



PROMOTING CLIMATE LITERACY IN BRITISH COLUMBIA'S APPRENTICESHIP SYSTEM: Evaluating One Union's Efforts to Overcome Attitudinal Barriers to Low Carbon Construction



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Promoting Climate Literacy in British Columbia's Apprenticeship System: Evaluating One's Union Efforts to Overcome Attitudinal Barriers to Low Carbon Construction

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Abstract

Buildings account for a significant component of total energy consumption and are thus a critical target in lowering society's carbon footprint and mitigating climate change. While there has been considerable progress in developing new technologies, materials and building designs to achieve this goal, one key element of making buildings more energy efficient is too often overlooked: the competency and commitment of the workforce responsible for the building construction. There is considerable evidence of a significant gap between the needed skill sets for low carbon construction and the capacity of the training and apprenticeship systems to deliver appropriate skills – including climate literacy - to the construction workforce, both in Canada and internationally. Furthermore, an apparent gap exists in terms of interest and investment on the part of government, employers, and union leaders within the industry to encourage this type of training and, more importantly, implementation of this training on the work site.

This research paper examines the efforts of one building trades union to promote climate literacy within British Columbia (BC) via the classroom. The BC Insulators union has responsibility for training all mechanical insulation (MI) trades' workers in the province under an agreement with the BC government. It delivers the classroom training under contract with the province's largest public training college, the British Columbia Institute of Technology (BCIT). As part of its commitment to address sustainability and green construction practices within the industry, the union has introduced a 'Green Awareness' course to their apprenticeship program curriculum. The two-module course was introduced in 2011 and is taught over the course of the first two years of the four-year program.

After conducting a review of the 'Green Awareness' course content, the research team performed qualitative interviews with a cohort of 2nd and 4th year apprentices. The former cohort had, at the time of the interviews, received both modules of the new course. The fourth-year cohort, on the other hand, had completed most of their classroom training before the module had been fully refined. They therefore had not received the formal 'Green Awareness' training. The purpose of this research was to determine whether exposure to the new 'Green Awareness' course content influenced the apprentices' views on climate change, and whether they identified links between climate change, their performance as insulators, and the performance of the construction industry more broadly.

The interviews identified significant differences in the two cohorts' levels of understanding of the links between the construction industry, MI, and climate change. Degree of understanding and interest also varied depending on the sector in which the apprentice had employment experience and the specific types of projects on which they had worked. Significantly, apprentices identified a number of barriers to their ability to implement best practices and low carbon construction, including: lack of co-ordination between insulators and other trades; the absence of stringent inspection of finished work; pressure to complete tasks at the expense of quality work; and a more general pattern of industry indifference to implementing best practices and low carbon construction. These findings indicate the need for further refinements in the content and delivery of the 'Green Awareness' course material. The authors conclude that incorporating climate change-related course content into the training process is an important step

in fostering climate literacy within the industry and should be encouraged in other trades. However, its degree of impact will be limited unless more sweeping changes are made to the organization and culture of the construction industry itself.

Background

LINKING CLIMATE CHANGE, THE CONSTRUCTION INDUSTRY AND THE BC INSULATORS

Climate change and the impacts of global warming represent one of the biggest threats to the human population today (Intergovernmental Panel on Climate Change (IPCC), 2014). Limiting its impacts will require urgent action to reduce global green house gas (GHG) emissions. Buildings represent an important contributor to global climate change mitigation (European Commission, 2014; International Energy Agency (IEA), 2013; Stern, 2006). Buildings account for approximately 35% - 40% of energy use and are a major source of greenhouse gas (GHG) emissions in developed countries, primarily from burning natural gas, oil and other fossil fuels (IPCC 2014). In Canada, residential and commercial buildings account for 27% of domestic energy use and 23% of GHG emissions (Council of Canadian Academies (CCA), 2015; Natural Resources Canada (NRCan), 2016b). Due to their longevity, the carbon footprint of buildings constructed today will continue to affect global warming for generations into the future, underscoring the need to adopt aggressive low carbon practices as quickly as possible (Stern 2006; Lucon et. al (IPCC), 2014; CCA 2015; Frappe-Seneclauze and Kniewassser 2016; EIA 2016).

The construction industry, therefore, can play an important role in improving the energy efficiency of buildings (Woodbury et. al. 2008). However, current industry culture, organization, and practices all present complex and significant barriers to building reform (Calvert, 2015c; Calvert & Tallon, 2016). The construction industry in Canada - and particularly in the province of British Columbia (BC) – is characterized by a competitive, low bid culture that prioritizes short term cost cutting to obtain a quick return on investment, often at the expense of quality and energy performance (Calvert 2015a; Calvert 2015b). Climate change advocates have pointed to the need for much more extensive government regulation and industry oversight as essential to implementing effective climate mitigation practices within the industry (Clarke 2006; Beresford and Duffy 2016). While necessary, a top-down regulatory approach does not adequately address an important divide between building policy - and corresponding regulations - on the one hand, and the achievement of low carbon construction practices on job sites, on the other (Gleeson & Clarke, 2013).

In this context, the lived experiences and acquired knowledge of the construction workforce can offer important insights into where - and how - change needs to occur (Clarke 2006). Obtaining an understanding of construction issues on the ground, by those working on building sites, provides a different perspective on the challenges the industry faces in responding to climate change. However, this 'bottom-up' focus has received too little attention in the debate around how to 'green' the building industry in BC (BC Climate Action Plan 2007; BC Energy Efficiency Buildings Strategy, 2008; BC

Climate Leadership Plan, 2016). Consequently, the potential role that labour can play in asserting pressure from the opposite direction is rarely examined. Additionally, the voice of trade unions is largely absent – or ignored – in most discussions about mitigating climate change by governments, in the academic literature and in the media (Lipsig-Mummé 2010; Lipsig-Mummé 2013; Lipsig-Mummé and Stephen McBride 2015; IEA 2016). For example, Canada's Second Biennial Report on Climate Change does not mention unions or labour organizations at all (Canada 2016). However, there are examples of construction trades' unions promoting higher standards to mitigate climate impacts by promoting low carbon working practices that prioritize energy efficiency and sustainability (Calvert and Tallon 2016).

The BC Insulators (formally known as the Heat and Frost Insulators Local 118) is a Vancouver-based trade union that represents all unionized mechanical insulation (MI) workers in the province of BC. Members of the union are highly trained journeypersons with a Trades Qualification (TQ) based on a 4-year apprenticeship program and successful completion of Canada's Red Seal trades certification exam in MI. Certified mechanical insulators are responsible for the installation and maintenance of MI in heating, ventilation and air conditioning systems (HVAC) (National Insulation Association, 2009). HVAC systems use energy to heat or cool buildings. They circulate temperature-controlled air, water, or other fluids to maintain designated internal temperatures, or to service specific functions within buildings such as district heating systems or steam sterilization in hospitals. Proper application of MI is important to maximize the energy efficiency and longevity of HVAC systems (Graham, 2016; Kephelopoulos, Geiss et. al. 2016; BC Homeowner Protection Office 2015;). Missing, damaged or improperly installed MI can significantly reduce heating and cooling system efficiencies. It can also lead to adverse health effects as mould or other air-borne contaminants can easily develop in warm, damp environments containing organic material and circulate through air ducts, in extreme cases leading to 'sick building syndrome (US EPA 2000; Bluysen and Cox 2003; ISIAQ 2004; ASHRAE 2009). Furnaces, boilers and air conditioning systems are responsible for well over half the energy consumption of commercial and industrial buildings (NRCan, 2016). Consequently, the energy efficiency of HVAC installations has a critical impact on overall building energy consumption and GHG emissions.

The BC Insulators believe that many of the changes they have witnessed in the province's construction industry over the past three decades have undermined its capacity to perform their jobs to the best standards and practices, and to ensure maximum energy efficiency in buildings (HB Lanarc, 2010). They also recognize that this has direct implications for industry impact on climate change and the potential to mitigate the carbon footprint of buildings. Low-bid contracting and pressure to cut labour and material costs have sacrificed quality standards at the expense of the efficiency, longevity, and the overall quality of building projects. Furthermore, they believe that many industry stakeholders have a diminished understanding of – or interest in - the value of MI and, particularly, its potential to reducing energy consumption and GHG emissions in buildings.

To address these shortcomings, the BC Insulators launched a targeted awareness and action campaign, which came to be known as 'Green Jobs, Great Jobs' (HB Lanarc, 2011). This campaign, directed at industry, government and the broader public, sought to promote awareness of the role of

MI in achieving long-term energy savings. It also emphasized that these savings could be achieved with modest up-front investments during new construction (or retrofit), typically requiring less than 1% of the capital cost of a development project (HB Lanarc, 2010). This campaign deliberately linked quality MI standards and implementation practices with climate change objectives. To provide evidence in support of its campaign, the union commissioned new research on MI from a reputable engineering consulting firm, HB Lanarc. It used this evidence in its presentations to municipal governments on the need for higher provincial building code regulations. Simultaneously, it encouraged municipalities to require better MI standards in their contract tendering and it promoted the value of MI at numerous building industry conventions, provincially, nationally and in the US. These efforts have been extensively documented in an earlier paper. They provide the context for this research project (Calvert & Tallon, 2016).

As part of its overall campaign, the BC Insulators' identified apprenticeship training as a major opportunity to promote its climate agenda to young workers entering the construction industry. It believed that incorporating climate literacy into the apprenticeship curriculum could increase member awareness and, potentially, member commitment to achieving industry-leading standards of MI installation. This realization led the union leadership to consider incorporating a new climate change module into the classroom component of its MI apprenticeship program.

THE DEVELOPMENT OF THE 'GREEN AWARENESS' COURSE CONTENT

The BC Insulators have designed, implemented and now maintain the curriculum for the MI trade in BC, a role that is unusual for most building trades unions in BC. The program is a designated RED SEAL program, meeting national standards of excellence for the training and certification of skilled insulators. The provincial trades training program for mechanical insulators is offered through the British Columbia Institute of Technology (BCIT), a public educational institution. However, unlike most of BCIT's other trade programs, which are delivered by college staff, the BC Insulators have a contract with the college, whereby they hire their own program instructor and then rent classroom and workspace from BCIT. This allows them to control the course content and classroom delivery of the MI apprenticeship program. Control over the curriculum has enabled the union to introduce a new climate module to highlight the important role of its members' work in promoting sustainable, environmentally friendly, and 'green' construction practice.

The decision to introduce a 'Green Awareness' course content reflected the issues embodied in the union's broader climate campaign initiative. The BC Insulators drew upon the findings of a White Paper commissioned at the outset of what would become the 'Green Jobs, Great Jobs' campaign from the consulting engineering firm, HB Lanarc (HB Lanarc, 2010). The White Paper highlighted the substantial benefits in energy savings and, therefore, reduced GHG emissions resulting from implementing higher standards of MI. The Business Manager of the BC Insulators consulted with the union's chief apprenticeship instructor to determine how to adapt its climate change campaign material for inclusion in the four-year apprenticeship program. The curriculum development, therefore, began with the research already being used to support the union's broader campaign to link MI with climate change.

