and they are worth saving.
    Interview 3 Response: convincing that original windows can be fixed, and the long term cost can be lower.

13. How do you address an owner's concern that annual removal of wood storm windows is difficult?

    Interview 1 Response: make it a non-issue by installing hardware that allows for hanging and tilt opening from interior.
    Interview 2 Response: This is a huge issue, but there is hardware available that allows storms to be hinged and tilted open so that storms don't need to be removed. Small storms can be removed from interior.
    Interview 3 Response: Recommend hardware that allows storms to remain in place and be hinged open during summer months. In many cases it makes sense to leave storms on all year round.

14. How do you address an owner's concern that old wood windows are harder to clean?

    Interview 1 Response: this is a harder issue to address, for example, if double-hung window is working properly then only difficult location for cleaning is outside of storm window. For clients that have difficulty, there may need service for exterior window cleaning.
    Interview 2 Response: Show them how to clean, easier to clean if windows are operational. Can provide hinge for bottom sash.
    Interview 3 Response: We don't. We advise owner that there are window cleaning services if the homeowner is unable to clean their windows themselves.

15. Are there many people/companies providing wood window conservation/repair work for the residential market?

    Interview 1 Response: No only a few and only in a few locations. Also, most conservation companies prefer to pursue larger projects.
    Interview 2 Response: No, and difficult for small companies. For larger projects, contractors want larger conservation subcontractors that can do larger jobs.
    Interview 3 Response: No, and many painters that do minor window repairs don't have the skills for proper repair work, example: often they using improper repair materials such as improper fillers and do not use moisture meters which is critical to ensure wood is at proper moisture levels for repairs. Poor repairs usually results in further deterioration.

16. Do you think there is potential market for more window conservation?

    Interview 1 Response: Yes.
    Interview 2 Response: Yes, especially those who can do wood frame repair.
    Interview 3 Response: Yes, if proper information about conservation work is presented to homeowners.

17. Do you think conservation of wood windows is important in older houses even if they are not designated as heritage buildings?

    Interview 1 Response: Yes.
    Interview 2 Response: Yes.
    Interview 3 Response: Yes.

18. Do you think homeowners are knowledgeable about their windows?

    Interview 1 Response: No.
    Interview 2 Response: No, not enough.
    Interview 3 Response: No, most owners don't know that old windows can be upgraded.

19. Do most home owners regularly maintain their windows?

    Interview 1 Response: No.
    Interview 2 Response: No.
    Interview 3 Response: Some do, but many use misguided information. Example: improper paints – latex paints are not the best paints for wood, however, but this is the current standard in commercial painting industry.

20. Do you think many homeowners are skilled enough to conserve their own windows (DIY)?

    Interview 1 Response: Maybe 25 percent – more need education.
    Interview 2 Response: Depends, some would be able to do stage 1 (minor) repair, but most are not skilled enough.
    Interview 3 Response: No, they don't have the tools and resources for conservation work. Sometimes we share work with owners so that they can do portions of work that they are capable of doing.

21. Do you think aluminum storm windows are a viable alternative to wood storm windows?

    Interview 1 Response: Wood storms are better, frame is a better insulator, aluminum storms will often trap moisture and cause wood decay.
    Interview 2 Response: No, aluminum storms are not arch'l appropriate.
    Interview 3 Response: No, aluminum storms often cause deterioration problems by trapping moisture at the bottom of storm due to blocked weep holes and where aluminum frame fastened to wood. Wood is also thermally better than aluminum.

22. Energy: Do you know if a properly repaired wood window and wood storm will provide the same thermal performance as a new replacement window?

    Interview 1 Response: Yes, and over time may perform better as replacements tend to reduce in thermal performance over time, e.g. loose argon gas.
    Interview 2 Response: Yes. Also often overlooked is proper sealing of basement windows which is crucial because older homes generally have a lot of infiltration through basement windows.
    Interview 3 Response: Yes. A lot has to do with proper weather-stripping.

23. Maintenance: How often should wood windows be repainted?

    Interview 1 Response: Ideally never. Proper painting should use a linseed base paint that only requires a surface wiping of linseed oil every five to ten years. Proper linseed oil paints are not available from standard paint suppliers/retailers for DIY. Typical commercial paints don't last long – repainting maybe needed very four to five years – traditional paints are not economical. Often mixes own paint for projects.
    Interview 2 Response: I refinish using linseed oil paints that only need wiping down with linseed oil every five to seven years depends on exposure – doesn't recommend standard commercial paints standard commercial paints which are lucky to last five years.
    Interview 3 Response: Depends on type of paint and exposure/location – generally seven to ten years. Often only spot painting is required.

