Windows and Doors in schools
A study of low-decile primary schools in Auckland

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Windows and Doors in NZ Primary Schools

A Research Report presented in partial fulfilment of the requirements for the degree of

Bachelor of Construction
In
Quantity Surveying

At Massey University, New Zealand
2015
Title: Windows and Doors in Primary Schools

This is my work and, to my knowledge, I have referenced all material I did not produce.

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This Report was prepared by Fadi Gully on behalf of APL Ltd and all information is confidential and shall not be shared.
Acknowledgments

For assistance during this project, I would like to thank my Supervisor, Dr Mikael Boulic, who has encouraged me, guided me and supported me. He has enabled me to develop my researching skills, and gain a much deeper understanding of the subject.

Secondly, I would like to thank David Waters from Architectural Profiles Ltd (APL). Without his assistance and APL’s financial support, I wouldn’t have been able to complete this project.

I would also like to thank all 20 schools principals, their teachers and caretakers that agreed to participate in this project. Their assistance and knowledge on the topic of windows and doors in existing primary schools aided me in obtaining the data that I required.
I would like to thank my fellow Massey University colleagues, Francine Liaw and Maxime Clozuet who were doing similar studies as I.

I would like to mention my good friend Sinan Amso for his assistance in editing. Above all, I would like to thank my family friends for their on-going support and patience.
Abstract

The children of today will be the adults of tomorrow, so it is essential that their learning environment of present, the classroom, does not affect their ability to learn.

The following research aims to investigate how often the existing windows and doors get opened in terms of allowing air in and out, and the duration they were opened whilst the classroom was occupied. It also investigated their ease of use, and performance in regards to: acoustics, insulation, durability, safety and security.

This research is located in 20 low-decile primary schools in the Auckland area. A survey was conducted to investigate the durability and performance of windows and doors. Primary school teachers and caretakers were the primary source of information.

The vast majority of teachers surveyed had complaints that the windows and doors in their classroom did not perform adequately.

The results revealed that most of classrooms were out-dated, and a majority of their windows and doors were damaged, and do not function accordingly. It is believed that because of these conditions, the children’s ability to learn to the maximum capability is jeopardised.
List of Abbreviations

BRANZ - Building Research Association of New Zealand

BOT – Board of Trustees

CO₂ - Carbon Dioxide

EECA - Energy Efficiency and Conservation Authority

HVAC – Heating, Ventilation and Air Conditioning

IAQ - Indoor Air Quality

MOE – Ministry Of Education

NERI - National Energy Research Institute

NES – National Environment standards

NZS - New Zealand Standard

RH - Relative Humidity

PPM – Parts Per Million

VOCs – Volatile Organic Components

WHO – World Health Organisation
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1.0 Introduction
The first chapter introduces the background of this study, which focuses on New Zealand primary schools’ windows and doors. This chapter will review the process of air ventilation within the classrooms, the need for durability and security for windows and doors. Furthermore, it presents the justifications of the study, research questions and objectives. This chapter also discusses the scope, limitations and the overall outline and structure of the study.

1.1 Background
In their early years, children spend around 30 hours a week for over 40 weeks per year in their classrooms. It is part of New Zealand law for all children to start school shortly after they turn five years old and they must be enrolled into a school by their sixth birthday (Education, 2006). As of July 2014, there were 1961 primary schools recorded in New Zealand (Counts, 2015) and a large portion of these primary schools were built after World War II (Swarbrick, Patterson, & Forwood, 2013). A majority of primary schools can be categorized as small, rectangular, wooden rooms, inexpensively built with minimum insulation. These primary schools were designed to provide natural ventilation through the opening of the single-glazed windows and doors. The classrooms within are fully carpeted and are heated separately the most economical way possible (McIntosh, 2011)

The air change in New Zealand primary schools is closely dependent on natural ventilation through the opening of windows and doors throughout the entire year (Wang, 2015). During winter, when high winds and/or cold weather are apparent, these outlets remain closed. Closed windows create a complicated situation for classroom occupants as it halts natural ventilation and causes the build-up of pollutants, moisture and bacteria. Consequently, this creates a lack of fresh air for the children and teachers to breathe, forcing them to breathe in pathogens and pollutants as well as preventing fresh air from moving around the classroom. This also makes it difficult to maintain healthy levels of Indoor Air Quality (IAQ). IAQ refers to the level of air quality inside a building and relates to the health and comfort of the building’s occupants. An inadequate level of IAQ can also affect the performance of the children and their learning ability (BRANZ, 2007).

Children’s immune systems are considered ‘immature’ compared to adults and poor ventilation can expose children to many pollutants which can cause them to have various allergies and/or become sick (Mathieu-Nolf, 2002). Because these primary schools depend on natural ventilation through the opening of windows and doors, when they are closed, this affects a healthy level of IAQ in the classroom. Ventilation and IAQ are closely related. An easy solution to all this would be to install mechanical ventilation such as an HVAC system into all classrooms. However, this option is expensive for all primary school as there is an expensive capital cost, and also an ongoing running and maintenance cost that will affect the school budget.
In NZ, little research has been done to investigate the IAQ of classrooms. Over the past 14 years, only 3 studies have been published, two of which were in the Wellington region and were undertaken 10 years apart: *Indicators of natural ventilation effectiveness in twelve New Zealand schools* (Bassett M. & P., 1999) and *the indoor air quality in 35 Wellington primary schools* (McIntosh, 2011). A third study was based in the Canterbury region: *Thorington school classroom energy and climate management* (Cutler-Welsh, 2006). All three studies found similar results. They found that levels of bacteria in the classroom were similar to those found near a water treatment plant. This suggests that there could be an issue with ventilation and moisture control in classrooms (Wang, 2015).

Windows in NZ have a minimum standard to perform not less than 50 years (B2/AS1). However, many primary schools in NZ were built after WWII (1945), so their existing windows and doors are outdated and are around 70 years old. The materials used in the construction of the windows and doors may be outdated in terms of performance. They may also lack the durability and features of today’s windows and doors. A lot of the outdated windows do not have the security features from today such as window catches, which prevent windows from opening outwards fully. These windows also contain single glazed glass panes which causes thermal losses in winter (BRANZ, 2007). Doors may also be outdated in terms of not having flat surfaces which can cause occupants to trip and fall when they are walking in or out of the classroom. Trip hazards may also make accessibility difficult for disability students, especially the ones using wheel chairs. Little research has been done on the durability of windows and doors in schools and their ease of use.

It is important to investigate this topic and to address it in a cost effective way, because healthy children will reduce the number of sick days they have and the time that they spend out of school. When children are in school more often, they will learn more and become more educated. Windows and doors performance in terms of durability, security and ease of use is also an important factor that needs to be examined.

### 1.2 Research Justification

Three NZ studies found that there is a problem with a lack of ventilation in primary class rooms during winter (Bassett M. and P. (1999); Cutler-Welsh (2006); McIntosh (2011). The studies also showed high levels of Relative Humidity (RH) and Carbon Dioxide (CO₂) all which contribute to creating an unhealthy learning environment for children. Children’s immune systems are undeveloped compared to adults, so exposure to pollutants created from a lack of ventilation in the learning environment could mean ill health or cause allergic reactions later on in their lives (BRANZ, 2007). There is a need to better understand how the teachers ventilate their classroom, in order to research the appropriate ventilation designs.

Investigating these issues is also important as they can directly influence on the health of children and teachers. Providing the best learning environment for the children is vital for their future, and the future of New Zealand. Furthermore, it is possible that windows and doors are not as well adapted in terms of durability and security to classrooms environments as they are in houses or buildings.
1.3 Research Questions and Objectives

Ventilation in schools is important to maintain a good level of IAQ. The problem with today’s windows and doors is that they are outdated (WWII) in terms of performance, which includes durability, safety, security, ease of use and ventilation. This current study attempts to investigate the usage and performance of windows and doors in schools. This project output will help industry and designers to develop new solutions and guidelines in order to increase the quality of the school environment. Accordingly, this study is formulated around the following questions and objectives:

**Research Question 1: How do teachers use windows and doors in NZ primary schools to improve ventilation?**

To answer this Research Question, my objectives will be:

- To investigate how often the existing windows and doors get opened in terms of allowing air in and out and the duration they are opened for whilst the classroom is occupied
- To investigate the ease of use and performance of these windows and doors

**Research Question 2: What are the needs in term of usability, durability and security of windows and doors in existing classrooms?**

To answer this Research Question, my objectives will be:

- To extend the body of knowledge around product use and provide recommendations and suggestions for the ministry of education and NZ schools.
- To examine the durability and security of windows that have been in place since the World War II era
1.4 Research Scope and Limitation

Schools in NZ are ranked into decile groups that rank from decile one up to decile 10, (10 being the highest). A school’s decile ranking is related to the amount of students the school draws from socio-economic communities (MOE, 2015). So a school that is ranked with a decile rating of 1, draws students from the lowest 10% of socio-economic communities, and a school that is ranked 10, draws students from the highest 10% of socio-economic communities. Decile rating method is used by the Ministry of Education to allocate funding, for example, schools with a low-decile ranking get more funding as opposed to schools with higher ranking (MOE, 2015). The ranks get reviewed every 5 years; however, a school can apply to have its ranking reviewed from time to time if they believe the surrounding community has transformed. The research conducted in this study is focused on low-decile primary schools (1-5), with another similar research being conducted at the same time with primary schools of high-decile (6-10). In this study, all primary schools student ages range from 5 to 12 years old.