However, the module quickly evolved to include additional materials from internationally recognized climate research, including training materials from the US Green Building Council (USGBC).

The completed 'Green Awareness' course consists of two distinct modules. These are currently delivered over the course of the first two years of the apprenticeship program. In their first year, the apprentices receive training in LEED building design and construction basics. This is a one-day, eight-hour course, based on the USGBC's 'LEED 101: Green Building Basics and LEED'. LEED, or 'Leadership in Energy and Environmental Design' represents a universal green building rating system developed by the USGBC in 2000 (Berardi, 2012; Booz, Allen Hamilton 2015). It is currently the largest third-party verification program for green building and construction in Canada. The Canada Green Building Council (CGBC) has registered over 5000 LEED projects since 2004, so that the country now has the second highest number of LEED projects anywhere in the world. The USGBC promotes LEED as the international standard for excellence in environmentally sound buildings of all types, now recognized in over 160 countries. The rating system guides decision-making about sustainable choices in the design, construction, operation and maintenance of buildings. The system is based on set prerequisites and credits that a project must meet to be granted one of four possible rating levels: Certified, Silver, Gold and Platinum (CGBC 2015; CGBC 2016a; CGBC 2016b; USGBC 2017).

The LEED 101 course is the USGBC's introductory course. It is intended "for those who are new to green building and looking to learn the basics of green building and LEED" (USGBC, 2017). It covers the history and role of the USGBC, the purpose and features of LEED designations and its different credit categories. It also includes the concept of sustainability as it applies to green building practices, cost considerations, and examples of real projects. The course concludes with a group evaluation of a case study followed by an individual exam (see Appendix A. for module outline). Following successful completion of the course, apprentices receive their LEED 101 certificate. This credential signifies that the individual has demonstrated a "basic understanding of the intent, concepts and terms for each LEED credit category, as well as green building best practices, regulations and incentives."

The second component of the 'Green Awareness' training is another one-day, eight-hour module covered in the apprentice's second-year. Entitled 'Green in Mechanical Insulation', this course is intended to clarify the link between MI and energy conservation. It connects the trade to the definition of Green Jobs provided by the US Bureau of Labour Statistics (BLS). This content draws the connection between jobs and issues of environmental impact, resource consumption, and sustainability. It covers the history of the MI trade as an energy saving practice, as well as current advances in tools and materials that promote sustainability and enhance energy conservation. The module presents statistics that contextualize MI's carbon reduction potential by comparing it to the potential in other economic sectors like transportation, manufacturing and forestry where it is generally far more costly to achieve comparable reduction levels.

The module also presents the cost and energy-saving potential of properly installed MI relative to other energy-saving options available for buildings. It includes a workshop in the 3E-PLUS software program that calculates the appropriate thickness of insulation required for a given application. The program inputs factors such as heating fuel expenditures, materials, installation costs, tax rates, maintenance,

and other economic factors. However, its developers emphasize that it can also be used to estimate greenhouse gas emissions and the corresponding reductions associated with a given insulation application. It therefore mirrors the union's green training material, which attempts to balance the economic and environmental benefits associated with MI. Like the LEED 101 module, this module concludes with an exam to ensure that apprentices understand the information presented (see Appendix B for module outline).

The union intended to implement the complete 'Green Awareness' course, including both modules, in 2011. However, one of the challenges associated with introducing these two modules was that the classroom course content of the apprenticeship program is already very full. Mechanical insulation apprentices receive only one full month of classroom training in each of their 4 years, for a grand total of 480 classroom hours. In comparison, plumbing apprentices at BCIT can expect 780 hours for in-class training. As a rule, MI apprentices in BC are allotted considerably less time than other trades for program training, including in the classroom. Both apprentices and the program instructor have voiced concerns that this is a serious challenge in enabling apprentices to learn the full scope of the trade. The union's commitment to add 'Green Awareness' training to an already condensed curriculum therefore created some tension in terms of balancing course requirements. Particularly relevant is the fact that the Red Seal certification exam does not include a climate change component. During the first year of implementation, only the LEED 101 module was introduced while these tensions were being negotiated. At the outset of the research project, the researchers were not aware of the delay in introducing the full new 'Green Awareness' course. Nor were they aware that it was being phased in incrementally as two modules over the first two years of classroom training. Rather, this only became clear during the first round of interviews with the fourth-year apprentices. As a result, the research project provided a unique opportunity to mark changes in apprentice responses according to their degree of exposure to the curriculum.

The union believed that adding these two new modules as a 'Green Awareness' training component to the apprentice curriculum would increase apprentice literacy around issues of sustainability and energy efficiency. It also hoped that the next generation of mechanical insulators would understand - and identify with - its campaign to promote the role of the trade as a "green job", with an important role to play in increasing energy performance and reducing GHG emissions in the construction industry. The BC Insulators' Business Manager - who was behind the push to initiate the 'Green Jobs, Great Jobs' campaign - expressed in an interview an additional, deeper meaning behind the inclusion of the 'Green Awareness' course (L. Loftus, personal communication, March 11, 2016). He felt it could foster a stronger sense of pride in the work of the trade and a drive to do the job well by implementing best standards and practices. Drawing on his over forty years of experience in the union, he felt that the trade was being pushed away from a standard of excellence as a result of industry cost cutting and a failure to appreciate the importance of proper installation of MI.

"I'm trying to instill that pride back into people; this really is a skill set, this is really something you can be proud of. Because what you're doing doesn't just give you a pay check, it actually provides an advantage to the community and an advantage to the environment." ~ BC Insulators Business Manager

The union leadership also believed that the 'Green Jobs, Great Jobs' campaign message might attract more young people to the trade by underscoring its positive contribution to mitigating climate change. Promoting the image of MI as an environmentally friendly trade would thus assist the union in recruiting apprentice insulators. The leadership also hoped that promoting the significance of sustainable construction practices and the substantial impact building design and construction can have on energy consumption and GHG emissions would encourage its apprentices to become environmental ambassadors. Ideally, they could become promoters of best practices and standards for MI both within the MI trade and throughout the construction industry. This could lead other trades to appreciate, more fully, the value of MI as well as changing the views of industry professionals and contractors. The union's goal was a more enthusiastic, motivated, and well-informed workforce; and the opportunity to contribute to a cultural shift in industry practices and priorities towards a more climate literate workforce through its apprenticeship program.

Research Objectives

This research project was designed to explore the impact of the introduction of the 'Green Awareness' course. Particularly, to determine whether exposure to the curriculum impacts apprentices' views on climate change issues and, specifically, how these issues relate to their trade and the construction industry as a whole. As noted earlier, evaluating the new training module is connected to a larger research initiative intended to assess the union's 'Green Jobs, Great Jobs' campaign. The purpose of this specific research project has been to gain a better understanding of the apprentices' experience within the MI apprenticeship program at BCIT through a semi-structured interview process. Their program experience encompasses not only their in-class training and shop work, but also their employment experiences out in the field, working as part of the construction industry in BC. Consequently, the research also assessed the extent to which what they learned about climate issues in the classroom was – or was not – reflected in their on-the-job experience. More specifically, the goals of this research project were to:

- Evaluate the overall apprentice experience both in the classroom and on-the-job, to determine what aspects of the training are working well (or not) and how it might be improved;
- Determine how apprentices feel about the current state of the construction industry and how they feel they, as mechanical insulators, are positioned within the industry;
- Determine the extent to which the new 'Green Awareness' course content has had an impact on apprentices' attitudes and understanding of how they perform their work as a mechanical insulator and as a member of the industry;
- Determine to what extent the new 'Green Awareness' course content has impacted their broader climate literacy and their understanding of environmental issues;
- Identify barriers to the achievement of climate literacy, including impediments to the implementation of associated skills and knowledge in the workplace, and commitment within the

- industry to low carbon construction and;
- Develop recommendations for overcoming these barriers in the classroom, on the job site and in the wider organization and culture of the industry.

Methods

This research process involved a qualitative review of the 'Green Awareness' course materials followed by qualitative interviews of apprentices enrolled in two different classroom cohorts (second- and fourth-year) during the spring 2016 classroom training sessions. The researchers developed their interview materials at the outset of the project, which were approved by both the Simon Fraser University's and the BC Institute of Technology's ethics review boards. The interview questions were designed to target three key areas of interest to the research. The first section focused on establishing basic demographic information as well as a general history of the apprentice's work experience within the broader construction industry, within the MI trade specifically, and as part of the apprentice program. The second section explored their experience with the classroom component of the apprenticeship program at BCIT. The third section then focused in on the history and nature of their employment within the apprentice program specifically. The fourth, and final section sought to investigate apprentices' understanding, attitudes, and opinions of how climate change and environmental issues were addressed through their classroom training as well as out in the field as part of their trade and as part of the construction industry more broadly. The interview consisted of 25 questions in total.

The researchers intended that the interview process would take approximately an hour, including conducting the informed consent process. They conducted the fourth-year apprentice interviews first, in April 2016, during their final week of classes. They took place just before the apprentices were writing their Red Seal exam and completing their training program. The interviews were conducted during class hours, over the course of an open study period and held in a private office space adjacent to the classroom. Following these interviews, the researchers decided to pursue an additional round of interviews with the second-year apprentices. These interviews were conducted approximately one month following the fourth-year interviews, after ethics approval had been obtained. The researchers carried out the second-year interviews during workshop hours in the instructor's private office adjacent to the shop space.

The interview sessions began by having the MI instructor introduce the Research Assistant to the respective cohort of apprentices during classroom hours. At this time, the Research Assistant provided a brief explanation of the research project, including the research objectives and the nature of the interview process. Interviews were entirely voluntary and this was made clear from the outset. The instructor served as the liaison with the class by soliciting those apprentices interested in participating and coordinating their interview order. While this was occurring, the Research Assistant was located in a spare, private office space. Consequently, the Research Assistant was not directly involved in recruiting participants. A total of seven fourth-year and eight second-year apprentices consented

to be interviewed. Each signed a consent form. Copies of the consent forms were provided to all participants.

The interviews were audio-recorded and all recordings were transferred to a password-protected computer for storage. The interview content was transcribed. Neither recordings, nor transcription documents contained the names of the participants and the researchers eliminated any identifiers (of organizations, employers, peers, or instructors) from the transcripts. Interviewee's identities were linked to interview numbers, which were recorded only on the original hard copy documents from their interviews (the question list and consent form). All documents associated with the data collection process will continue to be stored in a locked facility for a period of two years following study completion, according to the ethics agreement.

Both the decision to conduct the interviews and the context in which they were developed were informed by the results of the previous research project that described and evaluated the BC Insulators' overall 'Green Jobs, Great Jobs' campaign (Calvert & Tallon, 2016). This research included "expert" interviews with the BC Insulator's Business Manager, the Apprenticeship Program Instructor and other union officials. This earlier study provided the framework for the development of the current research project on the 'Green Awareness' course. The union viewed its decision to introduce the climate change module into the apprenticeship program as an important component of its larger campaign to 'green' the industry, raising the question of whether this addition was contributing to the overall campaign objectives.