24. What is the typical condition of wood windows that you are asked to investigate?

    Interview 1 Response: Poor condition, but perception is worse than reality, most common is deteriorated paint in which is often perceived by owners as structural failure needing replacement when repair is very feasible.
    Interview 2 Response: Very Poor condition – maintenance has not been provided.
    Interview 3 Response: Usually In better condition than the homeowner thinks – example: peeled paint, draughty – the homeowner thinks their windows are in very bad condition; however, the windows are easily repairable.

25. Costs: On a typical house, what is the typical of cost for conservation of a wood window? Example a 3 ft. x 5 ft. double hung windows with a wood storm

    Interview 1 Response: will vary based on condition and extent of work required/detail involved, but all inclusive approximate $1,400 for full restoration on average.
    Interview 2 Response: depends on extent of work needed, $800 to $1600 (1600 generally includes some repair on existing wood frame.
    Interview 3 Response: depends on extent of work needed, range of $800 to $1800.

26. How can a house owner find your contact information?

    Interview 1 Response: Can Google window restoration Ontario.
    Interview 2 Response: word of mouth, doesn't need to advertise.
    Interview 3 Response: Google/internet, word of mouth.

27. How do you market your business?

    Interview 1 Response: multiple methods, web site, word of mouth, flyers, this causes ripple effect.
    Interview 2 Response: word of mouth.
    Interview 3 Response: community events, web site, presentations, word of mouth.

28. Do you need better marketing?

    Interview 1 Response: Yes, more marketing is always better, e.g. lawn signs
    Interview 2 Response: not for obtaining more work, but overall conservation industry needs better marketing
    Interview 3 Response: No, but our industry does.

29. How do you compete against the window replacement industry?

    Interview 1 Response: Almost don't compete, many who don't care about conservation won't conserve.
    Interview 2 Response: Word of mouth, education.
    Interview 3 Response: Don't try to complete, we try to be honest and educate on the work that can be done.

30. What needs to be done to encourage more conservation of wood windows?

    Interview 1 Response: Better public education, more knowledge which will lead to more appreciation.
    Interview 2 Response: more education of homeowners.
    Interview 3 Response: More education for homeowners. Homeowners need more/better information. Provision of grants and incentives for conservation work would help. Better information from municipalities on conservation work would help.

Other Items discussed:

Interview 1:

Appearance: Re: old glass, most people don't look at their original glass, only through it, most don't have an appreciation of old glass that often has marks made by the craftspeople made it.

Appearance: 80 percent of a houses architectural appearance relates to windows.

Resources: It has become increasing difficult to purchase repair materials (worse for homeowners/DIY). Examples: putty, Canada's last linseed oil putty company closed; purchasing traditional weather stripping materials difficult.

Competition with other conservators: Wish there were more in the industry, there is potential for much more conservation if it was available. Plans to establish better networking, by identifying all in the industry.

Future: Feels there is a growing trend among the younger generation to value and want original materials and not just new “products”.

Economics: Window conservation is about people working, and generating economic growth focused on labour. Window replacement is more about product with less jobs associated.

Lead: Lead is not a major concern in conservation. Paint removal is primarily provided by steam or infrared, which doesn’t cause lead vapour. Lead containment is not a reason for not conserving/restoring. Never use chemical strippers.

Future: Want’s company to grow and establish locations in other locations.

Employees: Difficult to find employees trained in wood conservation. Working to establish more training.

Interview 2:

Resources: It has become increasing difficult to purchase repair materials Examples: putty.

Interview 3

Old wood windows versus new wood windows: The quality of wood in older windows was superior for rot resistance – due to older heartwood. There is a problem with many suppliers of new replicated wood windows not understanding wood and quality construction. In many cases the quality of new woods are not as good but this can be offset with new technology – such as better glues – but this takes training and knowledge.

Homeowner Trends: Homeowners often don’t plan for long term living in homes as much as in the past. Long term maintaining of windows is not a priority. Priorities have changed as to what is important in a house. This is a question that often comes up in client discussions – how long are you going to stay in your house. This relates to society changes that homeowner’s don’t have the time for maintenance, they are too busy.