The study is only restricted to low-decile primary schools that are located in Auckland, New Zealand. The fact that the researcher lives in Auckland as well as the short time frame for completing this study all facilitated with the number and the scope of the study. The study will take place during the winter months of the year, from June to August. This is due to previous studies that have identified a lack of ventilation around winter months and also the need to keep the heat inside the classroom. This causes the windows and doors to be closed. During the summer season, however, the fine weather makes it possible to open windows and doors, therefore the classrooms can be sufficiently naturally ventilated.

In order to achieve the objectives of this study, the researcher will examine 20 low-decile primary schools located in the Auckland area. This will be done through face-to-face questionnaires with teachers and caretakers representing each school. The reason that both teachers and caretakers are required is because they both have different usages for the windows and doors. Teachers use the windows and doors every week day for ventilation and sunlight. Caretaker’s role in the school is to make sure that windows and doors in schools are locked when the school is not in operation, so they will have a different view on the ease of use. They will also be more focused on maintenance and carrying out day to day repairs and minor repairs. They also need to make sure that planned maintenance such as cleaning is done when required.

There are some constraints in this study that may potentially affect the findings and interpretation of the results. As mentioned before, the study was based on a convenience sample of 20 low-decile schools in Auckland. The sample size is roughly around 10-15% of the total number of low-decile schools in Auckland. The selection of the study’s schools was based on convenience sampling. In addition, due to time constraints, the researcher was not able to involve other bodies such as the Ministry of Education or engineers to obtain their views on the subject matter.
This study has been approved by the Massey University Human Ethics Committee as a Low Risk Notification.

1.5 Organisation of the Study
The study was initiated by reviewing previous relevant literature on the topics of ventilation and durability of windows and doors. The methodology utilised was quantitative research design. Both primary and secondary data were collected and both are suitable to obtain the data for this study. Primary data was collected directly from face to face questionnaires, while secondary data were collected, for more general purposes, mainly through the Internet and journal articles. The literature review and data from primary data satisfy some components of the research objectives. The other objectives are then met by analysing numerical data obtained from questionnaires with a convenience sample of school teachers, and caretakers within.

The study is outlined as follows:

Chapter 2: Literature Review. This chapter provides insight into the prior literature and concepts concerning ventilation and windows and doors.

Chapter 3: Methodology. This chapter outlines the methodology used in the study. It describes the quantitative research design utilised and the rationale behind using it. Additionally, it explains the tools used and how participants were recruited as well as the collection, management, and numerical analysis of the data. Issues concerning reliability, validity and ethical considerations were also discussed within.

Chapter 4: Results. This chapter presents the results obtained from the data.

Chapter 5: Discussion. This chapter presents the discussion on the findings through statistical analysis.

Chapter 6: Conclusion. This chapter concludes the study by summarising the findings and drawing conclusions. It provides proposals for future research and presents the contribution to the body of knowledge and propositions.
2.0 Literature Review
In this chapter, the researcher reviewed existing literature related to the research questions, which were concerned with New Zealand primary schools' windows and doors and the ventilation processes within. This chapter is divided into four parts. The first part presents literature on New Zealand primary schools, which includes history of primary schools in NZ, design, numbers, laws/standards and decile system's. The second part presents literature concerned with natural ventilation and Indoor Air Quality, which includes definitions, laws, guidelines and processes. The third part presents literature on windows and doors, which includes their usage, security, durability, safety and importance. The fourth part presents a summary of the literature.

2.1 New Zealand Primary Schools
The first primary school in New Zealand was built in 1814, when the first European settlers arrived into the country shared an interest in education. Up until these missionaries arrived, Maori education had focused mainly on educating the older students and young adults. These settlers formalized educational ideas to create a Civilization Christian Maori Society (CCMS) which was schooling focused on children aged six to ten years old. One teacher could be in charge of a class with a hundred students at a time, with the help of monitors. Schooling became compulsory for Pākehā children that lived near a school in 1877 (May, 2005).

In 1878, schooling was controlled by three parties. The first was the Department of Education which was the governing body. The second was the Educational board, they were in charge of establishing new schools, employing and removing teachers and approving inspections in schools. The third was the school committees which had 7 members in each school that were elected annually. School committees were in charge of maintaining educational matters in schools as well as implementing recommendations made by the Educational boards (Knudson, 2014).

During the period of First World War (1914 – 1918), the NZ educational system went through a stationary period. New school projects were cancelled and employee salaries were reduced. This was part of the economic downturn, post the war, that NZ was experiencing in 1920. After World War II (1945), the NZ population grew dramatically and by 1951 the number of children between the ages of 5 to 9 had increased to 240,583 from 58,886. This posed a potential problem for the NZ educational system, and it was vital for new classrooms to be built (Knudson, 2014). Therefore, a majority of primary school in NZ are built after World War II.

These classrooms were designed for traditional teaching methods where teachers would stand in front of the classroom to teach and the children would be seated in rows of desks (Alsaif, 2011). Classrooms were all designed in a similar linear model, placed next to each other and had a corridor running along one side. They were rectangular in shape with large single glazed windows to allow for natural lighting and depend on open windows for ventilation.
The Education Act introduced in 1990 states that each school have a Board of Trustees or BOT (formally known as the school committees). The Ministry of Education provides a structure and budget for each school however the BOT for each school is responsible for school budgets and property. The BOT typically includes 5 to 7 members, which include the school principal, a staff member and elected parents. The renovation and maintenance of school buildings and property is the responsibility of the school staff and the community. The operation and management of schools is shared by the MOE and the BOT. In other words, the MOE are the owners of the schools and the schools BOT are the administrators (O’Rourke, 1992).

Primary classrooms in NZ are designed for children between the ages of 5-13 years old. The primary school can be three different types. The first type is a full primary school which includes year 1 to 8. The second type is a contributing school which includes year 1 to 6. The third type is an intermediate school which includes year 7 and 8. The total number of all the three primary schools types in July 2014 was 1,961. This has slightly dropped from 2009 where it was 2,029 (Counts, 2015). These schools are ranked into decile groups that rank from decile 1 to decile 10, (10 being the highest). The ranking system indicates the children’s families’ socio-economic background. So a school that is ranked with a decile rating of 1, draws it students from the lowest 10% of low socio-economic communities. The decile rating method is used by the Ministry of Education to allocate funding (MOE, 2015). The schools decile rankings gets reviewed every 5 years, however a school can apply to have it reviewed from time to time if they consider the socio-economic of the community has changed.

From when primary schools were first built in NZ until now, the classrooms have typically been constructed from lightweight timber, are rectangular in shape, single storey and small. The MOE provided a series of guidelines for schools and BOT. These guidelines contain air quality and ventilation, heating and insulation, acoustics, lighting and interior guidelines. These guidelines provide information and examples about classroom shape and size, physical needs and internal layouts (BRANZ, 2007). According to these guidelines, the recommended classroom size is 65 m² for teaching, with an additional 20 m² for toilets, a cloakroom or storage areas (MOE, 2010). As shown in the figure below (Figure 1), the minimum ventilation rate for teaching spaces for an average classroom of 30 people is 8 litres per second per person. This equates to about four complete air changes per hour.
These classrooms only receive natural ventilation through opened windows and doors; this however, creates an issue when they are closed. It is vital that classrooms collect fresh air circulation to expel the build-up of CO₂ which will help to maintain an adequate learning environment. These primary schools have sustainably performed well over the years. However, socially they have arguably performed not so well.

### 2.2 Natural Ventilation and Indoor Air Quality

Natural ventilation is a passive supply and removal of air, where the air movement is driven by wind and temperature differences through openings such as windows and doors. Natural ventilation in cold weather can lead to huge heat losses. It can also lead to coldness, wind draughts and increased heating costs. An adequate level of ventilation will require an increase in heat input to maintain a comfortable temperature in the classroom (BRANZ, 2007). Ventilation and Indoor Air Quality (IAQ) are linked because a good level of ventilation is one of the main methods of controlling IAQ. Outside air is not always the perfect solution to ventilate classrooms. External pollutants can sometimes contaminate the air so schools need to be aware of contaminants such as: kitchen and incinerator discharges, gasses and smells from nearby waste water systems, discharges from solid fuel burners or motor car emissions. A National Environmental Standard for air quality came in to effect in October 2006, and now requires schools to have resource consents before using incinerators or burying school waste on school grounds (Government, 2006).

A study conducted by BRANZ (2007) found that in 12 naturally ventilated classrooms in NZ, air contaminants presented fungi and bacteria related to damp conditions in some classrooms. CO₂ levels were also measured and often above the recommended standard. It also found that the ventilation rates were usually below the levels set for mechanically ventilated buildings. Volatile Organic Components (VOCs) were also at an unacceptable rate.