Analysis

The Research Assistant was responsible for the transcription and analysis of the interview content. A detailed, thematic analysis was performed on the transcribed interview content. The initial analysis involved a complete review of both sets of transcripts separately. For each set of transcripts, all the interviewees' verbatim responses were pasted into a spreadsheet and grouped together by question. For each question, the collection of responses was then explored, line-by-line, for emergent sub-themes. Full quotations that were felt to best summarize the concept behind a sub-theme were also captured at this time and are shared in the findings. In the secondary analysis, sub-themes that had emerged within each class were then compared across the two classes, question-by-question. In this comparison, differences and similarities that emerged across the two classes in terms of sub-theme content were assessed. Similar sub-themes were then grouped together under a major topic heading. These major topics, or main themes, provide the organizing structure for the discussion of the findings. Each sub-theme is explored as part of a major theme and according to both similarities and differences in opinions expressed within, as well as across the two classes. The principle investigator then reviewed the findings from this analysis. Challenges regarding the research and review process and any limitations are discussed in a later section.

Research Findings

Several major themes emerged in the findings of the apprentice interviews. Encompassed within these themes are emergent subthemes representing telling differences in apprentices' attitudes, understanding and opinions regarding not only the content and delivery of the apprentice curriculum itself, but also about the realities of their in-field training, their work in the trade, the role of green or environmentally-friendly practices in their trade and in the industry, and the potential to change current industry culture and practices. Some of these sub-themes demonstrate a distinct split in perspectives or opinions amongst members of the same class. This split often emerges along the lines of differences in work experience, for example whether the interviewee has experience in the industrial versus the commercial sector. There are also sub-themes that present clear divisions in opinion between the two apprentice cohorts, possibly as a result of factors such as their different levels of experience in the trade or their different degree of exposure to the new 'Green Awareness' course. While many of these sub-themes present clear divisions in attitudes, understanding and opinions, there is also important evidence of shared perspectives. These shared perspectives are not restricted to within a given apprentice class, but extend across the two groups of interviewees. As such, these uniting sub-themes are revealing of what might be prevailing attitudes and opinions within the trade regarding current construction industry culture and practices, as well as a shared understanding of the challenges facing the trade today.

To interpret how and why shared perspectives emerge within some themes while clear divisions are represented in others, and to gain an appreciation for why certain differences may exist within an apprentice class while others demonstrate clear distinctions between the two classes, requires an examination of the unique demographic distribution of each of the apprentice cohorts. Each of the interview samples, although not randomly selected, appeared to be fairly representative of their respective classroom populations. An examination of any differences in classroom experiences and curriculum exposure across the two apprentice cohorts is also essential, as these differences can be associated with differences in the nature of responses to certain questions across the two groups. For this reason, the discussion on the findings from this research will begin with a description of each of the two groups of interview participants. Each of the subsequent sections will then examine findings from each of the major themes that emerged from the interview process through an exploration of each of the affiliated sub-themes.

DESCRIPTION: DEMOGRAPHIC CHARACTERISTICS OF THE 2ND AND 4TH YEAR COHORTS

Key findings:

- **Fourth-year cohort:** all male, tighter age range (average 28), high school educated, heavy industrial sector influence, preparing for RED SEAL exam, slightly more pessimistic about industry and program experience.
- **Second-year cohort:** representation for both genders, wider age range, diverse levels of education and work experience, non-union representation, heavy commercial influence, more optimistic about industry and program experience.

The interview participants from the fourth-year cohort represented a very distinct demographic group. They were generally younger, white men. Their ages ranged from 23 to 33 years of age, with an average age of 28. This means that most of them would have begun their apprenticeship training in their early to mid-twenties. All but one had completed their high school education. However, only one had reported pursuing any post-secondary education, describing the experience as having taken “a few college courses.” All reported some other type of work experience prior to arriving at MI, although in most cases this involved working in the service industry as kitchen staff. A few reported prior construction experience but the extent and type of experience described varied dramatically. Most claimed very limited or no experience in construction. In terms of their experience within MI, a few reported having previous non-union experience. However, in terms of their experience within the apprenticeship program, they had all arrived at the program as a result of employment within the union and were all currently working for union employers. The majority had only worked for two or three different employers over the course of their apprenticeship, and several had stuck with a single employer. The majority (six) stated that most of their experience consisted of working in the industrial sector. This meant that, while the commercial sector perspective was represented, the majority of the interview content reflected the industrial sector experience and reality.

In terms of their program and curriculum experience, a few critical factors should be mentioned. First, the interviewees were less than a week away from writing their RED SEAL exam to complete their apprenticeship program. They were taking time out of a study period to assist in the interview process. It is possible that this situation generated some stress and anxiety. It may also have led to the manifestation of certain frustrations or criticisms regarding their experiences in the program or the field. Additionally, the interviews revealed that the fourth-year apprentices had arrived back to conduct their final classroom session only to find that they did not have a classroom space. They lost the first several days of class time switching classrooms, moving boxes and setting up for their training. The insulator apprentice program is not an “in-house” program at BCIT. The instructor is contracted and the space is rented. For this reason, the apprentices stated that they often feel they are treated differently than the other trades programs. This specific experience of having to reorganize their class space and losing valuable teaching time may have further contributed to a sense of frustration or pessimism regarding their experiences in the program.

Finally, the researchers believed at the outset of this project that this group of apprentices had been the

first to receive the complete new 'Green Awareness' course ('LEED 101' and 'Green in Mechanical Insulation'). However, it became clear early on that the fourth-year apprentices had not received the full official curriculum training. Only two apprentices recalled receiving the formal LEED 101 training and one of the two also recalled conducting a volunteer energy audit of a local Food Bank as part of a classroom activity. A few of the interviewees were aware of the new addition to the curriculum but admitted they hadn't been taught it. They gave a variety of different reasons for why this might be the case, including being a "little ahead of that", in other words being "a couple classes behind ... when they started that [the 'Green Awareness' course] up". They also mentioned lack of time as a possible contributing factor. One apprentice suggested "It was supposed to be a first-year thing, but we ran short on time because of the whole BCIT student, teacher thing that messed everybody up." Another apprentice sarcastically suggested, "I guess we spent those two days cleaning out the shop and the classroom." The rest of the interviewees seemed largely unaware of the specific 'Green Awareness' training. One admitted only knowing about green awareness through the program branding, "I mean, like you see it on our stickers, 'Green Jobs Great Jobs', that's about all I know". As a result, only one of the interviewed apprentices could recall climate change being mentioned in the classroom setting, the rest understood the majority of the questions in terms of energy savings and associated cost savings. For this reason many of the questions were adjusted to substitute concepts such as "energy savings", "green construction practices", or "environmentally friendly practices" in place of "climate change" or "climate change impact". The fact that they had not received this training had clear implications for both their understanding and interpretation of the questions as well as the types of responses they provided. In retrospect, this allowed for an informal pre- post-assessment of the training experience by comparing the content from the fourth-year apprentices with no formal experience of the 'Green Awareness' training, to the content obtained from the second-year apprentices who had recent experience with both components of the formal 'Green Awareness' course.

The interview participants from the second-year cohort exhibited substantial demographic diversity as compared to the fourth-years. The age range was much broader (26 to 47 years) with an average age of 32 years. This means that most of them would have begun the apprenticeship program when they were already in their late 20's or early 30's. This cohort also had several female apprentices, one of whom volunteered to participate in the interview process. Different gender perspectives were therefore also represented in the second-year cohort participants, distinguishing the group from their fourth-year counterparts. All of the participants had completed high school (or General Education Development) and five mentioned having some post-secondary education (though only one had officially completed a post-secondary program). Their prior employment history was extremely varied ranging from warehouse and factory work, to other trades, to the film industry.

When asked to describe how they decided to make the switch to MI, many second-year apprentices reported wanting a more reliable job or career, some were looking for greater freedom or flexibility in their work, others simply needed a job and wanted to be in a trade. The one consistent factor was that the majority had arrived at the trade a little later in life after attempting other careers. A couple of the apprentices reported having started in the non-union side, acquiring several years' experience in doing MI before either they or their employers made the decision to switch over to the union side. One

of the interviewees was still employed as a non-union worker (two spots in are reserved for non-union employees in each program cohort). This interviewee was putting himself through the apprenticeship program, without financial assistance from their employer. This provided a unique perspective not represented within the fourth-year cohort. In terms of their employers, most had worked for three or more different employers over the course of their insulation careers, which was different from the fourth-year apprentices' experience.

Several factors proved true of both apprentice cohorts. There was significant diversity in the types of projects and types of work sites represented in both sets of interviews. Industrial sector examples included working in shipyards, gas plants, pulp mills, alumina smelters, and refineries. Alternatively, examples from the commercial sector included schools, hospitals, high rises and other residential buildings, grocery stores, and office buildings as well as several landmark Vancouver City structures. The size and length of the projects varied, along with key factors such as the number of other trades involved, the number of contractors and subcontractors involved, and the number of mechanical insulators employed for the project. As well, both cohorts claimed to work for employers who were strictly MI contractors and there was also substantial overlap in the names of the companies with whom the apprentices had worked. The size of the different employers mentioned by both cohorts varied significantly. Some claimed to work for the largest MI contractor in the province, if not the country, whereas others reported working for a series of smaller companies (typically described as 20 to 30 or less employees). These similarities appear to be representative of the breadth of work typical for the trade of MI, a fact that was frequently cited as both a benefit and a challenge of the classroom program.

APPRENTICE PERSPECTIVES: PROGRAM EXPERIENCE

Key findings:

- Program covers a substantial amount of material – and information load is increasing as industry advances.
- Classroom time is important – opportunity to acquire practical knowledge, ask questions that might not be addressed on job sites.
- Program provides hands-on learning environment with knowledgeable instructor and opportunity to learn from fellow apprentices.
- More classroom time, increased investment in classroom supports (teacher's assistant, updated workshop space, dedicated classroom, etc.) would improve program experience.
- Apprentices identify a need to address working relationship with BCIT.
- Important for 'Green Awareness' course to explicitly address "climate change" – "energy savings" is already well established in curriculum.

As part of the interview process, apprentices were asked questions regarding their experiences in the program. These questions explored both the inherent benefits of being involved in the program as well as the nature of some possible shortcomings of the program and how it might be improved. Apprentices' valuation of the program experience also emerged in less direct ways through responses

to questions about their employment experiences, their interactions with other trades, their perceptions of the construction industry, and their degree of exposure to the 'Green Awareness' course content. While many of the perceptions about the program were similar across the two apprentice cohorts, there were slight differences that emerged. These differences were also amplified by other factors such as whether the apprentice worked in the industrial or commercial sector, what their previous work experiences had been, their reasons for becoming engaged in the trade, and their proposed plans upon completion of the program. The findings encompassed within this theme have obvious, direct implications for the classroom component of the apprenticeship program. However, they also provide important insights into how apprentices interpret, understand, and engage with other members of their trade as well as with other trades and professionals within the construction industry. These perceptions and attitudes will have an impact on how these trained apprentices represent and participate in their trade in the long-term.