B4 Summary of Responses from the Three Window Replacement Contractor Interviews

Part A: General Information about Interviewee and Their Work

1. Position:

   Interview 1 Response: Co-owner of Window, Door and Siding Contracting Company.
   Interview 2 Response: Owner of Window, Door, Siding & Exterior Renovation Company.
   Interview 3 Response: Owner of Window, Door, Siding & Interior/Exterior Renovation Company.

2. How long have you been involved with Replacement Windows?

   Interview 1 Response: 30 years.
   Interview 2 Response: 20 years.
   Interview 3 Response: 25 years.

3. What is your background in Replacement Windows?

   Interview 1 Response: Business, worked in retail home improvement – dealt with windows.
   Interview 2 Response: Several years' experience in development of grocery stores.
   Interview 3 Response: Many years of varied construction work which included fixing older windows.

4. What portion/percentage of your work is with older residential houses that still have original wood windows?

   Interview 1 Response: 20 percent.
   Interview 2 Response: 45 percent.
   Interview 3 Response: 60 percent.

Part B: Opinions on Replacement Windows and Conservation of Wood Windows

5. What are the main reasons home owners replace their original wood windows as opposed to conservation/repair of their wood windows?

   Interview 1 Response: Main reason is for less maintenance – primarily homeowners don't want to paint windows. Ease of cleaning with tilt windows. Energy savings is more of perceived reason, but less maintenance is the main reason.

Interview 2 Response: Main reason is for improved energy efficiency. Other reason is for increased house resale value.
Interview 3 Response: Many reasons: Better Energy Savings, Better Security against forced entry, Better Child Safety, Better Sound Control and Better Appearance.

6. What is/are the main reason(s) you recommend replacement?

Interview 1 Response: Same as 6 – less maintenance.
Interview 2 Response: Increased energy efficiency and maintenance free. (minimal maintenance needed).
Interview 3 Response: Same reasons as question 5.

7. What is the most common type of replacement windows you propose?

Interview 1 Response:
Frame/Sash type: Vinyl.
Operational type: Single-hung, tilt in window.
Glazing type: double-glazed, with high efficiency warm spacer, Low E, argon gas
Colour: depends on house – lots of colours available.
Other features: surface grilles, simulated divided lights. Lot of effort is put into matching appearance of original wood windows.

Interview 2 Response:
Frame/Sash type: Vinyl.
Operational type: Casements, but on older homes usually double-hung tilts.
Glazing type: double-glazed, Low E366.
Colour: White.
Other features: Quality hardware.

Interview 3 Response:
Frame/Sash type: Vinyl.
Operational type: Depends on house, on older homes usually double-hung.
Glazing type: double-glazed with super spacers.
Colour: Varies, common to have custom colours and in some cases painted
Other features: Better hardware – example coil system for double-hung.

8. What is the most common type of replacement windows system?

Interview 1 Response: Personal preference is a full frame removal as wood frame is often rotted. Full frame allows replacement to maintain more of the original glazing size. More expensive but better.
Full window replacement c/w removal of old frames: Personal preference.
Replacement maintaining old frames: Often done by others, less expensive.

Interview 2 Response: Varies – depended on existing condition.

Interview 3 Response: Generally a 50 percent split on full or maintaining frames. More people are maintaining frames on older houses, due to less cost.

9. What do you advise homeowners if they have concerns about heritage value of their old windows?

   Interview 1 Response: Shows examples of design and installations. Experience indicates that from a distance homeowners will not notice difference in appearance.
   Interview 2 Response: Maintain the sash appearance – example: maintain ellipse top if existing was ellipse.
   Interview 3 Response: Recommend they check with the municipality.

10. Would you, or when would you advise a homeowner to keep/maintain their existing windows?

    Interview 1 Response: Maintain stain glass, but not mounted in new windows.
    Interview 2 Response: Yes, if windows were in great shape. Sometimes have recommend replacement with wood replacements when owner wants to have natural stained finish, but this tends to be more expensive.
    Interview 3 Response: Yes, if there is special glass, example stained glass. In some cases recommendation is to keep stain glass as a special feature, but not incorporated into new window.