<table>
<thead>
<tr>
<th>Type of space</th>
<th>Number of people</th>
<th>Fresh air requirement (litres per second per person)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td>Laboratories</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Art, design, and technology</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Libraries</td>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>Multi-purpose halls</td>
<td>150</td>
<td>8</td>
</tr>
<tr>
<td>Gyms</td>
<td>30</td>
<td>10–13</td>
</tr>
</tbody>
</table>

*Figure 1: Minimum ventilation rate for teaching spaces (BRANZ, 2007)*

Note (1) This table has been adapted from Table 2 of NZS 4303:1990.

(2) Laboratories must comply with the Hazardous Substances (Exempt Laboratories) Regulations 2001.
IAQ can be identified through bad smells such as body odours, smells from faulty drains, gasses from un-flued heaters, gasses from paint, printers or cleaning products, musty odours from dust and mould. These smells can be noticed to various people at different degrees. It can cause some occupants to have allergic reactions, even if they cannot smell them. Human’s sense of smell can becomes desensitised after exposure to toxic gasses.

### 2.2.1 Relative Humidity Levels in Classrooms

Relative Humidity (RH) is the water vapour ratio that is present in the air compared to the total amount of vapour the air can actually hold if completely saturated. RH is expressed as a percentage. A high level of RH supports the growth and survival of indoor allergens including moulds and bacteria. However, a low level of RH can affect occupant’s skins and eyes by drying them out. The World Health Organisation (WHO) has a recommended RH level of 40% to 60%. This level complies with comfort levels and minimizes the growth of indoor allergens (Sterling, Arundel, & Sterling, 1985). In the McIntosh (2011) Study on Indoor Air Quality in 35 Wellington primary schools, it found that in 11 out of the 35 classrooms, during 60% of the school hours, the RH levels were exceeding 60%.

### 2.2.2 Carbon Dioxide Levels in Classrooms

Carbon Dioxide (CO₂) levels are often seen as good indicator to measure IAQ. CO₂ is a colourless, odourless gas that is vital to plant life on earth. It is produced in the respiration system from humans and animals. As shown below in Figure 2, an adequate level of CO₂ in a classrooms is about 600-800 parts per million (ppm). Anything over 1,000 ppm indicates that the level of IAQ is not acceptable or recommended (Ashrae & Standard, 2007). The figure below that was prepared by BRANZ for the Ministry of Education shows the different levels of passive ventilation in classrooms.

![Figure 2: Carbon Dioxide as an indicator of classroom ventilation (Ministry of Education, 2015).](image)

A NZ study found that in 12 out of 35 naturally ventilated classrooms, the average level of CO₂ was over 1,000 ppm during school hours 50% of the time (McIntosh, 2011). Another NZ study found that in 4 out of 5 naturally ventilated classrooms, the average level of CO₂ was also above 1,000 ppm (Cutler-Welsh, 2006). Both studies concluded that the natural ventilation in classrooms failed to reach a recommended CO₂ level. However, this could be achieved in mechanically ventilated classrooms.
2.3 Windows and Doors Use in Schools

In a BRANZ (2007) report that was developed for the Ministry of Education NZ titled “Designing Quality Learning Spaces: Heating and Insulation” it states that on an ideal summer day, windows and doors in classrooms can provide a satisfactory level of passive ventilation as shown in the figure below (Figure 3):

![Figure 3: Natural Ventilation on an ideal summer day (Ministry of Education, 2015).](image)

However, in Figure 4, shown below, it demonstrates that on days when it is too cold, and the windows and doors are kept shut in an attempt to keep the heat in, natural ventilation fails.

![Figure 4: Natural Ventilation on a very cold day (Ministry of Education, 2015).](image)

Windy days also obstruct passive ventilation because the windows and doors are closed in an attempt to prevent air draughts as shown in Figure 4 above. Also, if there are too many pupils in the room, and/ or there is an insufficient amount of windows in the classroom, passive ventilation fails. BRANZ recommend that outside opening doors in classrooms should be relied on for ventilation because they are often kept closed because of the weather (BRANZ, 2007).

The BRANZ report suggests that the design of windows in classrooms should include means to allow ventilation for all types of weather. These windows should include trickle ventilators that allow ventilation through all the time. These are a good security feature as the actual window does not have to be opened for the ventilators to be in use. It also suggests small windows at high levels for windy days. Small windows at bench heights are also recommended however these may need to be closed on windy days so they don’t blow away writing materials and stationery. These windows still need to be at levels where opening and closing catches are at reasonable reach heights.
2.4 Summary
The section on New Zealand primary schools indicates that the majority of classrooms, and schools, were constructed during 1950's and 1960's. It demonstrates that the classrooms were designed in a linear style where students sit in rows of desks facing the front of the class and the teacher. Classrooms were constructed from lightweight timber, are rectangular in shape, single storey and small in size. These classrooms had large single glazed windows and dependent on opened windows for ventilation. The section also defines how New Zealand schools are assigned a decile rating, which indicates the socio-economic background of the families of the students in each school. The lower the socio-economic background of the students families, equates to the lower the decile rating. This however means higher government funding for the school, as opposed to the higher rating schools that receive less government funding.

The section on natural ventilation and Indoor Air Quality has emphasized that the ventilation rate, RH, CO₂ levels in naturally ventilated classrooms fails to meet the appropriate guidelines. Natural ventilation relies on driving wind forces which are not fully controllable and hence a close control of the classroom is difficult. An increase in natural ventilation during winter will negatively impact the indoor temperature levels. However, a low level of ventilation can lead to an increase in RH and CO₂. Almost all primary school classrooms in NZ are naturally ventilated in winter with poor IAQ rates which is not acceptable.

The last section of the literature review relating to the use of windows and doors in school has stressed how important it is that these outlets must be opened to allow for fresh air ventilation, in both summer and winter. In addition, recommendations by BRANZ were listed in order to reach appropriate ventilation levels.

2.5 Research Strategy
The first step to collecting this data is studying and analysing existing windows and doors in New Zealand primary classrooms and gaining knowledge from their key operators, teachers and caretakers. This present study could, therefore introduce school teachers and caretakers with the knowledge and importance of adequate ventilation levels and Indoor Air Quality through the opening of windows and doors. Caretakers could also benefit from this study to enable them to operate and maintain the existing windows and doors in their schools. Subsequently, it could also provide guidelines and design standards for educational and learning environments. The next chapter presents the chosen methodology to carry out this research study.
3.0 Methodology
This chapter discusses the methodology of this research study and the basis behind using it. It also presents the research design utilised and the sample and data collection processes. This is followed by the analytical methods used to analyse the data obtained. Finally, issues regarding ethical considerations were also described.

3.1 Research Approach
It is vital in any project to have methodological processes that are both well suited to the purposes of the project and are able to systematically answer research questions (Creswell, 1994). The two most used methods for answering a research question are: quantitative and qualitative methods.

Quantitative methods: are objective and systematic methods that include collecting and analysing numerical data through subjecting them to statistical tests (Creswell, 1994).

Qualitative methods: are subjective methods that include analysing and reflecting on perceptions in the purpose of gaining understanding of a social or human phenomenon (Creswell, 1994). The choice between these methods is dependent on the researcher and the research questions that they are attempting to answer (Yin, 2011). In this study, the researcher selected quantitative research as a study methodology.

Both primary and secondary data were collected and both are suitable to obtain the data for this study. Primary data was collected directly from questionnaires, while secondary data were collected, for more general purposes, mainly through the Internet and journal articles. By exploring and combining information from different sources, data were cross-examined; therefore reducing the impact of potential bias (Yin, 2011).

Quantitative Research Design
Quantitative research is a data-led approach that delivers a measure of what participants think from a statistical and numerical point of view.

3.2 Method of Data Collection and Justification
Bryman and Bell (2015) stated, “To understand the research area more in detail, empirical data must be collected”. Primary and secondary data are two types of empirical data. In this study, both primary and secondary data were used and collected.

No primary data existed before this study and was collected specifically to satisfy the objectives of this study (Bryman & Bell, 2015). Face to face questionnaires between the researcher and the participants were used to collect the data. However, secondary data is information that existed before this study was undertaken (Bryman & Bell, 2015). In this study, secondary data was mainly collected through Internet sources, journal articles and literature books. The use of both primary and secondary data
increases the validity and subsequently prevents the dependence on a singular approach (Bryman & Bell, 2015).

There are four main types of data collection methods: interviews, questionnaires, observations and documentations (Fisher, 2004). The collection method chosen for this study was questionnaires that are administered by face to face. Face to face questionnaires allow participants to convey their own perceptions and feeling towards the windows and doors in their school. This method allows for greater analysing of the data, as each school can be compared to one another. Participants will also be asked one or two open ended questions so they can discuss their thoughts and decision making process.

Questionnaires
The researcher believed that it was vital to administer the questionnaires directly to the teachers and caretakers because they are the ones who use the windows and doors in the classroom every day.

3.3 Target Population
The study has focused on primary schools in the area of Auckland, New Zealand. The sampling population in this study will be primary school teachers and caretakers that maintain the primary schools. The study will be focused on 20 schools that have a low-decile rating (1-5).