- i. Program benefits:** In terms of what apprentices perceived as being the benefits of the apprenticeship program, both the fourth- and second-year cohorts agreed that having designated time to learn and apply knowledge and to ask questions was essential. For many, this luxury simply did not exist out in the field. This was particularly true of apprentices with field experience in a non-union work environment as well as for those with experience working in the commercial sector, particularly as compared to their industrial counterparts. The impact of acquiring theoretical and technical knowledge of their trade was also enormous. The classroom content was described as helping to provide context for their work. Many were unfamiliar with MI prior to beginning work in the trade and therefore gained a whole new appreciation of why they do the work they do and why it is important. In terms of technical knowledge, math in particular was one subject, which was raised numerous times. For many, this was their first attempt at learning math since high school and was a highly challenging and technical skill that they simply never would have learned out in the field.

The opportunity to apply new knowledge in a hands-on environment (through the supervised workshop component) was also cited as a major advantage by both cohorts. The breadth of material covered over the course of the program was also considered an advantage of the classroom material. Many of the apprentices appreciated the exposure to areas of the trade in which they didn't have previous employment experience. They acknowledged this benefit in relation to the fact that the types of projects and associated technical skills covered by the MI trade were extremely diverse. Some expanded on this explanation by recognizing that they may not always be able to find work in "their area" of the trade, and having an understanding of the other types of work would help them in securing future employment. The second-year cohort also appreciated the program as an opportunity to learn from a knowledgeable instructor with several decades of experience in the trade, and in the union as well as an opportunity to learn from fellow apprentices, many of who had previous work experience to draw upon.

Despite these shared perspectives, the contributions made by the fourth-year participants were much less enthusiastic and descriptive than their second-year counterparts. In fact, several interviewees presented overtly negative responses to this question. One suggested that the classroom component was "a joke" and that while apprentices come in with high expectations,

they are ultimately disappointed. There was also the suggestion that much of the material was either extremely outdated or so new that the instructor himself had a hard time explaining it. Finally, several complained that much of the material was not relevant to their work and they found that content relevant to the industrial sector was emphasized to the exclusion of the commercial context. By comparison, the second-year participants focused more on the positives of the classroom experience and were less inclined to drift into negative or pessimistic responses.

Program challenges: The second- and fourth-year interviewees also shared similar responses in relation to challenges or weaknesses in the program structure and content. Paradoxically, many of these factors were the same as those previously cited as benefits of the program. For example, while the breadth of material covered in the program was originally cited as a positive, it also created some tension as apprentices in both cohorts expressed feelings that some of the content covered was not relevant, and that too much emphasis was placed on the industrial side at the expense of learning about the commercial side of the trade. Time was frequently emphasized as a restricting factor of the program. Many felt that the classroom component was too short to cover the amount of material that needed to be covered. Some compared it to other trade programs, suggesting their classroom time was by far the shortest. They are not wrong in this perception. The MI apprentice program at BCIT involves a total of 480 classroom hours. This is considerably less than many of the other well-known construction trades such as plumbing, which requires a total of 780 classroom hours, or electrical, which involves a total of 1200 in-class hours of training. As a result, many described feeling rushed in their learning and experiencing pressure to keep up with course content. One fourth-year apprentice went so far as to suggest that there was a sense of “belittling” of those who couldn’t keep up. Second-year apprentices emphasized that this was a particular challenge for learning the math component of the program. For many, this was their first time attempting math since high school and the amount of time designated to teaching it was simply insufficient. Several apprentices had also clashed with the instructor brought in to teach the math component of the program, but felt they had no one else to seek out support from and were therefore at a loss for how to improve.

“The class sessions being four weeks, it’s too minimal ... not enough time, especially with how much is being put in to year one, year two, year three, and then level four. That as the industry is getting bigger, we’re getting more products, and a lot more information and that increases the workload that we have to handle on top of the math that we have to do. The math is a big thing too; they need to spend more time with the math.” ~ Second-year apprentice

The need to cover a large amount of material in a limited amount of time was further exacerbated by several other factors. Both cohorts complained of a lack of focus in the delivery of the course material. The implication was that a greater emphasis should be placed on “the need to know” material and content. As well, many openly expressed frustration regarding the program’s working relationship with BCIT. The fourth-year cohort had just spent the first few days of their last classroom session moving locations and setting up a new classroom, and were fairly bitter about how this impacted their final instruction session before their RED SEAL exam. Many of the interviewees felt that, as a result of their contract relationship with BCIT, the MI program always got the “short end

of the stick" as compared to other trade programs. This treatment, they felt, was reflected in the types of spaces and amount of resources the college provided to them.

"BCIT has to become more involved ... our teacher is one of the only contractors; all of the other teachers are full-time teachers, so we get the short end of the stick ... This year alone we lost almost a week because we had to move all of our material back and forth and swap classrooms twice." ~ Fourth year apprentice

- ii. Program improvement:** One of the most frequent examples given on how to improve the program was by providing an additional classroom support, in the form of an extra instructor or Teaching Assistant figure. Factors such as class size, different learning needs, different levels of experience with MI, need for extra help, and the reality of class interruptions were all cited as important reasons for extra assistance. Additionally, both fourth- and second-year apprentices also discussed the potential of extending the classroom component of the apprenticeship program. Both groups of apprentices also emphasized the need to address the situation with BCIT in terms of improving classroom and shop facilities. This would mean ensuring permanent and sufficient workspace for the MI program, rather than having to share with or work around the other trades' classes. The fourth-year apprentices also mentioned a need to update the program curriculum, to make it more relevant to today's industry context and with more attention paid to the commercial sector.
- iii. "Climate change" versus "energy savings":** The fourth-year apprentice interviews were conducted first and it became clear early on in the interviews that most of the apprentices were unfamiliar with the formal 'Green Awareness' course. When asked whether their classroom training discussed the link between climate change and their role as mechanical insulators, the general consensus was that climate change was not specifically mentioned at all. When asked whether energy savings, energy efficiency or environmentally friendly practices were discussed in relation to their trade, the consensus was that while the role of MI in creating "energy savings" was mentioned, it actually could be touched on more. Concepts such as "energy savings" and "energy efficiency" were broached in discussions around the role of MI and were seen as providing context for their work and as common sense knowledge for any trained mechanical insulator. It was also recognized as being a selling feature or promotional feature for them in doing their job.

"The whole purpose of our entire trade is to save energy, which is green right? But we've always been told it's a green trade like that's a huge advertisement for our trade, like that's something we use even to advertise ourselves." ~ Fourth-year apprentice

Preference for the term 'energy savings' over 'climate change' or even variations of 'environmental impact' was also reflected in the discussion of their relationships with their employers. The consensus was that no mechanical insulator employer is thinking in terms of their impact on climate change or the environment. Employers in the industrial sector were perceived as being cognizant of 'energy savings' in terms of energy efficiency and associated cost savings. The assessment of the commercial sector was more damning in that project deadlines were perceived as the top priority and were the main determinant of cost savings in terms of a collecting on a quick return on

investment (ROI).

"Well on the commercial side it's deadlines right? Industrial it's like, 'cover that hole up or you're going to be wasting all of this money on killing boilers' and stuff like that. So I think more industrial is all about saving energy." ~ Fourth-year apprentice

It was not just the fourth-year apprentices who expressed some discomfort and confusion around the use of the term 'climate change'. When asked whether the new components of the classroom training provided them with a clear understanding of the relationship between climate change and their role as mechanical insulators, the second-year cohort had seriously mixed responses. While several noted that the term 'climate change' was indeed mentioned in the training, their emphasis was on understanding their trade in relation to energy savings. The apprentices recalled that the new 'Green Awareness' course content discussed how energy savings was linked to carbon output and GHG emissions – but they did not emphasize the direct link to global climate change. Rather, the link was implied:

"It's implied, but a lot more emphasis was really put on just the energy waste, just as a fact, and not so much the global climate change. Because I think that's just a matter of fact to most people now. I think most people can kind of figure out what you mean when you're talking about wasted energy." ~ Second-year apprentice

Another second-year apprentice expressed that, "It's more about the energy, but it's kind of like they go hand in hand, I think. You're saving energy, you're saving the climate in a way right?" The apprentices rationalized this emphasis by explaining the need to be able to translate and mobilize the message outside of the classroom environment. The understanding was that, out in the field, the construction industry is a business first. They repeatedly stated that the priority for any business is cost savings and profit, it's "all about the dollar, all about the money". Therefore, to promote their role as a green trade, apprentices felt they needed to speak about energy savings and associated cost savings"

"If we really want this to be a movement than, it's got to be 'how can we save you money?' number one, rather than 'help the earth' number one; because people don't necessarily care about that even though they should, and that's the truth." ~ Second-year apprentice

The distinction between discussing 'energy savings' versus 'climate change' specifically is important for understanding how the instructor is presenting the 'Green Awareness' course content in the classroom as well as how it is being interpreted and understood by the apprentices themselves. It may also impact overall audience acceptance of the concepts and material covered in the curriculum. As these interviews highlighted, the construction industry currently demonstrates little tolerance or opportunity for dialogue on climate impact and is not devoid of climate deniers. Some of the apprentices themselves expressed conflicting perspectives on the issue of climate change. For them, restricting the conversation to the topic of 'energy savings' may make it less controversial, more relatable, and overall more acceptable at this point in time.

APPRENTICE PERSPECTIVES: THE MECHANICAL INSULATION TRADE:

Key findings:

- Industrial sector and commercial sector differ substantially in terms of: commitment to training/supervision (greater in industrial), pressure to meet tight timeline/deadlines (greater in commercial), quality and quantity of resources (greater in industrial), emphasis on work quality over quantity (greater in industrial) and overall work-site culture and norms.
- Perceived poor treatment of MI within industry (greater on commercial side) – positioned lower in the trade hierarchy.
- Lack of understanding/awareness amongst industry professionals and other trades of what MI is and the skills/training required for proper installation.
- Lack of awareness/understanding translates to devaluation of MI trade.
- Leads to challenges in job performance/quality, working/communicating with other trades, workplace morale.

Both apprentice cohorts openly shared perspectives on their trade, including insights on current divisions within their trade as well as how their trade fits within the broader construction industry. Many of the interview questions were specifically designed to target apprentices' employment history and experience within the industry. These types of questions were typically the ones that generated the most animated, detailed and lengthy responses from the apprentices. It was clear that, regardless of their number of years of experience in the trade or in the industry, that all apprentices had substantial and strong opinions regarding their trade. While it could be argued that other sub-themes could be wrapped up under the major theme, the findings presented here focus specifically on how the role of industrial versus commercial sector experience influences how the apprentices view their trade and the industry at large. It also explores a consistent and persistent theme across both cohorts regarding the treatment of mechanical insulators by other trades within the industry.