11. How competitive is your window replacement market?

    Interview 1 Response: very competitive, very price sensitive. Many larger companies strongly market less expensive replacement (maintaining frames) and non-custom design (not sensitive to heritage).
    Interview 2 Response: very competitive, but providing better service ensures competition is not a problem for this company.
    Interview 3 Response: very competitive, many other companies encourage financing to encourage replacement, but this is debt financing that costs more.

12. Do you have any concerns about heritage advocates?

    Interview 1 Response: No.
    Interview 2 Response: Yes, their lack of knowledge.
    Interview 3 Response: Yes, their lack of knowledge and lack of specific rules. It can be very frustrating dealing with heritage committees.

13. Do you think homeowners are knowledgeable about their windows?

    Interview 1 Response: More knowledgeable than in past due to internet.
    Interview 2 Response: No.
    Interview 3 Response: Some are very knowledgeable due to researching information available on the internet.

14. Do you think many homeowners are skilled enough to replace their own windows (DIY)?

    Interview 1 Response: No, training is needed. Industry will have fenestration technicians in future.
    Interview 2 Response: No.
    Interview 3 Response: No.

15. Do new replacement windows provide enough improved energy savings to make replacement for energy reasons a good reason to replace windows?

    Interview 1 Response: No, too long of payback. This is misleading marketing in the replacement industry.
    Interview 2 Response: Yes.
    Interview 3 Response: Depends on the house – yes it will improve energy savings but depends on how much savings. In some cases it makes more sense in newer houses (late 1900s) which often had poor windows installed.

16. Do you recycle the old wood windows or dispose?

    Interview 1 Response: Recycle wood windows to habitat for humanity. Unfortunately glass goes to dump as there is currently no market for recycled glass.
    Interview 2 Response: Recycle as much as possible, save old frames. Current problem is lack of market for recycled glass.
    Interview 3 Response: Dispose. Currently, locally, not able to have glass recycled.

17. Do you have to take precautions against old Lead Paint when removing windows?

    Interview 1 Response: Starting to get more sensitive – other related concerns is associated asbestos insulation installed next to windows.
    Interview 2 Response: No.
    Interview 3 Response: No.

18. What is the typical condition of most wood windows when asked to propose replacement windows?

    Interview 1 Response: Very poor, sometimes fully rotted.
    Interview 2 Response: Houses built prior to 1950s tend to have wood in good shape provided it hasn't been covered by aluminum or metal storm windows.
    Interview 3 Response: Typically poor due to lack of maintenance, but each house is different.

19. Costs: On a typical house, what is the typical of cost of a window replacement Example a 3 ft x 5 ft double hung windows with a wood storm?

    Interview 1 Response: depends on extent of custom design. Standard $800-$900, but custom design up to $1800. Approximately $100 less if maintain existing frame.
    Interview 2 Response: Full replacement $850 to $900.
    Interview 3 Response: Full replacement $700 to $800, Replacement using existing frame $100 less.

20. Costs: Do homeowners usually buy low end, middle or high end replacement windows?

    Interview 1 Response: Only sells mid to high end, won't sell low end windows. Mid to high end are better, heavier vinyl, more reinforcing etc.
    Interview 2 Response: Only sells from one quality manufacturer to maintain higher quality which causes less confusion for homeowner.
    Interview 3 Response: Homeowners generally buy low end for cost reasons.

21. Costs: Is the cost to replace windows typically less than maintain/repair of existing wood windows?

    Interview 1 Response: Yes.
    Interview 2 Response: Depends on condition of existing windows and the ability to provide sound advice.
    Interview 3 Response: Yes.

22. What is the typical life span of new replacement window?

    Interview 1 Response: 30 to 35 years, but longer if maintained – estimate another 20 years.
    Interview 2 Response: Well over 20 years, but some poor quality vinyl windows have lasted less than ten years.
    Interview 3 Response: Varies, there are window components that last longer than others. Example, vinyl frames may last the lifetime while double glazing may have to be replaced.

23. Are there items that need maintenance on a replacement window?

    Interview 1 Response: Yes there is some maintenance required. Cleaning, replacement of some hardware such as cranks, replacement of double glazed sealed units – windows are designed for glass replacement.
    Interview 2 Response: Yes. Must clean and lubricate hardware. Must clean tracks for closure – but this is minor maintenance to maintain operating parts of window.
    Interview 3 Response: No, but homeowners must properly use: example - over cranking can cause damage to hardware.