The reason that primary schools only in Auckland have been chosen, are because the researcher live in Auckland and there is a limited time frame to complete the study. Both teachers and caretakers are chosen to participate because they have different views and usages of how windows and doors should be used in a school. The teachers will use the windows every day to allow ventilation into the classroom and the doors to gain entrance in and out of the classroom. The caretakers views will be towards security and making sure no intruders break in and durability to allow the windows and doors to function properly for everyday use.

Participants were contacted through schools admin via convenient sampling, then permission was obtained from school principals for their participation. Participants then had the option if they wanted to participate in the questionnaire. Depending on their answers, a meeting was scheduled with the participants at a location on school grounds, after hours, where no children were around.

Each questionnaire lasted approximately 15-20 minutes and consisted of the same core questions regarding the windows and doors. Complementary questions were added to suit, to further gain information on the use of windows and doors.

All questionnaires were transcribed form a hardcopy onto the computer so the data could be analysed.
3.4 Method of Data Analysis

After all the data is collected, it will be analysed using statistical software Microsoft Excel.

The research objectives below will be answered:

**Research Question 1:** How do teachers use windows and doors in NZ primary schools to improve ventilation?

To answer this Research Question, my objectives will be:

- To investigate how often the existing windows and doors get opened in terms of allowing air in and out and the duration they are opened for whilst the classroom is occupied
- To investigate the ease of use and performance of these windows and doors

**Research Question 2:** What are the needs in term of usability, durability and security of windows and doors in existing classrooms?

To answer this Research Question, my objectives will be:

- To extend the body of knowledge around product use and provide recommendations and suggestions for the ministry of education and NZ schools.
- To examine the durability and security of windows that have been in place since the World War II era

3.5 Ethical Considerations

Participants will be approached by the researcher after visiting their primary schools and asking permission from the school principal to talk to (A) a caretaker and (B) a teacher. The information sheet and participant consent were developed to satisfy the issued regarding ethics and they were provided to the participants to read and sign should they agree to participate. It costs nothing for the participant’s to be involved in this research. Participants will not be compensated by payments or gifts for after agreeing to take part in this research. Participants will not be compensated by payments or gifts for after agreeing to take part in this study. It will take roughly around 15-20 minutes of the participant’s time, during winter 2015. The questionnaire will that the participants will answer will try probe the participants to express their thoughts and feelings towards the existing windows and doors in the classrooms and if there are any problems with the windows and doors such as size, shape or positioning. If participants agree to take part in the study, they are free to withdraw at any time. All participants’ details will be kept confidential throughout the study, and will be destroyed after 3 years. After school hours, the researcher will take pictures of classrooms with no children being present. The participants will suffer no risk of harm or discomfort from taking part in the questionnaire. All questions from the screening questionnaire are answered no, in section A and B, therefore this will be a low risk research project. The nature of harm in this project is very minimal, and is no more than what is normally encountered in everyday life. The Ethics application, as well as the Screening Questionnaire is attached in Appendix C.

3.6 Section Summary

The methodology chapters set out in detail the methodology used in the data collection. It explains methods used to evaluate and identify any failures in windows and doors, in NZ primary schools. In order to understand failures fully, components of durability and natural ventilation were evaluated. As this research was undertaken from a ‘user perspective’, the methods established were to develop a solution to the existing windows and doors.
4.0 Results
This chapter presents the results of the data collected from the face to face questionnaire responses as well as secondary data. These findings were essential in order to answer the research questions relating to air ventilation and the usability, durability and security of windows and doors in NZ primary schools. The findings are grouped into three divisions namely, general overview, ventilation, and performance.

4.1 General overview
This section presents an overview of the set-ups related to this research study. It is divided into three sub topics: schools, teachers and caretakers, and lastly classrooms.

4.1.1 Schools
In this study, 20 low-decile primary schools were involved. The location of these schools is noted figure below (Figure 5), where the blue dot denotes to the location.

![Figure 5: Map of Auckland with selected primary schools in blue](image_url)
The table below (Table 1) presents the decile ratings of the involved schools, which vary from decile 1 to decile 5, with the average decile rating of 2.6. The number of students in each school is also shown. The number of students ranges from 108 and 790 with an average of 419 students.

<table>
<thead>
<tr>
<th>School</th>
<th>Decile</th>
<th>Roll</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>354</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>209</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>432</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>210</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>137</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>335</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>108</td>
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<tr>
<td>8</td>
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<td>537</td>
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<td>551</td>
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<td>3</td>
<td>788</td>
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<tr>
<td>11</td>
<td>3</td>
<td>519</td>
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<tr>
<td>12</td>
<td>2</td>
<td>548</td>
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<tr>
<td>13</td>
<td>3</td>
<td>252</td>
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<tr>
<td>14</td>
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<td>397</td>
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<td>15</td>
<td>1</td>
<td>284</td>
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<tr>
<td>16</td>
<td>2</td>
<td>402</td>
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<td>17</td>
<td>1</td>
<td>564</td>
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<td>18</td>
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<td>585</td>
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<td>19</td>
<td>3</td>
<td>790</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
<td>372</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>2.6</td>
<td><strong>418.7</strong></td>
</tr>
</tbody>
</table>

Table 1: The decile rating of the surveyed schools and their roll of students.
4.1.2 Teachers and Caretakers
Overall, 20 teachers and caretakers were surveyed in this study. Each school was represented by one teacher and one caretaker. Due to fundamental differences in responsibilities between the teachers and caretakers, questions were tailored differently to obtain the most relevant responses. The framework of questions was in such that teachers were more focused on the overview and usage of windows and doors while caretakers asked about the details of maintenance and durability. The gender difference can be seen in Figure 6 below.

![Gender of the Teachers and Caretakers](image)

**Figure 6 Gender difference of the teachers and caretakers**

Figure 6 above displays that out of the 20 teachers who participated in the questionnaire, 85% were female and only 15% were male, while 95% of the caretakers were male and only 5% were female.

4.1.3 Classrooms
The date as to when the classrooms in each respective school was built is shown in the figure below.

![Years When the Classrooms Were Built](image)

**Figure 7 Age of the classrooms visited**
Figure 7 shows that most of the classrooms were built before the 1970s (over 60%) and over half were built over 50 years ago.

The researcher noted the number of windows and doors in each classroom visited which is displayed in the table below (Table 2). The table also includes the year group of the students that were in the classroom, as well as the number of students that occupied the classroom.

<table>
<thead>
<tr>
<th>School</th>
<th>Windows</th>
<th>Doors</th>
<th>Year</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>1</td>
<td>4, 5</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>2</td>
<td>5, 6</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>2</td>
<td>5, 6</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>1</td>
<td>2, 3</td>
<td>27</td>
</tr>
<tr>
<td>5</td>
<td>8</td>
<td>2</td>
<td>3, 4, 5, 6</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>2</td>
<td>3, 4</td>
<td>27</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
<td>2</td>
<td>5, 6</td>
<td>24</td>
</tr>
<tr>
<td>8</td>
<td>12</td>
<td>1</td>
<td>3, 4</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>2</td>
<td>1, 2</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>3</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>11</td>
<td>14</td>
<td>1</td>
<td>4, 5</td>
<td>30</td>
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<tr>
<td>12</td>
<td>18</td>
<td>2</td>
<td>3, 4</td>
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<td>3, 4</td>
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<td>4</td>
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<td>20</td>
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<tr>
<td>20</td>
<td>15</td>
<td>2</td>
<td>2, 3</td>
<td>29</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>13.95</strong></td>
<td><strong>1.85</strong></td>
<td><strong>3.35</strong></td>
<td><strong>25.85</strong></td>
</tr>
</tbody>
</table>

Table 2: A summary of number of windows and doors in each classroom visited as well as the number of students and the year group they belong to.

As shown in Table 2, the average number of windows and doors for each classroom was 14 and 2, respectively. In addition, the average number of students occupying the classroom was 26 and the year average year group of which the children were, was 3.

The figure below (Figure 8) demonstrates the Teachers opinions on whether there was a sufficient amount of sunlight entering their classroom.
When teachers were asked whether there is adequate sunlight entering their classrooms, 85% agreed with this statement as shown in Figure 8.

Classrooms were investigated for mould. The results are displayed in the figure below (Figure 9).

As shown in Figure 9, over half of the classrooms investigated (60%) contained no visible sighting of mould. However, 30% of the classrooms contained visible specks of mould. Surprisingly, 10% of the classrooms visited contained moderate patches of mould. One school was severely damaged by mould that the entire school is due to be demolished and re-built in the next two years. In that school, the classrooms that had severe amounts of mould were out of use and could not be visited and therefore were not considered within the survey.
4.2 Ventilation
This section presents the findings related to the ventilation processes in the classrooms inspected. Some of the data obtained within this section were obtained directly through questions to either teachers or caretakers. The figure below (Figure 10) specifies Mechanical ventilation types found.

![Mechanical Ventilation in Classrooms](image)

**Figure 10** Percentage of Mechanical ventilation present in classrooms

As shown in Figure 10, under a quarter of the classrooms investigated use HVAC system (20%) as a source for mechanical ventilation. The rest of the classrooms (80%) contained no means of mechanical ventilation systems.