- i. The industrial-commercial divide:** Very early on in the interview process, a clear difference emerged between the industrial sector and the commercial sector experience for apprentices. The second-year cohort, in general had far more experience in the commercial sector than the industrial sector, whereas the opposite was true of the fourth-year cohort. Despite this, similar narratives emerged in both cohorts that painted a vastly different apprentice experience, both in the classroom and in the field, according to which sector the individual's work experience was based in. As mentioned earlier, apprentices with commercial experience were more critical of the overall classroom content, suggesting its focus was biased towards the industrial context. It appeared that even for the industrial workers, course content was also a point of contention. It became apparent that within the industrial sector, the type of work an insulator can perform varies widely according to the types of projects they specialize in. Working in the shipyards, for example, would be considered a very different experience from working in refineries or pulp mills. Some apprentices with industrial experience appreciated the exposure to training in other areas of the field, acknowledging that they may at some point be required to find work outside of their current field. However, others tended to share the frustration expressed by some of their commercial

counterparts, that much of the material was not relevant to their own work. This presents a clear challenge for the program and the instructor, where preparing all of the apprentices equally means providing training in any and all areas of the trade where an apprentice might find work.

The commercial-industrial divide emerged even more aggressively when apprentices were asked to discuss challenges they faced in the field in terms of performing their job effectively and efficiently. When asked whether project timelines and pressure to meet deadlines factored into their ability to perform their jobs properly in the field, the responses fell into two distinct camps. Apprentices with majority commercial experience replied with a generally emphatic "Yes", followed by a detailed explanation of how and why they believed this the case. On the other hand, those apprentices who worked primarily in the industrial sector replied with general "No's". A few apprentices on the commercial side suggested that the degree of pressure varied by project and depended on various contextual factors, but all admitted to feeling pressure to cut corners in order to meet deadlines at some point on the job. Factors that can influence the degree of pressure the apprentices reported feeling on the job site included the leadership on site and the level of communication, coordination, and support they received from other trades on site. Therefore communication, awareness, and understanding of or appreciation for the MI trade on the part of the other trades and the general contractor was considered essential to the quality of work the apprentices were able to achieve.

This was particularly crucial for trades that had a direct influence on the installation of the MI. "It really comes down to the attitude of who's leading which crews. And the big crews that matter most to us are the plumbers and the wall guys." In that sense, several apprentices acknowledged that it wasn't necessarily that they were pressured directly or that time was taken away from them explicitly. In fact, this would be virtually impossible to do, as mechanical insulators aren't typically included in the formal project schedule that is used to run a major project. Instead, other trades who are included in the schedule experience time cuts and pressure that generates a domino effect both down the project timeline and down the trade hierarchy. There was a strong impression that this was "just the construction industry" and therefore an inevitable reality of working on the commercial side of the industry. Apprentices seemed committed to accepting this as part of their day-to-day reality in doing their job, suggesting, "You can only do what you can do," and "You do your best."

"It's kind of like everybody's there just trying to do their thing, get in and out as quickly as they can, make that money ... all that they care about is their jobs, they don't care about anybody else's job." ~ Second-year apprentice

This reality was attributed to an industry culture where "profits are number one" and where time equals money. "A lot of guys just cheap out, they try not to, but they do." This is reflective of an industry where contractors are invested in building performance only until the point of project completion, at which point their involvement and therefore their investment is terminated. There is no incentive in the sector to consider long-term performance as the financial gains are all obtained in the short term.

The experiences described by the industrial apprentices were, essentially, the exact opposite. In fact, one apprentice went so far as to describe a scenario where he was pressured to pick up the pace by a foreman on an industrial site he was working on and the foreman was ultimately reprimanded for it. The priority on the industrial side was described as being quality over quantity; "if it's wrong, they make you tear it off and redo it." It wasn't that timelines or deadlines were non-existent, so much as apprentices felt there was always sufficient time to perform a job properly. Or, in situations where extra hours were required, apprentices noted that it was dealt with reasonably, either by bringing more men on to a job or simply requiring overtime hours with appropriate pay.

"No, never really felt pressure ... they always want us to get it done, but I never feel pressure, I just do good quality work, that's what you want to do; they [the foremen] give us the time to do it." ~ Second-year apprentice

This stark dichotomy in commercial versus industrial work-site experiences also emerged in the discussion around the role of journeymen in apprentices' training in the field. In the case of the fourth-year interviewees, most claimed to have been overseen by a journeyman at some point in their training, typically at the outset. Significantly, the majority of the fourth-year apprentice interviewees claimed to work in the industrial sector, and it was these individuals who composed the better part of the group who reported receiving more extensive journeyman mentorship. Apprentices on the commercial side were more likely to describe their experience as being "overseen" by a journeyman whereas for those on the industrial side described being "paired-up" with a journeyman. The fourth-year apprentices described several possible different reasons for why supervision by a journeyman might be lacking, particularly on the commercial side. These included the size of the company (supervision was less likely with smaller companies), the cost of employing a journeyman (versus relying on experienced apprentices), the number of available spots on a job (smaller jobs were less likely to have journeyman supervision), the ratio of apprentices to journeymen in the trade (far more apprentices than certified journeymen), as well as the obvious stipulation of whether you worked in the industrial versus the commercial sector.

The second-years, who had more commercial work experience than industrial, described more diverse types of training experiences. Several suggested that occasionally, there had been a journeyman involved in their supervision and training, but that often times it is simply other apprentices providing training to apprentices on-site. One described it as, "you go to work and that's your foreman ... you learn from whatever foreman is on site," whether that foreman has journeyman or apprentice status was, for all intents and purposes, irrelevant. Another described it as a "fifty-fifty thing," where ideally you would have a journeyman involved in your training, but it was just as likely to be trained or supervised by someone else, or to have to learn on your own. The consensus seemed to be that mentoring by a journeyman was a possibility for an apprentice, but that it couldn't be counted on in the commercial sector. One apprentice who worked on the commercial side offered the harshest assessment:

"No, no that doesn't happen anymore, it really doesn't. Maybe in industrial ... [the instructor]"

always says you're supposed to but half the employers nowadays are so cheap they just throw you on a job and just expect you to get it done." ~ Second-year apprentice

The second-year apprentices were far less likely to suggest reasons for why this was the case than their fourth-year counterparts. However, both cohorts seemed acutely aware of a significant difference in training expectations and supports across the two industry sectors. One apprentice who worked on both sides of the industry validated this interpretation by confirming that when he had worked on the industrial side he had been mentored by a journeyman, but that had not happened while he had worked on the commercial side.

- ii. Treatment of mechanical insulation trade within the construction industry:** The number and types of challenges faced by the apprentices in the field tended to differ according to the sector in which they were employed. However, feelings of frustration regarding the general treatment of mechanical insulators and MI as a trade within the industry were universal. Members of both sectors expressed the opinion that the trade was treated poorly relative to other trades on a job site. Reasons for this differential treatment included lack of awareness and education on the part of both contractors and other trades groups regarding the trade and its importance in the long-term functioning and performance of a building. "On the construction site, it feels like we're not treated as good as everybody else, because we are a small trade that not much people know about." This was frequently presented as a status issue whereby mechanical insulators' position as a "second" or "sub-contracted" trade made them less valuable or prestigious in the eyes of the industry. The amount of labour required for MI on project sites is fairly small relative to many of the other trades; therefore, mechanical insulators are typically brought in as a sub-contractor on projects and the number of insulators present on a job site is dramatically less than, say, the number of plumbers, or drywallers, or framers. Their very physical presence on a work-site is therefore lacking and can make it challenging for them to assert themselves, especially on larger projects. As well, as a sub-contracted trade, they are often not included in major contractor meetings. As a result, their voices and interests are not represented in key decision-making processes. This contributed to the apprentices' perception that they are often "thought-out" of the construction process.

"The thing with being insulators, we're considered a second trade; we're not a first trade. What I mean by that is electricians and plumbers and framers, they're considered like a first trade, they're more respected. And we're like a second trade and a lot of construction people think that we're kind of useless." ~ Second-year apprentice

Adding to the perspective of being an "invisible" or "second trade" was the fact that MI is not included in the formal scheduling process of a construction project. "I mean I don't think they're ever gonna consider us in the schedule, I think we're gonna be like the afterthought, always." This lack of interest or awareness was linked to the significant role cost-savings play in decision-making regarding scheduling and the prioritization of the various trades on a job-site. "A lot of it is like they cater to the trades that cost more per hour for them ... I don't know who's at the top, but it's like a ladder and as insulators, we're kind of near the bottom so we get forgot about." As a less visible, or less valuable trade than they expressed feeling that this made them more disposable.

So, whereas other trades were pushed to meet deadlines, they were simply pushed-out, "I find a lot of general contractors, maybe they only care so much about one of the trades or whatever, and they don't even care about some of the other ones – insulators!" As well, because of their inability to represent themselves in key-decision making processes, it was easier for their role to be entirely eliminated from a project in an effort for contractors or project managers to cut timelines and cut construction costs. The two cohorts' shared concern over the treatment of the trade within the industry also emerged in response to questions regarding how the industry might be improved. The idea of equal treatment of trades within the industry came up several times within the second-year interviews in particular. The second-years suggested was a shift in industry culture, industry "politics" and the current established hierarchy was a necessary prerequisite to better treatment of mechanical insulators, and equal treatment across all the trades.

"Like, knowing that you are a trade but we're all here for the same reason, we're all here on the same project, and all of our work matters, that would be ideal." ~ Second-year apprentice

The inequitable treatment of mechanical insulators within the industry was a concern shared by both groups of interviewees. However, this understanding seemed to impact the two groups of interviewees differently in terms of their overall attitudes regarding the industry, the MI trade, and the apprentice experience. In general, the second-years were far more likely to express satisfaction and pride not only in their trade and their work, but also in regards to their experience in the apprenticeship program and their classroom training, as compared to their fourth-year counterparts. This may be an artefact of the added impact of two extra years of exposure in the field, and any associated accumulation of experiences of poor treatment. All second-year apprentices expressed interest in continuing with the apprentice program and pursuing work in their trade, whereas two fourth-years were committed to leaving the trade and the industry as soon as they received their RED SEAL certification. The second-years were also far more likely to link their positive feelings about their trade back to the idea of MI as being an environmentally friendly or green trade, and the positive impact they felt this made in their work. "It makes me feel like my trade is way more important than a lot of the other ones now [chuckles] because it's major, major energy savings." The link between the second-year apprentices' emphasis on "feeling good" about their trade, and their roll in energy savings is suggestive of the impact the 'Green Awareness' training had on their perceptions of the MI trade; "I didn't know it was a green trade until I started, until first year. But, I don't know, it just makes me feel good about my job." In comparison, the fourth-year apprentices were far less likely to bring up this connection. In the few cases that it did emerge, they were far more likely to downplay the impact or significance of this link.