24. Do homeowners paint vinyl replacement widows?

    Interview 1 Response: Yes, but need to have proper preparation for proper adhesion. E.g. rubbing surface with acetone.
    Interview 2 Response: Yes, and not a problem if done correctly.
    Interview 3 Response: Yes, there is more painting, but there is also more colours direct from the manufacturer.

25. How do you market your business?

    Interview 1 Response: Multi methods: home shows, internet, newspapers, job signs. Windows of the manufacture also advertises.
    Interview 2 Response: Don't, 95 percent is by referral.
    Interview 3 Response: homes shows, yellow pages.

26. Do you think the window replacement industry gets unfairly criticized by those who advocate heritage conservation?

    Interview 1 Response: Yes and no. Some replacement work is poor, but also some heritage work is also poorly done.
    Interview 2 Response: Yes, because advocates tend to only focus on poor replacement examples that are usually provided by less than replicable window contractors that in some cases have destroyed the appearance of the house. Yes, there are contractors that provide "tailgate warranties" – meaning they only care about the quick sale, don't care about the appearance of the window and don't stand by their work.
    Interview 3 Response: Yes, they tend not to be knowledgeable about replacement windows that can provide better energy efficiency and match heritage appearance.

Other Items discussed:

Interview 1:

Recycling: Vinyl windows are recyclable; don't have to end up in landfill.
Appearance: Vinyl replacement windows can be custom designed to have the appearance of original wood windows. This approach is more expensive than standard replacement, but believes this is a viable option to costly repairs and ongoing painting/maintenance requirements of wood windows in older houses. Enjoys taking the time with clients to design windows for older/heritage houses. Has been disappointed in seeing other replacement windows, that are not sensitive to heritage.
Interview 2: None.
Interview 3: None.

B5 Summary of Responses from the Three Home Inspector Interviews

Part A: General Information about Interviewee and Their Work

1. How long have you been involved with home inspections?

   Interview 1 Response: seven years.
   Interview 2 Response: eleven years.
   Interview 3 Response: ten years.

2. What portion/percentage of your home inspection work is with older residential houses?

   Interview 1 Response: 40 to 50 percent.
   Interview 2 Response: 50 percent.
   Interview 3 Response: 60 percent.

Part B: Opinions on Conservation of Wood Windows

3. Does your training in home inspections include information on older homes and heritage issues?

   Interview 1 Response: Not heritage, yes for older homes on items such as wiring and heating.
   Interview 2 Response: No, but has extensive past experience with window repair when working as a painter. Has repaired double-hung window counter-weights.
   Interview 3 Response: Yes, but not required and no certification required. Personal interest came from earlier background of house renovations prior to being a home inspector.

4. Does your training in home inspections include information on windows?

   Interview 1 Response: Yes, different types, including storm windows.
   Interview 2 Response: Yes, with respect to thermal effects/energy performance.
   Interview 3 Response: Yes.

5. Does your training in home inspections include information on old wood windows?

   Interview 1 Response: Yes.
   Interview 2 Response: No.
   Interview 3 Response: Yes.

6. Do you consider existing older windows or replacement windows to be better?

   Interview 1 Response: Not necessarily, often older wood windows need some repair, e.g. sticking windows, weather-stripping, which can be low cost to correct. If there is good insulation in other areas, then energy isn't a big issue with existing wood windows. With vinyl windows, there can be lots of problem issues with vinyl windows: warping, brittle/cracking from U/V.
   Interview 2 Response: New replacements are better, particularly for energy efficiency. Typically, ten percent of heat loss in a house is through windows.
   Interview 3 Response: Equal, if older wood windows are maintained then it is not cost effective to replace them. E.g.: Not cost effective for energy savings.

7. If an older house has original wood windows what are some of the typical repairs/upgrades you have advised?

   Interview 1 Response: sealing gaps, filling voids with spray foam insulation. Many houses in rural areas have more exposure to wind and sealing/weather-stripping is very important.
   Interview 2 Response: Painting, weather-stripping/caulking. Estimate that 70% of homeowners do take care of their houses/windows.
   Interview 3 Response: reputty glazing, caulking around windows frame, remove flaking paint and over paint, avoid stripping due to existing lead paint.