Figure 11 depicts the heating systems found in the inspected classrooms.

![Heating Systems in Classrooms](image)

**Figure 11** Primary heating systems in classrooms

As shown in the figure above (Figure 11), 40% of the classrooms inspected contained wall mounted electric heaters. 20% of the classrooms had wall mounted heat pumps with a further 20% having wall
mounted gas heaters. 10% of the classrooms had central heating systems (radiator systems) and another 10% only had mobile electric heaters as their primary source of heating for the entire classroom. The figure below presents these findings.

As stated in the literature review section, windows and doors are used to allow fresh air to enter rooms. Teachers were asked whether the windows and doors in their classroom allowed for sufficient amounts of fresh air. This is shown below, in Figure 12.

![Current Windows and Doors Allow Sufficient Amounts of Fresh Air](image)

**Figure 12** The amount of incoming fresh air when windows and doors are opened

When teachers were asked if windows and doors allowed for adequate amounts of fresh air into the classroom when opened (Figure 12), 65% of them agreed that it is sufficient. 20% of teachers believed that their current windows and doors in do not allow sufficient amounts of fresh air.

Teachers were asked whether they opened the windows in their classroom every time they teach. This is shown in the figure below (Figure 13).
As shown in Figure 13, when teachers were asked whether or not they opened the windows during their classroom session, half of the teachers disagreed. 35% agreed that they did open the windows during their classroom sessions.

Caretakers were asked to comment on if they thought teachers and students do not open the windows enough. This is show in the figure below (Figure 14).

As show in the results above (Figure 14), 80% of caretakers agreed that teachers and students do not open the windows and doors appropriately in summer to allow for fresh air ventilation. On the other hand, 65% of caretakers also agreed that windows and doors do not get opened enough during winter.
Teachers were asked if they thought it was “smelly” in their classroom, especially after weekends or activities like lunchtime. This is shown in Figure 15.

When teachers were asked whether the classrooms were smelly, especially after weekends or activities like lunchtime, 80% agreed that they had an unpleasant smell, with 20% of those strongly agreeing with the statement above. This is further elaborated in the figure above (Figure 15).

Furthermore, the figure below (Figure 16) demonstrates caretaker’s opinion’s on when they were asked if they thought that the classrooms were “musty”.

As shown in Figure 16, 70% of caretakers agreed that classrooms were musty, especially after lunchtime breaks and weekends. 15% disagreed with this statement, and the remaining 15% neither agreed nor disagreed.
4.3 Performance
This section discusses the performance, in regards to acoustics, insulation, durability, safety and security and accessibility of the existing windows and doors. The data presented in this section were primarily obtained from caretakers; this is largely due to the maintenance factor associated with the caretaker's role. However, both caretakers and teachers rated this as an important topic.

When asked a general question on whether the windows and doors in most of the classrooms are outdated in terms of performance and ability to do their jobs adequately, caretakers responses are shown in the figure below (Figure 17).

![Figure 17 Windows and doors usage, in relation to their performance and ability to do their task](image)

Figure 17 demonstrates half of the caretakers surveyed agreed that the current windows and doors in their schools were outdated, with an additional 25% strongly believing with the above statement, whilst the remaining 25% disagreed.
In the classrooms inspected, door types were recorded and are shown in the figure below (Figure 18).

**Figure 18 Type of doors in classrooms**

As shown in Figure 18, all of the classrooms had hinged doors. Two classrooms also had sliding doors and only one classroom had bi-folding doors. All of the doors that contained glazing were all single-glazed. 85% of the glass was clear while 10% was tinted. The findings are further demonstrated in the figure below.

As well as door types, window types and materials were also recorded and are shown in the figure below (Figure 19).

**Figure 19 Type of windows in classrooms**

Figure 19 elaborates on window types. 45% of the classrooms contained timber joinery. 70% of all the classrooms investigated contained aluminium joinery. However, 15% of the classrooms contained both aluminium and timber joinery. Moreover, 85% of the classrooms had windows that were awning
10% that were casement (side hung). 15% of the classrooms contained sliding horizontal. Just over half of the classrooms (55%) contained louvered windows. All the windows in the classrooms surveyed were single-glazed glass, with 85% of them being clear and only 15% being tinted.

4.3.1 Acoustics
Teachers were asked if noise from the outside, affected if they chose to open the windows. There responses are shown in the figure below (Figure 20).

Figure 20 The noise from outside the classroom and whether it affects opening of windows during teaching hours

Figure 20 displays that 50% of teachers agreed that between the teaching hours of 9:00am and 3:00pm, Monday to Friday, noise from outside or surrounding classrooms enters and deters them from opening the windows. 30% of teachers disagreed with this, whilst 5% strongly disagreeing and stating that it does not affect the classroom. The remaining 20% neither agreed nor disagreed.
4.3.2 Insulation

The figure below (figure 21) demonstrates insulated areas in the classrooms investigated.

![Insulation in Classrooms](image)

Most of the classrooms examined contained no insulation (80%) and only 21% of the classrooms contained wall insulation. Only one classroom contained ceiling insulation (5%). One classroom had both ceiling and wall insulation. This is displayed above in Figure 20.

4.3.3 Durability

The figure below (Figure 22) demonstrates the ease of use, in terms of hardware mechanisms that teachers found in opening the current windows and doors in their classrooms.

!["Are The Current Windows and Doors Easy to Open?"](image)

When teachers and caretakers were questioned on the easiness of use of the current windows and doors in terms of hardware mechanisms, the results obtained exhibited a noticeable disparity.
Figure 22 displays that 40% of the participants agreed that the windows and doors are easy to open (with 5% strongly agreeing) while 55% stated that they think the contrary (with 10% strongly disagreeing).

In addition, caretakers were asked if all current windows and doors in their schools operated correctly. This is shown in the figure below (Figure 23).

Figure 23 The percentage to whether windows and doors in schools open and operate appropriately

Figure 23 displays that 65% of caretakers stated that the current windows and doors do not function accordingly or operate correctly. The remaining 35% agreed that all windows and doors in their school opened and operated appropriately.

Furthermore, caretakers were asked if all current window fasteners and door locks in their schools operated correctly. Their results are shown in Figure 24.
The figure above (Figure 24) shows that 70% of caretakers stated that not all of the current window fasteners and door locks operated correctly in their respective schools. The remaining 30% noted that the current fasteners and locks operate appropriately.

Caretakers were questioned if “locking the windows and doors is a simple exercise”. The results are displayed below in Figure 25.

Figure 25 demonstrates when caretakers were questioned on whether the process of locking the windows and doors to be a simple exercise, 65% agreed that it was a simple task. The remaining 35% disagreed with the statement.
Caretakers were asked whether commercial grade windows and doors were in used or installed in the classrooms. Figure 26 displays the results.

![Chart showing the presence of commercial grade windows and doors in schools.](Image)

**Figure 26** The presence of commercial grade windows and doors in schools

When participants were asked to whether commercial grade windows and doors were in used or installed in the classrooms (Figure 26), 75% stated that they were. 15% of caretakers stated that no commercial grade windows and doors had been installed. However, 10% of caretakers did not know whether or not any had been installed.

### 4.3.4 Safety and Security

The study’s participants were asked to comment on some aspects relating to safety and security. Teachers were also questioned about any accidents that occur when students walk in and out of classrooms as show in the figure below (Figure 27).

![Chart showing accidents caused by trip hazards.](Image)

**Figure 27** Accidents that occur when students walk in and out of classrooms
35% of teachers stated that doors do not possess a hazardous risk for students while walking in and out of classrooms as shown in the figure above (Figure 27). 65% of teachers, however, believe that accidents caused by trip hazards occur when walking in and out of classrooms.

Caretakers were asked if it was easy to break into classrooms through windows and doors. The figure below (Figure 28) displays their feelings.

As shown in Figure 28, a large number of caretakers (75%) agreed that it is easy to break into classrooms through the current windows and doors (20% of them being strongly agreeing). On the other hand, 25% of caretakers disagreed with this. This is presented in the figure below.
4.3.5 Accessibility

Caretakers were questioned on if all classrooms were easily accessible for students with limited mobility. The results are displayed in Figure 29 below.

Figure 29 The ease of accessibility into the classroom (through doors) for children with limited mobility such as people with wheelchairs

Figure 29 displays that In regards to accessibility, more than half of the caretakers (55%) agreed that doors in all classrooms made the accessibility for students with limited mobility (e.g. wheelchair or crutches) easy. Alternatively, 40% stated that the doors made access to the classrooms difficult for students with limited mobility.
4.4 Summary of the results

20 teachers and 20 caretakers participated within this questionnaire. The results showed that there were certain trends that are listed below:

- The majority of caretakers were Male
- The majority of teachers were Female
- The majority of the classrooms were built over 50 years ago and still had existing windows and doors
- All classrooms were poorly insulated
- There was only a small amount of classrooms that had mechanical ventilation
- Half the teachers did not open the windows every time they taught a class
- Caretakers thought that teachers and students did not open the windows and doors enough throughout summer and winter
- Caretakers mostly agreed that the windows and doors were outdated
- All glazing in the classrooms investigated were single-glazed glass panels
- Noise from the outside affected teachers opening windows
- Most of the windows and doors did not open and operate correctly according to caretakers
- Window fasteners and door locks did not operate correctly
- Locking the windows and doors was a simple exercise
- Most Caretakers agreed that it was easy to break into classroom through windows and doors
5.0 Discussion
The purposes of this study were to investigate whether the current windows and doors in New Zealand primary schools are outdated in terms of performance and ability to perform their stated tasks. This chapter presents a discussion that has been developed from the findings provided in the previous chapter. The discussion and result's interpretations are presented in relation to the literature and the research questions.