APPRENTICE PERSPECTIVES: CURRENT CONSTRUCTION INDUSTRY CONTEXT

Key findings:

- Industry culture (particularly commercial sector) a barrier to work performance and to adoption of more environmentally-oriented construction practices: “Business first”, “profit-driven”, “all about the money” or the “bottom-line”.
- Established/ingrained culture characterized by an “old school” mentality that fears or distrusts change and is invested in maintaining the status quo: “just get the job done”, fear of change and no “culture of concern”.
- Contributes to lack of interest, awareness and understanding around environmental issues.
- Industry organizational structure and size also contributes to unrealistic timelines/ performance expectations and break-down in communication/ relations amongst trades.
- Decision-making at “top” does not consider realities at the “bottom”.
- Limited time and resources shared inequitably amongst trades, further contributing to breakdown of trade relations.
- Massive implications for workplace morale, work quality, innovation and overall performance.

Outside of their experiences as mechanical insulators, the apprentices also offered some revealing insights regarding the state of the construction industry more broadly within BC. Overall years of experience in the industry or having previous experience in other areas of the industry (outside of MI) were less-obvious predictors of differences in response than was the type of sector (industrial or commercial) the apprentice worked in. The weight given to certain industry cultural norms varied significantly based on industrial versus commercial sector perspectives. As discussed previously, industrial was seen as a slower paced environment where emphasis was placed on quality over quantity. Commercial on the other hand was aggressively profit-driven, with significant implications for workplace environments and barriers to work performance. However, several key components remained consistent. Construction was presented as a business-minded, profit-prioritizing, massive and somewhat unwieldy industry. Furthermore, these industry norms were seen as ancient and entrenched, largely unyielding to change. Industry organizational structure and existing hierarchies were presented as both contributing and sustaining forces of current cultural practices and norms. The subthemes presented in this section are extremely important in providing context for the apprentices’ perspectives on their own trade, as revealed in the previous theme. They also provide context for how the apprentices responded in the subsequent section, which explores subthemes on how to change the construction industry; specifically, how to move it in the direction of adopting “green” or more sustainable development practices and standards.

- i. Industry culture:** Both groups of interviewees frequently expressed opinions or attitudes that demonstrated a shared understanding and acceptance of a distinct culture, and associated current practices and norms, within the construction industry. One concept that surfaced often in both groups of interviewees was the understanding that the industry is guided by a “business-first” mentality, whereby the first priority is profit and, therefore, cost-savings serves as a major driving

force. As one second-year apprentice put it, in the construction industry “it’s all about the dollar, it’s all about the money.” For the second-year interviewee’s, this shared, accepted reality of the industry first emerged in response to whether or not the ‘Green Awareness’ course content was successful in demonstrating the link between global climate change, carbon emissions, energy savings, and the MI trade. The interviewees agreed that, while concepts like climate change and green house gas emissions were mentioned, that it was more of an implied concept and that the major emphasis was placed on the “business side” of things. The second-years were quick to defend this approach in terms of its applicability in the real world, out in the field. The understanding was that the people who were primarily responsible for determining the environmental impact or sustainability of a project were those in charge, and it was these same individuals who drove the agenda of cost-savings and profits first, “because the people who have the money I mean generally don’t really care so much about the environment, they just care about their bottom line.” To reach them, to encourage them to make meaningful change, means delivering messaging that is grounded in cost-savings, which, for mechanical insulators, is through energy-savings. One apprentice put it as, “If we really want this to be a movement then, it’s got to be ‘how can we save you money?’ number one, rather than ‘help earth’ number one.”

“Yeah, no your boss will, if you save money, your boss will promote you, if you save the planet but you waste a little bit of money, your boss is gonna have a talk with you. So that’s your incentive, that’s your carrot on the stick right there.” ~ Second-year apprentice

The fourth-year apprentices had not received the same exposure to the ‘Green Awareness’ course content. However, this same interpretation of industry priorities emerged in both fourth- and second-year transcripts in response to questions about the current prevalence of conversations or practices promoting sustainability and energy savings on work sites, as well as the acceptability of these types of conversations within the construction workforce. “I think a lot of the people that run construction sites, are the old timers that don’t give a s***, that probably don’t care about green or saving energy, they care about their bonus and getting it done on time.” This idea of a generational divide in the industry and its influence over current industry culture was also provided as an explanation for why cost savings had emerged as a top priority, and why there was little room for discussion on “green practices” or “greening the industry” in construction. This was mentioned not just in terms of industry leadership, but also in terms of engaging in the subject matter amongst the broader workforce.

*“I think a lot of people in construction are a lot of tough skin fellows, that they just don’t give a s*** and they just throw garbage, make garbage, and they just do it – like the old timers – just do it to get it done.” ~ Second-year apprentice*

This quote also demonstrates another aspect of the workplace culture that was emphasized by several apprentices from both interview groups, the idea that workers are there just to “get the job done.” The consensus was that most workers in the industry are there to do their work and to collect their pay at the end of the day, and that there was a distinct absence of a “culture of concern.” The fear was that this culture is now seriously ingrained, and will continue to passed

from one generation to the next via training, mentorship, and initiation of new, young workers as well as by the guidance of the leadership who are setting the priorities, thus making it extremely hard to achieve meaningful and lasting change.

When asked about their employers specifically and whether they actively encouraged or promoted the link between MI and energy savings or climate change, there were many emphatic "No's." For those apprentices who chose to elaborate, their consensus was that, "they [the employers] understand that what we're doing is energy savings and it saves the climate or whatever, but in the end of the day it's how much money is in their pocket." Even when discussing construction projects that were designated LEED buildings, projects whose priority should be the sustainability of the building and of the environmental impact of the project, there was a distinct cynicism about the motivation behind the work. "I don't think it's the end objective, I don't think it's heavily emphasized and I don't think it's emphasized in a way that they really should be emphasizing it if it's their goal." One apprentice expressed the belief that the primary driving force behind bidding and working on LEED projects was the incentive for added profit, not for its environmental value; "I think it's a lot more they'll pick it up because it'll help them make the money." Aside from the more direct financial gains from a single project, it was also seen that employers encouraged the promotion of energy savings because "it gives us more work." In other words, the key directive of the trade is to save energy and if the apprentice is not "saving energy, we're not making the money."

The negative narrative regarding current industry culture and its impact on the performance and attitudes of tradespeople and workers dominated in the transcripts of both apprentice groups. However, both cohorts also revealed a small, but not insignificant counter-narrative that, while the culture that prioritizes cost and profit is the predominate one, its influence differs from job to job and across sectors according to a variety of factors. These include the type of project and its timeline, who the general contractor is, who is leading the various teams of trades, and whether or not those teams have worked together before. This break in narrative suggests that a certain degree of change may already be occurring in industry culture, and may present unique opportunities to encourage shifts in the current predominant industry culture.

Despite this recognition of context-dependent cultural influence, the pessimistic narrative regarding current industry culture was further enforced by responses to the question of whether the construction industry in BC was moving towards "green construction practices". Both groups of interviewees offered a range of responses, but all were tempered in their enthusiasm. There were several apprentices from both interview groups who simply responded with emphatic "No's." There were many who felt that the industry was moving in the right direction of increasing "green construction practices". However, they all offered slightly cynical suggestions as to why this was the case. Several of those who agreed that a shift was occurring, still felt it was occurring far too slowly considering the extent of the problem and the urgent need to act. And all of those who responded somewhat positively to the question attributed this shift to external pressures acting on the industry, rather than an internal shift in industry interests. The belief was that increasing public awareness and global interest in environmental issues were driving the industry to change.

The consensus was that more outside pressure would be needed to introduce real change and to speed up the process; "I just see that they do what they can – the minimal – and that's it." Participants from both cohorts felt that any change, regardless of how small or how slow, in the industry culture in BC was not necessarily mirrored across the nation. Instead, several apprentices expressed the opinion that Canada in general was far behind many other countries (examples from Europe were provided as comparisons) in terms of encouraging new "environmentally friendly" standards within the industry.

Finally, industry culture was a key focus when apprentices were discussing how they would like to see the industry change in order for them to do their jobs properly. For commercial workers from both apprentice groups, the need for appropriate amounts of time and space to do their jobs was critical in terms of their ability to perform their roles efficiently and effectively. The current lack of sufficient time and space was pinned on three key factors: unrealistic project timelines, the lack of coordination and communication amongst the trades on a job site, and a lack of education or awareness about the work performed by trades outside of your own. The scheduling conflict, as mentioned earlier, was seen as a product of top-down pressure to reduce costs and therefore optimize profit from a project. The perception was that a hierarchy was then often introduced, whereby the needs of the various trades were prioritized within these tight timelines and level of importance was dictated by how much they would cost the project. In this sense, the apprentices consistently felt that mechanical insulators were on the bottom rung of the ladder and were often ignored in scheduling considerations, if not out rightly cut from the project.

"There's a lot of different job sites where it's like we're the after thought, we're the cut corner ... 'Oh well, ok we need to save money on this project, let's just scrap the idea of insulating this thing, this way,' or you know, 'let's just decrease the quality' or 'oh, we don't feel like using an inch and a half material because then we have to add an extra inch of concrete per floor' ..."
 ~ Second-year apprentice

There was also a concern that lack of insight or awareness on the part of both the professionals (such as engineers and architects) responsible for designing the project, as well as the general contractor responsible for executing the project contributed to unrealistic deadlines. The lack of sufficient consideration for contingencies given the inevitability of project setbacks and delays was an example of how unrealistic timelines can emerge when those leading the project don't have an intimate understanding of what has to happen on the ground. Concerns around lack of education or awareness also extended to other trades. This appeared as a major concern for many of the interviewees, though it was expressed in different ways. Some saw it as a deliberate disinterest in, or dismissal of MI as a trade; "nobody ever gives us the consideration because we're not the "real trades" as far as the electrical or the iron workers and stuff like that, nobody thinks about the insulators." Others saw it simply as the product of each trade feeling pressure from their superiors, needing to get their job done in a timely fashion and not having the time or the flexibility to care about what other trades are doing or to ask questions; "Like I said earlier, people just look out for themselves when they're on the site because they just want to get their work done so they're not getting in trouble from their boss."

This contributed to the issue of lack of communication and coordination amongst the trades directly in the sense that there simply wasn't enough time to do so effectively. One apprentice also linked it back to the idea of how the trade of MI is viewed within the industry, "we're like an afterthought, they don't even think about us; so I'm always asking, being my own foreman, trying to figure it out." Several other apprentices seemed to share the perception that for coordination with other trades to occur, it was up to them as individuals to take initiative by communicating their needs or concerns directly with the other trades or with their respective foremen. This was deemed unusual but necessary in a workplace culture that did not encourage or facilitate communication where discussion amongst its workers; "I'm not sure if it's the job site, or just the people ... like people are just not really social on the job sites, like they just want to go to work, do their thing and then go home."