B6 Summary of Responses from the Three Realtor Interviews

Part A: General Information about Interviewee and Their Work

1. Position:

   Interview 1 Response: Sales Representative.
   Interview 2 Response: Sales Representative.
   Interview 3 Response: Broker.

2. How long have you been a Realtor?

   Interview 1 Response: less than one year.
   Interview 2 Response: 26 years.
   Interview 3 Response: 23 years.

3. What portion/percentage of your real estate work is with older residential houses?

   Interview 1 Response: not known yet.
   Interview 2 Response: 80 percent.
   Interview 3 Response: Response: 30 percent.

Part B: Opinions on Conservation of Wood Windows

4. Does your training in real estate include information on older homes and heritage issues?

   Interview 1 Response: Only a small component, instruction is given on issues of heritage designation. Advised that real estate agents should not make recommendations on heritage work/replacement work on designated homes as recommendations may conflict with requirements during heritage approval process.
   Interview 2 Response: No.
   Interview 3 Response: Yes, can be obtained by continuing education, have not taken specific courses in heritage, but have taken course on energy conservation, e.g. energy star information.

5. Does your training in real estate include information on windows?

   Interview 1 Response: Yes, e.g.: information on windows types and energy R values.
   Interview 2 Response: No.
   Interview 3 Response: No.

6. Does your training in real estate include information on old wood windows?

   Interview 1 Response: Not specific information on old wood windows.
   Interview 2 Response: No, but took a seminar on architectural styles, given by local archives, and included as part of real estate continuing education. Recommend seminars like this be more available.
   Interview 3 Response: No.

7. Do you consider existing older windows or replacement windows to be more valuable to the market value of an older house?

   Interview 1 Response: Yes, due to perception that new windows increase value
   Interview 2 Response: Depends on house – some houses with "significant architectural value", e.g.: pre 1900s may have windows that do contribute to the heritage/market value as they are appealing to some clients, but most houses, e.g.; 1930s new replacements will be more valuable to market value.
   Interview 3 Response: New replacements sell faster – more valuable for market value due to public being taught to believe replacements provide energy savings.

8. If an older house has new replacement windows do you promote this as a selling feature?

   Interview 1 Response: Yes.
   Interview 2 Response: Depends, refer to previous question, so in most cases replacements are promoted as a selling feature.
   Interview 3 Response: Yes, for energy savings.

B7 Summary of Responses from the Three Heritage Stratford Committee Member Interviews

Opinions on Conservation of Wood Windows

1. If an owner of a designated heritage property wants to replace their windows do they have to get approval?

   Interview 1 Response: Yes, if designated and if located in the Heritage Conservation District.
   Interview 2 Response: Yes.
   Interview 3 Response: Yes, and also if located in the Heritage Conservation District.

2. Has the Heritage Advisory Committee had to deal with the issue of wood window conservation versus window replacement?

   Interview 1 Response: Yes.
   Interview 2 Response: Yes.
   Interview 3 Response: Yes.

3. Does the Heritage Advisory Committee think that conservation of original wood windows is important in a designated house? If so, for what reasons.

   Interview 1 Response: Yes, appearance.
   Interview 2 Response: Yes, keep it as original as possible.
   Interview 3 Response: Yes, important and preferred but not essential as long as replacement window has same look.

4. Does the Heritage Advisory Committee think that conservation of original wood windows is important in an older house that is not a designated property? If so, for what reasons.

   Interview 1 Response: Yes, appearance.
   Interview 2 Response: same as question 3.
   Interview 3 Response: Yes, but not mandatory.

5. What are the Heritage Advisory Committee's typical recommendations for dealing with original wood windows?

   Interview 1 Response: Preference is repair, but if deteriorated, replace in wood.
   Interview 2 Response: No Response
   Interview 3 Response: Preference in order - 1st: maintain original, 2nd: replicate in wood, 3rd: vinyl provided if maintains near look of original. Can't impose a financial hardship if homeowner can't afford the more preferred.

6. Does the Heritage Advisory Committee use standards and guidelines for property owners to follow for dealing with windows? (example – Parks Canada's "Standards and Guidelines for the Conservation of Historic Places in Canada")

   Interview 1 Response: Don't have specific guidelines, but guidelines would be useful.
   Interview 2 Response: No response.
   Interview 3 Response: Don't have specific guidelines, but would like guideline in future to avoid ad hoc advice.