The literature review found that after World War II, the number of students attending primary school grew from 58,886 in 1945 to 240,583 in 1951 (Knudson, 2014). This meant that was a potential problem for the NZ educational system because there was a shortage of schools and classrooms to accommodate the dramatic rise in the population of children between 5-9 years old. Therefore, a large number of classrooms were built after the World War II (1939-1945) era to accommodate that dramatic rise in population of students in NZ. In our study, we found that 40% of the classrooms were built before 1959, and over half of these classrooms were built over 50 years ago. This was supportive of the literature review evidence. When teachers that participated in the study were asked if the current windows and doors in their classrooms were easy to use, over half disagreed. This could be due to the fact that over half of the classrooms in the study were over 50 years old.

As half of the classrooms that were included in this study were built over 50 years ago, they are most likely to be outdated in terms of performance and ability to do their job for a modern learning environment. Caretakers were asked if they thought the current windows and doors in their schools classrooms were outdated in terms of performance. Half of the caretakers agreed with this and a quarter strongly agreed that the windows and doors in their schools classrooms were outdated. This is supported by an investigation of the windows and doors which found that all of the classrooms contained single-glazed glass panels and 45% of the classrooms contained wooden joinery, which is an outdated joinery material and is now almost practically obsolete in commercial grade windows and doors. The single glazed glass panels found in the classrooms allow for too much heat transfer from one side of the glass to the other, with double-glazing windows the minimum industry standard nowadays. Double-glazed or even insulated glazing windows can affect heat loss and condensation, and will have an effect on noise transfer entering the classroom.

The literature review showed that all New Zealand primary classrooms were designed and built to depend on natural ventilation through the opening of windows and doors (McIntosh, 2011). The results in this study found that 80% of the classrooms did not have any type of mechanical ventilation and still depended on the opening of windows and doors for ventilation. Furthermore, the results showed that 50% of teachers did not open the windows every time they taught the class. This was also supported by caretakers who agreed that teachers and children did not open the windows and doors enough in summer and winter to allow for fresh air ventilation. As found in the literature review, CO₂ builds up when there is an inadequate amount of ventilation in the classroom. The results also found that when caretakers were asked if they thought the classrooms were “musty” especially after weekends and/or lunch time breaks, 70% agreed that they were. Likewise, a majority of teachers also
agreed that the classrooms were “smelly” especially after weekends or activities like lunchtime. The results support McIntosh (2011) who showed that CO₂ build up is due to a lack of ventilation in the classroom, was due to a lack of opened windows. It is therefore vital that at least some windows and doors are open so the classroom can collect fresh air circulation to expel the build-up of CO₂ (ASHRAE & Standard, 2007). Poor classroom layout and design could also be a part of the concern that there is not an adequate amount of fresh air circulation; however this was not investigated in this study. Although CO₂ was not measured or tested in this study due to time constraints, it was evident that teachers and caretakers believed that the classrooms were under ventilated. This was similar to results found in a study on a Canterbury primary school (Cutler-Welsh, 2006).

McIntosh et al (2011) found that the majority of Wellington primary school classrooms were built after the World War II era (1945) and included minimum or no insulation, which was the norm around that period. The classrooms were heated separately, the most economical way possible. The results of this study in Auckland found that over half of the classrooms were also built around the World War II era, over 50 years ago and over three quarters of the classrooms (80%) did not contain any insulation and only 20% of the classroom contained wall insulation. The classrooms were also investigated for heating devices and 40% contained wall mounted electric heaters, with 20% containing wall mounted heat pumps and another 20% with wall mounted gas heaters. The remaining 20% of classrooms that were investigated were split between central heating systems (10%) and mobile electric heaters (10%) as their primary source of heating. The results in this study were consistent to McIntosh (2011) study of the indoor air quality in 35 Wellington primary schools where little there was little insulation and poor heating systems found in the classrooms of the primary schools.

McIntosh et al (2011) found that NZ primary school classrooms had large single glazed windows to allow for as much natural lighting as possible. This study found that 85% of teachers agreed that there was sufficient amount of sunlight (natural lighting) entering the classroom. The only problem with this was that the large glass panels that allowed all the natural light to enter the classroom were single-glazed glass panels. This is supported by an investigation of the windows and doors in this study which found that all of the classrooms contained single-glazed glass panels. Half of the teachers in this study also agreed that outside noise prevented them from opening windows whilst they were teaching. The single-glazed glass panels found in the classrooms permit too much heat transfer from one side of the glass to the other, so attempting to heat up a classroom with large windows on a cold winter morning is almost an intolerable task as the heat from the inside is continually leaking to the outside through the single-glazed glass panels. The literature review found that the minimum standard in New Zealand learning environments is now double-glazed windows, which is thwarting future classrooms from having this problem. Double-glazed or even insulated glazing windows can positively affect heat loss and condensation in classroom, and will also have a positive effect on noise transfer. This could be a good solution to retro-fitting all outdated existing windows and doors in primary classrooms.
An interesting trend that was found was that in all of the schools that were investigated in this study, was that when teachers were asked if there current windows and doors allowed for adequate amounts of fresh air ventilation, over half of the participants agreed. This was interesting because over half of the teachers also agreed that they did not open the windows and doors every time they taught. This could mean that the teachers were not well educated in the importance of having some open windows and doors at all times to allow for natural fresh air ventilation. However, half of teachers agreed that noise from outside of the classroom deters them from opening windows because it will cause a distraction to their teaching sessions, so this could also be the reason for teachers not opening their windows and doors at all times.

When caretakers were asked if current windows and doors open and operate correctly, 65% disagreed. Caretakers were also asked if the window fasteners and door locks operate correctly and 70% disagreed. The pattern that was consistent was, all windows and doors that didn’t open and operate correctly, also had faulty window fasteners and door locks. This could also be due to the fact that all the windows and doors, their locks and fasteners were as old as the classrooms, and in most cases this was over 50 years old, so are probably over-used and faulty. However, contrary to this, caretakers mostly agreed (65%) that locking the windows and doors was an easy task. This is probably due to the fact that the caretakers lock the windows and doors every day and have become familiar and efficient with this repetitive task.

When caretakers were asked if access into classroom for children with limited mobility was an easy task, more than half agreed. There were some instances where it would almost be impossible for students with limited mobility to enter particular classrooms, but this was not seen as a problem because the school had the capacity to accommodate for this by moving the teachers and students into other classrooms with more suitable access. Teachers were asked whether accidents had occurred by students walking in and out of the classroom by trip hazards and 65% of them agreed. This was often due to a lack of visible indication of the trip hazard and lack of caution by the students. Three quarters of the schools involved in this study had commercial grade standard windows and doors installed to some part of the school, according to their caretakers.

5.1 Summary of the Discussion

The results of this study found that the current windows and doors in existing primary school classrooms are outdated and non-compliant to the standards of windows and doors today. The existing single glazed windows allow heat and noise transfer from outside the classroom into the inside. The classrooms also lack insulation and therefore teacher prefer to keep the windows and doors shut in an attempt to keep the heat in. This causes a lack of fresh air circulation throughout most of the day, which allows for CO₂ build up, and causes the classroom to become musty and smelly and is affecting the student’s health. This consequently leads to the students becoming sick, and therefore missing day(s) of school, which prevents them from learning.
6.0 Conclusion
The study explores and investigates the windows and doors currently in use in New Zealand primary schools and their overall performance. This chapter will present the overall conclusions based on the findings and discussions provided in previous chapters.

6.1 Overall findings

This study of windows and doors in 20 low-decile (1-5) primary school classrooms took place in Auckland, New Zealand, however the results could be generalised for the whole of New Zealand. This study was part of a larger study that included Francine Liaw, a fellow Quantity Surveying student, who focused on 20 high-decile (6-10) primary schools in Auckland, and Maxime Clozuet, an Engineering exchange student from France who focused on CO₂ levels and monitoring the duration that windows and doors in classrooms are opened. The overall findings of the study found that the current windows and doors in existing primary school classrooms are outdated and non-compliant to the standards of windows and doors today. The existing single glazed windows allow heat and noise transfer from outside the classroom into the inside. The classrooms also lack insulation and therefore teacher prefer to keep the windows and doors shut in an attempt to keep the heat in. This causes a lack of fresh air circulation throughout most of the day, which allows for CO₂ build up, and causes the classroom to become musty and smelly and is affecting the student’s health. This consequently leads to the students becoming sick, and therefore missing day(s) of school, which prevents them from learning. Therefore, there is a need for creating and maintaining a clean and healthy indoor environment in primary school classrooms.