"We're all standing right beside each other ... but we honestly never talk ... you have to be able to communicate on the job site and there isn't a lot of it going on right now, like people don't talk nearly enough; so people are like afraid to go and talk to some other trade." ~ Second-year apprentice

These same factors also contributed to the issue of sufficient space to install the correct thickness of insulation to all of the necessary pipework. Poor design plans that didn't leave sufficient space for proper installation of insulation along duct work and pipes; lack of consideration for, or awareness of the MI trade that leads plumbers to place pipework too close together or that leads drywallers to close up walls before insulation is completed; pressure to get the job done quickly without wasting time by asking questions and seeking out members of other trades directly impacted by your work. These issues were cited as reasons why, even if the apprentices had the time to complete a project properly, they might still be faced with the need to cut corners due to insufficient space.

"Like, nobody ever allows for insulation. When they put the plumbing in, they run it as tight as they can, when they put the ducting in, they run it touching the plumbing and ... nobody ever gives us the consideration because we're not the "real trades" – as far as the electrical or the iron workers and stuff like that – nobody thinks about the insulators." ~ Second-year apprentice

- ii. Industry size and organizational structure:** The current size and associated organizational structure of the construction industry in Canada, and in BC emerged as an explicit theme from the second-year interviews in terms of how it works against any plans to change industry practice or shift industry culture. However, both second- and fourth-year apprentices offered as to how the industry hierarchy, particularly the substantial divide or disconnect between the top leadership and the people on the ground working, have serious implications for project quality and workplace culture. Once again, pressure from the top, from leadership, bosses and foremen, was perceived as creating divisions or tensions amongst the workers on site; "I find even no matter how much you get along with the other trades, everyone's pushed, right?" This disconnect was amplified by feelings of helplessness, and an inability for individuals to self-advocate to change their own working conditions. One second-year apprentice expressed this sense of helplessness, as it's

"hard to have a voice when you're not the foreman." For mechanical insulators, this feeling of helplessness or inability to self-advocate in their work environment could also be amplified by their position as a sub-contracted trade and their relatively small presence on work sites. As mentioned earlier, another second-year apprentice discussed how their position as a sub-contracted trade excludes mechanical insulators from having self-representation at many of the development and project meetings. Therefore, if the employer they're contracted by doesn't have the subcontractor in mind as a top priority, their interests or concerns are simply not shared and not heard by decision-makers on work sites.

This feeling of major disconnect was also revealed in apprentices' responses to questions about how their employers represent the trade and, in particular, whether or not they openly discussed the importance of MI in terms of its environmental impact or in regards to climate change specifically. Several apprentices, particularly those working for larger employers, were somewhat aback by the question, "I'm not going to sit down and have a shoot-the-s*** with him [the employer] about climate change, no." The general consensus seemed to be that, if the employers were having these conversations, it was "in the office" not "out in the field" amongst the workers.

"Like I'm sure somewhere in the office they might be considering that? But just on the scale that I deal with it, in terms of thinking about my employer, ... most of the time, it's my foreman and he's a climate change denier." – Second year apprentice

The apprentices' concern about employer-representation was also reflected in the emphasis they placed on the impact that on-site leadership has in dictating the work environment and quality of workmanship on a project. Workplace culture and project quality were both frequently mentioned as varying dramatically from job site to job site. This was seen as a direct reflection of the quality and mentality of the foremen, bosses, supervisors, and contractors working on that project; "it's like the Wild West, everyone's got their own rules." When asked about their ability to perform their jobs properly, without pressure to cut corners to meet deadlines, one second-year apprentice emphasized, "it really comes down to the attitude of who's leading which crews ...". Apprentices described having worked with leadership from other trades who "just got" MI, who communicated and who worked with other trades to ensure that work was conducted to the best standards and that everyone could do their job. However, one apprentice acknowledged that these functional workplace relationships rarely transfer in the commercial sector. In such a large industry, with so many projects, you simply cannot expect to work with all of the same crews from job to job. Furthermore, the impression given by apprentices was that motivated leadership, willing to prioritize quality practice over profits was an anomaly in the industry to begin with. So the chances of working on a site where foremen and contractors from all trades demonstrated this type of professional ideal was far from likely.

One apprentice hinted at how size factors into determining the conditions on a work-site, and the morale of the workforce; "I like it, we're a small company, it's not a big company, we get things done. There's a lot of trust in the employees right that we know the knowledge and we know how to do the work properly." The implication is that, the experience of working on larger sites or with

larger companies is a downgrading of trust, of sufficient training, of self-efficacy and that these factors can generate decreased efficiency and effectiveness on project sites. Size also emerged as a concern in terms of ownership and responsibility on job sites. One second-year apprentice felt that on projects where developers rely on general contractors to coordinate and execute large projects, the developers "pass the buck" to contractors when it comes to ensuring standards and best practices on site. The apprentice's point was that contractors, whose priority is to project completion and timelines, cannot and should not be really they solely responsible for enforcing best practices, and that developers are shirking their responsibility.

"I used to think ... a building was just like, 'hey it's a building', and everyone works for one company. But it's not; it's a universe really. You've got all these subcontractors and contractors and they're all doing their own thing. So, while you could have half the people doing what they're supposed to do, but the other half aren't doing what they're supposed to do, then you're 50% crap." ~ Second-year apprentice

APPRENTICE PERSPECTIVES: "GREENING" THE CANADIAN CONSTRUCTION INDUSTRY:

Key findings:

- Current progress in industry is slow at best, faced with much resistance and lack of motivation/investment on the part of the work force and the employers.
- "Greening" the industry will require:
 - A major cultural shift in the industry
 - Addressing trade relations and barriers to horizontal as well as vertical channels of communication within the industry.
 - Both internal and external initiatives (a multi-faceted approach)
- Proposed approaches:
 - Policy, legislation (with penalties, incentives, and enforcement) – can involve internal initiatives but will also require external, third-party intervention.
 - Education and awareness initiatives (for general public, current journeypersons, other trades, and industry professionals).
 - Adoption of marketing approaches (recognizing industry as business/responding to market forces).

Both cohorts of apprentices were asked about their opinions on changing the industry; whether the industry is currently undergoing change towards green construction practices, and what it will take to push the industry in that direction. While both offered some level of response, there were obvious differences in the types of responses provided by the fourth-years as compared to their second-year counterparts. Fourth-years offered shorter, less detailed, less diverse and less enthusiastic or optimistic responses than the second-year apprentice group. Unlike previous sections, this distinction was not a reflection of differences in commercial versus industrial experience. Rather, it reflected the general pervasive apathy generally expressed by the fourth-year group. As hypothesized previously, this

could have been a result of various contributing factors including length of program experience and exposure, age and maturity, career context, and exposure to program challenges and stress. However, it is quite possible that the second-year apprentice exposure to the 'Green Awareness' course had a role to play in the greater degree of enthusiasm with which they spoke to this major theme as compared to their fourth-year counterparts. This is not to say that all of their responses were overtly positive, optimistic or rosy. However, they were diverse, detailed and honest.

- i. Approaches based on policy, legislation, enforcement and incentives:** The majority of the apprentices from both groups of interviews touched on some sort of policy, or legislative-based approach to addressing cultural and structural barriers to change in the construction industry. These approaches all tended to focus on external enforcement measures. While it was not always explicitly stated, the majority seemed to reference government intervention in particular, "The industry needs to be touched on by something outside of it, like the government needs to step in." The consensus was that current forms of regulation for the industry were insufficient or inadequate, and that some means of enforcement would be required to ensure best practices and standards were upheld; "On the commercial side ... they don't care, and to change that, there's got to be a regulation in place that you have to build to a certain standard. I mean building codes only go so far." This theme emerged first in relation to the question about whether the industry in the province of BC was moving towards greater acceptance of green construction practices, or sustainable development. The few apprentices who felt that it was often cited external pressures as the main force behind these changes.

Far more of the interviewees, however, felt that changes were either non-existent or occurring extremely slowly. In this case, greater pressure from outside the industry in the form of, not only public pressure, but also government intervention was deemed necessary to encourage the rate and quantity of change necessary to shift the industry culture. This would also require active enforcement of any new policies or legislation. The apprentices also seemed to agree that, for any of the new policies or legislation to have teeth, any enforcement practices would need to be cost-based; "It's money, that's it, that's all I can think of. I think we're all on board with saving energy, but it's always a business before everything else." Whether these practices should come in the form of financial incentives (e.g. bonuses, tax-credits, tax-breaks) or penalties (e.g. fines) was up for debate, but all agreed that the current business-minded industry culture presented a leadership that would respond most strongly to a financial argument for 'going green'.

"Cause as it is now, they're not going to profit off of it, and like I said they're more about money. At the end of the day, they're a business, and if you're not making money than what's the point right?" ~ Second-year apprentice

One second-year apprentice provided an example from his own experience where he was on a job site where there were fines for not disposing of your waste properly. He suggested that the financial incentive was key in motivating leadership to ensure proper disposal of materials amongst the site workers. Furthermore, it offered the opportunity to generate a conversation around recycling within the workplace. Several apprentices expressed the need for a third party, objective

auditor or investigator. While the government was seen as an important regulatory body in terms of establishing the mandate, they were also perceived as having their own agenda and were therefore suspect in its enforcement. As one second-year apprentice put it, "the government has their agenda, the union has their agenda; everyone has their own agenda, right?" Responses were not always optimistic in terms of the likelihood of these changes occurring; the pace and complexity with which policy is produced and then legislation is introduced was a concern:

"But it's so hard you know, because it has to go through legislation, and then you have people who talk for people, then those people have to go talk to those people, and then they talk to like the house, and I don't see it happening, no. I feel like construction is just ... it's construction, and that's how people see it ..." ~ Second-year apprentice

Another factor frequently cited by both cohorts as essential to improving performance and quality of work in the industry was better communication and coordination of the different trades. Once again, financial incentives were offered as a motivator to encourage better interaction; the idea of implementing "kickbacks" to tradespeople who worked efficiently and effectively with the trades directly impacted by the work. It was also seen as an important responsibility of worksite leadership; "That needs to come from the head, the big head honcho dude, he needs to sit down and be like, 'listen, this is my site, this is how it's gonna be run, ya'll are gonna communicate'."

Linked to this issue of coordination and communication of trades was the idea of differential treatment of the different trades involved in a project. As highlighted previously, the apprentices often felt that mechanical insulators were treated unfairly on job sites and that poor treatment or disregard for their trade within the industry resulted in poor work performance and an inability for them to do their jobs properly. The necessity for equal treatment of the different trades groups therefore came up several times. Many apprentices saw this as a need to address the "politics" within the industry. The concept of industry "politics" was linked to the idea of an industry culture that included a trade hierarchy that prioritized the more expensive and more visible trade groups. Similar to the issue of unequal treatment across the various trades, was the need to address unequal treatment within the MI trade. One fourth-year apprentice with industrial work experience focused on the idea that if the industrial and commercial sector were on par in terms of pay and benefits, this would work to improve workplace morale and workplace culture and therefore better quality work on the commercial side of the industry.