7. Do you find owners knowledgeable when discussing issues relating to their windows?

   Interview 1 Response: N/A, haven't spoken to enough homeowners.
   Interview 2 Response: No response.
   Interview 3 Response: No, most rely on their contractor's advice.

8. If a property owner proposes replacement, what are the main reasons given for this? (example - have any home owners wanted to replace their windows with vinyl windows for energy savings)

   Interview 1 Response: Cost, ease of cleaning windows, safety concerns for children.
   Interview 2 Response: Cost.
   Interview 3 Response: Cost, advice of contractor, safety concerns for children/codes, e.g.: guard heights.

9. Stratford's Official Plan identifies all of the older residential neighbourhoods are part of Stratford's "Heritage Area". Do you consider these older residential neighbourhoods as having heritage value?

   Interview 1 Response: Yes, these neighbourhoods have character.
   Interview 2 Response: Yes.
   Interview 3 Response: Yes, many beautiful homes.

10. Stratford's Official Plan identifies all of the older residential neighbourhoods are part of Stratford's "Heritage Area". Do you consider all older houses having heritage value and not just designated properties?

    Interview 1 Response: Most have heritage value.
    Interview 2 Response: Yes, I would consider all the older houses important.
    Interview 3 Response: Most do have heritage value.

11. If you consider older residential neighbourhoods and their houses having heritage value, would you consider that conservation of original wood windows important to a neighbourhood?

    Interview 1 Response: Yes.
    Interview 2 Response: Yes.
    Interview 3 Response: No, what is important is the general impression of the houses.

12. What would you consider is the main reason(s) homeowners may not want to conserve their original wood windows? (examples – cost, lack of knowledge, lack of tradespeople, new windows require less maintenance, lack of appreciation of original)

    Interview 1 Response: Cost, also lack of tradespersons, maintenance, not functioning properly.
    Interview 2 Response: Cost and lack of knowledge.
    Interview 3 Response: Cost, also lack of tradespersons, maintenance.

Appendix C – Introduction Letters and Consent Forms

Appendix C includes:

- Cover letter for Homeowner Mail Survey
- Cover letter for Homeowner Interview
- Cover letter for Stakeholder Interview
- Consent form for Interview

UNIVERSITY OF WATERLOO

University of Waterloo
200 University Avenue West
Waterloo, Ontario, Canada
N2L 3G1

School of Planning

Dear Homeowner:

My name is Ron Bean and I'm a Masters student in the School of Planning at the University of Waterloo. I'm conducting my thesis research in the field of heritage planning under the supervision of Professor Dr. Robert Shipley.

My thesis research study is focused on windows of older houses in Stratford; specifically houses built prior the 1950's. Original windows of older houses were typically single glazed, operable wood windows, often combined with wood storm windows. Your house may still have its original wood windows, or some of them. At some point in time, most owners of older houses are faced with the decision to either conserve (keep and maintain) their original wood windows or replace them with new windows. This study is to identify reasons why homeowners may choose to replace their wood windows instead of keeping and maintaining them, or, as I have entitled my study - *Barriers to the Conservation of Older Residential Wood Windows*. Studying these reasons is very important in understanding the role of conservation in buildings, planning and society. I would like you to participate in this mail survey.

Filling out of this survey should take no more than 15 minutes. Your involvement in this survey is entirely voluntary and there are no known or anticipated risks to participate in this study. Attached is a self-addressed stamped envelope.

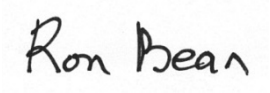
Any information you provide will be considered confidential and will be grouped with responses from other participants. Further, you will not be identified by name in any thesis, report or publication resulting from this study. The data collected will be kept for a period of 2 years in my supervisor's office at the University of Waterloo and then confidentially destroyed.

Contact information

If you have any questions regarding this study, or would like additional information about participation, please contact Ron Bean by email at rbean@uwaterloo.ca. You may also contact my supervisor Professor Dr. Robert Shipley by telephone at 1-519-888-4567 Ext. 35615 or by email at rshipley@uwaterloo.ca.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. Should you have comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you in advance for you interest in this project.