6.2 limitations of the Study

There were constraints in this study that may have affected the findings and interpretation of the results. The sample size was smaller than ideal and could have had an influence on the outcomes. The selection of the study’s participants was not based on random sampling and thus not done in a traditional sampling approach. Time constraints also affected this number; however, the results obtained showed some clear trends that agree with previous literature. In addition, due to time constraints, the researcher was not able to involve other bodies such as the Ministry of Education or engineers to obtain their views on the subject matter.

6.3 Future Studies

From this present study, there are additional opportunities for future research. The propositions developed could be investigated further as theory testing. Further study could incorporate classroom layout and floor space size, materials, sizes and positions of the existing windows and doors. The amount and duration the windows and doors are opened and closed throughout the day could also be investigated to get a better understanding of the current use of the outlets within the classroom.
Whilst the scope of this research does not extend to designing healthy classrooms, it argues those minimum guidelines and enforced standards and limits for healthy buildings, both old and new, are necessary to maintain healthy indoor air environments for classrooms in New Zealand. Teachers and children health must not be affected by unsatisfactory surroundings. This study was set out to serve the boundaries for acceptable ventilation (natural) methods through the use of windows and doors, identifying performance methods and components that would best be suited in New Zealand primary school classrooms.
7.0 References


Yin, R. (2011). Qualitative research from start to finish. new york: Guilford Press.
Appendix A: Questionnaire

NAME OF PRIMARY SCHOOL: _____________________________________________________________
CLASSROOM NUMBER: __________________________________________________________________

SECTION A: BACKGROUND INFORMATION
The following questions are about you, your job description and your experience.

1. Name (Optional) ___________________________________________________________________

2. What is your gender?
   a) Male
   b) Female

3. How old are you?
   a) Under 30 years old
   b) 31 – 40 years old
   c) 41 – 50 years old
   d) 51 – 60 years old
   e) Over 60 years old

4. How many schools have you taught/worked in so far? ______________

5. How long have you been working in this school? ______________ years

6. How many years have you been teaching in total? ______________ years

7. Have you changed your perspective over the years regarding windows/doors opening and closing? YES NO

8. What year group are you teaching in? ______________

9. How many students are in this classroom? ______________

SECTION B: GENERAL QUESTIONS ABOUT THE CLASSROOM

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Absenteeism in my classroom is on the rise due to sickness/health issues.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. The windows have a lot of condensation on a cold winter morning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. It could be smelly in my classroom (especially after activities and after the weekends)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. There is sufficient sunlight entering my classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. During the teaching hours, the noise from outside enters the classroom and deters me from opening windows.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. The windows and doors are easy enough to open and close in terms of hardware mechanisms? e.g. handles, fasteners, locks.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>-----------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>16.</td>
<td>I open the windows each time I teach a class.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>17.</td>
<td>When the windows and doors are open, they allow enough fresh air in to make the classroom feel comfortable.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>18.</td>
<td>When the windows are open, they pose a risk to the safety of the children either internally or externally.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>19.</td>
<td>Windows can be opened even on windy days.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>20.</td>
<td>The doors are easily accessible for people with limited mobility for e.g. people in wheelchairs.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>21.</td>
<td>The right style of windows and doors are used to allow for a good level of ventilation.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>22.</td>
<td>IF THERE IS A THRESHOLD: Accidents caused by trip hazards (threshold) and falls do not occur (when walking in/out of the classroom).</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>23.</td>
<td>It is easy to break into classrooms through doors and windows.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>24.</td>
<td>IF THERE IS INVERTER HEAT PUMP: Do you use it in winter?</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>IF THERE IS INVERTER HEAT PUMP: Do you use it in summer?</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>If you're using the heat pump rather than opening the windows.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
</tr>
</tbody>
</table>

**Open-ended Question:**
27. What is the biggest problem with your windows and doors?

---

**Additional Comments and Suggestions:**

---

**END OF SURVEY**

**THANK YOU VERY MUCH FOR YOUR KIND PARTICIPATION AND CONTRIBUTION TO THIS RESEARCH.**
Questionnaire for Caretakers

NAME OF PRIMARY SCHOOL: .................................................................................................................................
CLASSROOM NUMBER: ...........................................................................................................................................

SECTION A: BACKGROUND INFORMATION
The following questions are about you, your job description and your experience.

1. Name (Optional).................................................................................................................................................

2. What is your gender?
   a) Male
   b) Female

3. How old are you?
   a) Under 30 years old
   b) 31 – 40 years old
   c) 41 – 50 years old
   d) 51 – 60 years old
   e) Over 60 years old

4. How many schools have you worked in so far? ____________

5. How long have you been working in this school? ________ years

6. When was this classroom built? ________

SECTION B: GENERAL QUESTIONS ABOUT THE CLASSROOM

7. The classrooms are musty (especially after activities and after the weekends). Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

8. Locking windows and doors throughout all classrooms is a simple exercise. Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

9. Do all window fasteners and door locks operate correctly?

10. Do all windows and doors open easily and correctly?

11. Do you know if Commercial grade windows and doors have been installed in your school?

12. How often do the door handles and window catches need to be replaced?

13. How many panes of glass are broken by students per year?

14. Who repairs your windows and doors?

15. Teachers and/or Children do not open the windows and doors enough in summer to allow for fresh air ventilation. Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Teachers and/or Children do not open the windows and doors enough in winter to allow for fresh air ventilation.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>17</td>
<td>The doors are easily accessible for people with limited mobility for e.g. people in wheelchairs.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>18</td>
<td>The windows have a lot of condensation on a cold winter morning.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>19</td>
<td>It is easy to break into classrooms through doors and windows.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>20</td>
<td>The windows and doors in most of the classrooms are outdated in terms of performance and ability to do their job.</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Neither Agree nor Disagree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
</tr>
</tbody>
</table>

**Open-ended Question:**
21. What is the biggest problem with your windows and doors?

________________________________________
________________________________________
________________________________________

**Additional Comments and Suggestions:**

________________________________________
________________________________________
________________________________________

**END OF SURVEY**

THANK YOU VERY MUCH FOR YOUR KIND PARTICIPATION AND CONTRIBUTION TO THIS RESEARCH.
Classroom Investigation

NAME OF PRIMARY SCHOOL: ________________________________
CLASSROOM NUMBER: ________________________________

Part 1: Heating
- Wall mounted electric heater
- Mobile electric heater
- Wall mounted heat pump
- Wall mounted gas heater
- Central heating system (radiator)

Part 2: Insulation (Type and Thickness)
- Walls
- Floor
- Ceiling

Part 3: Mechanical Ventilation
- Any fan extractor?
- HVAC

Part 4: Mould
- No visible mould
- Specks of mould
- Moderate mould patches
- Extensive covered areas

Part 5: Door (# _____)
- Any door threshold?
- Hinged Doors
- Sliding Doors
- Bi-Folding Doors
- French Doors
- Glass? Single/Double glazed?
- Tinted / Clear?
- Other

Part 6: Windows (# _____)
- Aluminium
- Timber
- Awning (Top Hung)
- Casement (Side Hung)
- Sliding Horizontal
- Sliding Vertical
- Louvres
- Glass? Single/Double glazed?
- Tinted / Clear?
- Other
Appendix B: Low Risk Notification

Massey University
Te Kneenga ki Pūrehuroa

NOTIFICATION OF LOW RISK RESEARCH/EVALUATION
INVOLVING HUMAN PARTICIPANTS

Staff researchers and supervisors are fully responsible for ensuring that the information in this form meets the requirements and guidelines for submission of a Low Risk Notification.

SECTION A:

1. Project Title
   Windows and Doors in Schools
  Projected start date: 01/05/2015
  Projected end date: 27/07/2015
   (Low risk notifications must not be submitted if recruitment and/or data collection has already begun)

2. Applicant Details (Select one box only and complete details)

   ACADEMIC STAFF NOTIFICATION
   Full Name of Staff Applicant(s) ____________________________
   School/Department/Institute ____________________________
   Region (mark one only) __________________________________
   Telephone ____________________________ Email Address ____________________________

   STUDENT NOTIFICATION
   Full Name of Student Applicant ____________________________
   Postal Address ____________________________
   Telephone 0211807689 Email Address fadi.gully@gmail.com
   Employer ____________________________
   Full Name of Supervisor(s) ____________________________
   School/Department/Institute ____________________________
   Region (mark one only) ____________________________
   Telephone 64 (09) 414 0890 ext. 84149 Email Address M.Boulie@massey.ac.nz

   GENERAL STAFF NOTIFICATION
   Full Name of Applicant ____________________________
   Region (mark one only) ____________________________
   Telephone ____________________________ Email Address ____________________________
   Full Name of Line Manager ____________________________
   Section ____________________________
   Telephone ____________________________ Email Address ____________________________
3. **Type of Project** *(provide detail as appropriate)*

<table>
<thead>
<tr>
<th>Staff Research/Evaluation:</th>
<th>Student Research:</th>
<th>If other, please specify:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Staff</td>
<td>Name of Qualification</td>
<td></td>
</tr>
<tr>
<td>General Staff</td>
<td>Credit Value of Research</td>
<td>(e.g. 30, 60, 90, 120, 240, 360)</td>
</tr>
<tr>
<td>Evaluation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Describe the process that has been used to discuss and analyse the ethical issues present in this project. *(Please refer to the Low Risk Guidelines on the Massey University Human Ethics Committee website)*

5. **Summary of Project**

Please outline the following *(in no more than 200 words)*:

1. The purpose of this research is to try and identify any possible cost effective methods to increase ventilation through the use of windows and doors in New Zealand Primary schools classrooms during winter, whilst trying to keep the heat indoors. This research will also try to identify if the windows and doors are outdated in terms of performance and if there are any issues such as; durability, safety or security issues, as well as the ease of use of the existing windows and doors in the classrooms. This research will focus on low-decile (1-5) rating primary schools within the Auckland area.