Ron Bean
University of Waterloo
School of Planning
rbean@uwaterloo.ca
Survey return address: Ron Bean, 175 Bedford Drive, Stratford, ON, N5A 5J7

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200 University Avenue West
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Dear Homeowner:

This letter is an invitation to further participate in my thesis research study. As noted in the mail survey, my name is Ron Bean and I'm a Masters student in the School of Planning at the University of Waterloo conducting my thesis research in the field of heritage planning under the supervision of Professor Dr. Robert Shipley. Your involvement is an interview to gather additional information and to discuss in more detail your mail survey responses.

Study Overview:

As noted in the mail survey, my thesis research study is focused on windows of older houses in Stratford; specifically houses built prior the 1950's. Original windows of older houses were typically single glazed, operable wood windows, often combined with wood storm windows. Your house may still have its original wood windows, or some of them. At some point in time, most owners of older houses are faced with the decision to either conserve (keep and maintain) their original wood windows or replace them with new windows. This study is to determine reasons why homeowners may choose to replace their wood windows instead of keeping and maintaining them, or, as I have entitled my study - *Barriers to the Conservation of Older Residential Wood Windows*. Studying these reasons is very important in understanding the role of conservation in buildings, planning and society.

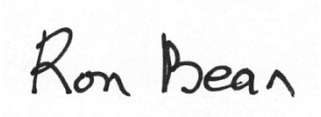
Any information you provide will be considered confidential and will be grouped with responses from other participants. Further, you will not be identified by name in any thesis, report or publication resulting from this study. The data collected will be kept for a period of 2 years in my supervisor's office at the University of Waterloo and then confidentially destroyed.

Contact information

If you have any questions regarding this study, or would like additional information about participation, please contact Ron Bean by email at rbean@uwaterloo.ca. You may also contact my supervisor Professor Dr. Robert Shipley by telephone at 1-519-888-4567 Ext. 35615 or by email at rshipley@uwaterloo.ca.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. Should you have comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you in advance for you interest in this project.



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Dear Stakeholder:

This letter is an invitation to participate in my thesis research study. I'm a Masters student in the School of Planning at the University of Waterloo conducting my thesis research in the field of heritage planning under the supervision of Professor Dr. Robert Shipley.

Study Overview:
My thesis research study is focused on windows of older houses; specifically houses built prior the 1950's. Original windows of older houses were typically single glazed, operable wood windows, often combined with wood storm windows. At some point in time, most owners of older houses are faced with the decision to either conserve (keep and maintain) their original wood windows or replace them with new windows.

As a stakeholder in window conservation, window replacement or related involvement you play an important role in assisting homeowners in making professional decisions on window conservation or replacement. These decisions can impact their homes; such as the appearance, energy savings and maintenance.

This study is to identify reasons why homeowners may choose to replace their wood windows instead of conserving them, or as I have entitled my study – *Barriers to the Conservation of Older Residential Wood Windows.* Studying these reasons is very important in understanding the role of conservation in buildings, planning and society.

Your Involvement:
Your involvement is an interview which includes a series of semi-structured questions related to your specific area of expertise with windows.

Any information you provide will be considered confidential and will be grouped with responses from other participants. Further, you will not be identified by name in any thesis, report or publication resulting from this study. The data collected will be kept for a period of 2 years in my supervisor's office at the University of Waterloo and then confidentially destroyed.

Contact information
If you have any questions regarding this study, or would like additional information about participation, please contact Ron Bean by email at rbean@uwaterloo.ca. You may also contact my supervisor Professor Dr. Robert Shipley by telephone at 1-519-888-4567 Ext. 35615 or by email at rshipley@uwaterloo.ca. I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. However, the final decision about participation is yours. Should you have comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca.

Thank you for your interest in this project.

Ron Bean

Ron Bean
University of Waterloo, School of Planning
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CONSENT FORM

I have read the information presented in the information letter about a study being conducted by Ron Bean under the supervision of Professor Dr. Robert Shipley of the School of Planning at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through the Office of Research Ethics at the University of Waterloo. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Dr. Maureen Nummelin in Office of Research Ethics at 519-888-4567, ext. 36005 or maureen.nummelin@waterloo.ca.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

☐ Yes ☐ No

I agree to the use of anonymous quotations in any thesis or publication that comes from this research.

☐ Yes ☐ No

Participant Name: _____ (please print)

Participant Signature: _____

Witness Name: _____ (please print)

Witness Signature: _____

Date: _____