2. The methods I will use to conduct this research will be a quantitative questionnaire. I will be undertaking face to face questionnaires with Teachers (1) and Caretakers (2) from 20 different low decile primary schools within Auckland.

*(Note: ALL the information provided in the notification is potentially available if a request is made under the Official Information Act. In the event that a request is made, the University, in the first instance, would endeavour to satisfy that request by providing this summary. Please ensure that the language used is comprehensible to all)*

Please submit this Low Risk Notification *(with the completed Screening Questionnaire)* as follows:

1. For staff based at either the Palmerston North or Wellington campus; and students whose Chief Supervisor is based at either the Palmerston North or Wellington campus:

<table>
<thead>
<tr>
<th>External Mailing Address</th>
<th>Internal Mailing Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics Administrator</td>
<td>Ethics Administrator</td>
</tr>
<tr>
<td>Research Ethics Office</td>
<td>Research Ethics Office</td>
</tr>
<tr>
<td>Massey University</td>
<td>Courtyard Complex, P221</td>
</tr>
<tr>
<td>Private Bag 11222</td>
<td>Turitea</td>
</tr>
<tr>
<td>Palmerston North 4442</td>
<td>Palmerston North</td>
</tr>
</tbody>
</table>
2. For staff based at the Albany campus and students whose Chief Supervisor is based at the Albany campus:

External Mailing Address
- Ethics Administrator
- Research Ethics Office
- Massey University
- Private Bag 102904
- North Shore City 0745

Internal Mailing Address
- Ethics Administrator
- Research Ethics Office
- Room 1.29
- Study Centre
- Albany Campus

SECTION B: DECLARATION (Complete appropriate box)

ACADEMIC STAFF RESEARCH
Declaration for Academic Staff Applicant
I have read the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants. I understand my obligations and the rights of the participants. I agree to undertake the research as set out in the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants. My Head of Department/School/Institute knows that I am undertaking this research. I confirm that this submission meets the requirements set out in the Guidelines for Low Risk Notifications and that the information contained in this notification is to the very best of my knowledge accurate and not misleading.

Staff Applicant’s Signature

Date:

STUDENT RESEARCH
Declaration for Student Applicant
I have read the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants and discussed the ethical analysis with my Supervisor. I understand my obligations and the rights of the participants. I agree to undertake the research as set out in the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants. I confirm that this submission meets the requirements set out in the Guidelines for Low Risk Notifications and that the information contained in this notification is to the very best of my knowledge accurate and not misleading.

Student Applicant’s Signature

Date: 12/05/2015

Declaration for Supervisor
I have assisted the student in the ethical analysis of this project. As supervisor of this research I will ensure that the research is carried out according to the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participants. I confirm that this submission meets the requirements set out in the Guidelines for Low Risk Notifications.

Supervisor’s Signature

Date:

Print Name

---------
Appendix C: Screening Questionnaire

**Massey University**
Te Kūnenga ki Pūrehuroa

**SCREENING QUESTIONNAIRE**
**TO DETERMINE THE APPROVAL PROCEDURE**
*(Part A and Part B of this questionnaire must both be completed)*

<table>
<thead>
<tr>
<th>Name:</th>
<th>Fadi Gully</th>
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</thead>
<tbody>
<tr>
<td>Project Title:</td>
<td>Windows and Doors in Schools</td>
</tr>
</tbody>
</table>

This questionnaire should be completed following, or as part of, the discussion of ethical issues.

**Part A**
The statements below are being used to determine the risk of your project causing physical or psychological harm to participants and whether the nature of the harm is minimal and no more than is normally encountered in daily life. The degree of risk will then be used to determine the appropriate approval procedure.

If you are in any doubt you are encouraged to submit an application to one of the University’s ethics committees.

**Does your Project involve any of the following?**
*(Please answer all questions. Please circle either YES or NO for each question)*

**Risk of Harm**

<table>
<thead>
<tr>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Situations in which the researcher may be at risk of harm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Use of questionnaire or interview, whether or not it is anonymous which might reasonably be expected to cause discomfort, embarrassment, or psychological or spiritual harm to the participants.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Processes that are potentially disadvantageous to a person or group, such as the collection of information which may expose the person/group to discrimination.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Collection of information of illegal behaviour(s) gained during the research which could place the participants at risk of criminal or civil liability or be damaging to their financial standing, employability, professional or personal relationships.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Collection of blood, body fluid, tissue samples, or other samples.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Any form of exercise regime, physical examination, deprivation (e.g. sleep, dietary).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. The administration of any form of drug, medicine (other than in the course of standard medical procedure), placebo.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Physical pain, beyond mild discomfort.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Any Massey University teaching which involves the participation of Massey University students for the demonstration of procedures or phenomena which have a potential for harm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Informed and Voluntary Consent

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Participants whose identity is known to the researcher giving oral consent rather than written consent (if participants are anonymous you may answer No).</td>
<td>YES NO</td>
</tr>
<tr>
<td>11. Participants who are unable to give informed consent.</td>
<td>YES NO</td>
</tr>
<tr>
<td>12. Research on your own students/pupils.</td>
<td>YES NO</td>
</tr>
<tr>
<td>13. The participation of children (seven (7) years old or younger).</td>
<td>YES NO</td>
</tr>
<tr>
<td>14. The participation of children under sixteen (16) years old where active parental consent is not being sought.</td>
<td>YES NO</td>
</tr>
<tr>
<td>15. Participants who are in a dependent situation, such as those who are under custodial care, or residents of a hospital, nursing home or prison or patients highly dependent on medical care.</td>
<td>YES NO</td>
</tr>
<tr>
<td>16. Participants who are vulnerable.</td>
<td>YES NO</td>
</tr>
<tr>
<td>17. The use of previously collected identifiable personal information or research data for which there was no explicit consent for this research.</td>
<td>YES NO</td>
</tr>
<tr>
<td>18. The use of previously collected biological samples for which there was no explicit consent for this research.</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

### Privacy/Confidentiality Issue

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<td>19. Any evaluation of organisational services or practices where information of a personal nature may be collected and where participants or the organisation may be identified.</td>
<td>YES NO</td>
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### Deception

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<td>20. Deception of the participants, including concealment and covert observations.</td>
<td>YES NO</td>
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### Conflict of Interest

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<td>21. Conflict of interest situation for the researcher (e.g. is the researcher also the lecturer/teacher/treatment-provider/colleague or employer of the research participants or is there any other power relationship between the researcher and research participants?)</td>
<td>YES NO</td>
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### Compensation to Participants

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<td>22. Payments or other financial inducements (other than reasonable reimbursement of travel expenses or time) to participants.</td>
<td>YES NO</td>
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### Procedural

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<td>23. A requirement by an outside organisation (e.g. a funding organisation or a journal in which you wish to publish) for Massey University Human Ethics Committee approval.</td>
<td>YES NO</td>
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Part B

FOR PROPOSED HEALTH AND DISABILITY RESEARCH ONLY

Not all health and disability research requires review by a Health and Disability Ethics Committee (HDEC).

Your study is likely to require HDEC review if it involves:
- human participants recruited in their capacity as:
  - consumers of health or disability support services; or
  - relatives or caregivers of such consumers; or
  - volunteers in clinical trials; or
- human tissue; or
- health information.

In order to establish whether or not HDEC review is required: (i) read the Massey University Digest of the HDEC Scope of Review standard operating procedure; (ii) work through the ‘Does your study require HDEC review?’ flowchart; and (iii) answer Question 24 below.

If you are still unsure whether your project requires HDEC approval, please email the Ministry of Health for advice (hdecs@moh.govt.nz) and keep a copy of the response for your records.

24. Is HDEC review required for this study? YES NO

Select the appropriate procedure to be used (choose one option):

If you answer YES to any of the questions 1 to 23 (Part A) and NO to Q24 in Part B

↓

Prepare an application using the MUHEC Application Pack

If you answer YES to question 24 (Part B)

↓

Prepare an application using the Health & Disability Ethics Committee Application Form

If you answer NO to all of the questions in Parts A and B*

↓

Prepare a Low Risk Notification

*Note - researchers who are new to the University, new to research with human participants or have significant other reasons, are welcome to send in a full MUHEC application, even if the Screening Questionnaire questions have all been answered “no”.

GO BACK TO APPROVAL PROCEDURES, STEP 4, AND DOWNLOAD THE INFORMATION REQUIRED.