- ii. **Approaches based on marketing, promotion, education, and awareness:** The other types of approaches proposed by the apprentices focused around the need for increased education and awareness, and the potential of "green construction practices" as a marketing tool. These suggestions emphasized a need to generate more interest (inside and outside of the industry) for green construction practices as well as increased knowledge of what approaches are currently available within the industry (and how MI can contribute). This then serves to generate pressure for increased adoption of sustainable development. Once again, relations amongst the different trades emerged as a significant subtheme. One fourth-year apprentice suggested that offering other trades a "crash course" in MI would help improve communication, appreciation, and respect between the

MI trade and those trades that they work most directly with. A couple apprentices from both the second- and fourth-year cohorts expanded this idea to include increased awareness of roles across trades, so that each trade had a clear understanding of how their work impacts (either directly or indirectly) on the work performed by other trades. Building on this idea of the importance of communication was the suggestion that tradespeople would benefit from the incorporation of soft skills or "people skills" into their training. Ensuring tradespeople are comfortable and confident in communicating with others, and educating them on the importance of frequent and effective communication would increase cross-talk and coordination within and amongst trades on job sites.

Several apprentices were quick to point out that waiting for the next generation of apprentices was an ineffective and inefficient method. Instead, educating the existing workforce would produce change now and ensure that the concepts and ideas presented in programs like the MI 'Green Awareness' course had room for discussion and application out in the field. Therefore, continuing education opportunities for mature workers are an important piece of any education or awareness approach to driving change in the industry. One apprentice saw a current lack of awareness around issues of sustainable development and "green construction practices" as a major contributor to the lack of interest or investment on the part of construction workers. "A lot of people go through the program, they do their four years, they go out, they start working and then they get disconnected or they don't manage to keep on top of all the old programs." In an industry where the older, more experienced generation of workers is perceived as a being "set in its ways" and "stubborn" or resistant to change, it can be very intimidating and challenging for the incoming workforce to be the voice of change. Continuing education could therefore offer an important method to both support the next generation of apprentices in making change, as well as relieve some of the pressure or responsibility they might feel to help implement meaningful change in an old, established industry.

In terms of impact, one fourth-year apprentice suggested that greater awareness and education around the environmental impact of current building practices would help promote rethinking what constitutes "waste" within the industry. Apprentices noted the reusing and recycling of materials as an area where some advances had already been made in the industry. Several apprentices discussed the use of bins for sorting materials on job sites, and one had mentioned a job site where penalties were incurred for improper sorting. They therefore described this as an area, which could be pushed even further. In particular, they emphasized more could be done in terms of recycling and reusing materials used in MI. An educational approach would help promote and advocate this need. Several second-years described their own experience of developing increased awareness through education via the 'Green Awareness' course, and the subsequent feelings of pride, interest and motivation it produced. Exposure to the 'Green Awareness' course content had increased, not just their understanding, but also their interest in "green construction practices" and helped them contextualize the global impact of their industry and workforce.

"The ['Green Awareness' training] gave me a better understanding of how important buildings are for the consumption of waste products and energy, how much material is used, how much energy is used." ~ Second-year apprentice

Several apprentices explained that this new awareness gave them a sense of pride in doing their job, and incentivized them to do their job well. It is possible that this effect would translate to other members of the industry. A second-year apprentice looked at the impact of his learning experience within the apprenticeship program, and extended the idea of the importance of this type of education beyond the boundaries of the construction industry. This apprentice's exposure to the 'Green Awareness' course content had led him to appreciate energy in an entirely new way. He highlighted the fact that people tend not to think where our energy comes from, or how much we use for different parts of our day-to-day life and suggested that we often just take it for granted, "We really need to be a lot more conscious of ... how much energy we're using, where its coming from, where it's being lost, how efficiently it's being used." The knowledge that 30-35% of the energy that humans produce, goes directly into buildings was a big eye opener for him, and he thought it would likely be the same for others. He supported the need for this type of information to be shared early and often:

"I think that's something that could probably be hitting people much, much sooner and not just trades; I think that's something that really needs to be expressed to everybody in general ... I think that could even be something that starts to hit, you know, elementary schools and start teaching people about it young and then they start being more conscious about it moving forward." ~ Second-year apprentice

Slightly contradictory to this understanding of an increased need for education on energy consumption and sustainable development in the younger generations, was the idea that younger generations are already invested in environmental issues and that 'going green' could actually be used as an important promotional tool. Several apprentices expressed an understanding that the "younger generation" from which the next generation of mechanical insulators and tradespeople would emerge, has demonstrated an interest in environmental issues, and that sustainability is a concept that they care about. One second-year apprentice felt that this gave the trade of MI an edge in recruitment. The trade's long history as an energy-saving practice, as embodied in the 'Green Jobs, Great Jobs' campaign, could be leveraged to attract the next generation of mechanical insulators. His concern was that there was a substantial gap in awareness and understanding in the general public regarding the role of MI as a trade. Education was an essential piece to engaging and recruiting a workforce that cares about environmental issues, is invested in the 'Green Jobs, Great Jobs' movement, and will work to shift current industry culture:

I know tons of people ... my age or younger, who are like, 'greenhouse gases, yeah let's fight 'em, let's go green!' ... Then the number one question is, 'where the hell do I get a job that would be doing anything to help with that?' you know? So you educate that this is what mechanical insulation is and this is why it helps, and THEN you learn how to do it, rather than ... go do it and then you learn" ~ Second-year apprentice

Apprentices also mentioned the potential for using environmental and sustainability messaging as a marketing or promotional tool in terms of making it an attractive "sell" to owners and employers in the industry. This speaks to the existing predominant cultural interests described within the

industry. Second-year apprentices offered several suggestions on how to go about promoting and selling “green construction” to the public. One focused on advertising to attract contracts; “... maybe something for the promotion of their company about how green they are and how well they’re doing and this is what they’re doing for the environment, that would probably get them more work through contractors ...” Another focused on advertising at the sales end, “You might even be able to sell the apartments or condos for more money by going, ‘listen, we managed to make this building 90% energy efficient, which means your energy bill is a lot less.’” Critical to their argument is the belief that green, or sustainable construction practices are already attractive to a substantial portion of the general public looking to purchase commercial property, “That’s a thing people like; people like to buy things that have the green stamp of approval on it. Why not the building market, which people are just buying into right now?” In this case, all that remains is to convince the industry that this public interest can be leveraged to increase profit margins by providing an edge over the competition when it comes to attracting potential buyers and increasing rates of sale. One second-year apprentice was quick to offer suggestions on how that might be achieved:

“In the real-estate market ... it can be part of the sales pitch, ‘by the way, when we designed this building, we designed it with energy savings in mind ... and then you can show people the mechanical room, you know, ‘this is the amount of effort and time that we put into it to make sure that no energy is wasted in this building.’” ~ Second-year apprentice

The use of MI as a promotional piece requires that people, as in the general public who form the consumer-base for these commercial development projects, understand what MI is. Its success therefore hinges on the degree to which people understand and appreciate how MI contributes to the picture of sustainable development. This need once again brought apprentices back to the importance of education as a piece to shifting industry practices. The apprentices argued that people need to be made aware of MI in order for them to become savvy, informed buyers. The public needs to understand what MI is, how it works, and when it is used so that they know what questions to ask as consumers and what to look for when making a purchase. Not only does this ensure the feasibility of MI as a marketing tool, it also works to prevent green-washing and quality-cutting practices like those described by the apprentices with experience on LEED sites:

“It’s not just about slapping a solar panel on the roof - because the solar panel generates some energy and it’s great and all - but if we can be less wasteful, that’s the better choice. Think about recycling: reduce, reuse, recycle.” – Second-year apprentice

- iii. **“Green culture” versus “safety culture” in the industry:** The interview findings paint a description of current construction industry context in BC with significant challenges for the promotion and implementation of “green construction” practices. The previous sections presented the general approaches apprentices felt would be most effective in moving the industry towards sustainable practices. However, there was also one unique, specific example that emerged over the course of the second-year interviews, which had to do with the growth and evolution of “safety culture” in the construction industry. The idea of safety culture was presented in terms of occupational health

and safety on worksites and a demand within the construction industry to create a culture that puts the safety of the workers first. The comparison of "green culture" to safety culture first emerged in response to a question about whether work site culture reflected concerns about the sustainability of a project, or the importance of reducing the carbon footprint of buildings. One second-year apprentice compared the lack of interest in green practices relative to that of workplace safety:

"It's a different topic [than 'green construction'], but safety culture. When you walk onto industrial sites, that one's being really heavily pressed ... I guarantee you, if you landed on a site that practiced the green program nearly as hard as some of these industrial sites [are] really trying to emphasize their safety program, you would see a lot of big changes." ~ Second-year apprentice

Once again, the implication was that the promise of financial incentives, or the threat of financial penalties, was essential to engaging the industry and encouraging better standards of practice. In this case, the industrial sector was seen as having been encouraged by external pressures to take a hard stand on workplace safety through the introduction of harsh financial penalties and the potential for lawsuits in the case of workplace injury; "You for sure know that's about money, that's very much about money. It's very expensive when somebody gets hurt; it's a very costly affair." However, the same could not be said of environmental concerns. The same apprentice pointed out the particular challenge for the industrial sector, in that the type of projects performed by this sector often are directly at odds with environmental interests. The question then becomes, how do you marry two images - industrial development and environmental sustainability - that have historically been so at odds with each other and, in many ways, continue to be so?

"It's really hard for them to pitch how they're building a camp and, 'we want it to be green, and we want it to be efficient,' because we're gonna have a bunch of miners here and they're gonna go into the ground and pull up a bunch of bitumen ..." ~ Second-year apprentice

The lauding of the success of safety culture within the industry was not just limited to industrial projects. One apprentice recalled working on the construction of a hospital where the leadership actively promoted and enforced safety practices amongst all of the works involved in the project. One approach they used was publicly recognizing individuals who had demonstrated knowledge of and commitment to safety practices in their day-to-day work. These individuals would be recognized in front of their peers at project-wide, monthly or bi-monthly meetings and given a reward like a pre-paid Visa card. This approach involved a commitment on the part of the project leadership to instigating shifts in workplace culture. The apprentice suggested that this type of approach might also be used to promote and encourage sustainability initiatives or environmentally friendly practices (e.g. recycling) on worksites, "It would really push the mentality forward; it would make people at least think about it for once."

The discussion of the success of safety culture relative to environmental culture was not limited to areas of the industry responsible for conducting projects indifferent or even antithetical to the environmental movement. In fact, one second-year apprentice with experience working on LEED sites was adamant in his evaluation that LEED projects require better oversight and more

aggressive enforcement of standards in meeting their sustainability designations. He provided an example from his own experience of working on a designated LEED project. The apprentice recalled being told it was a LEED project for the first time: "When I found out it was a LEED project, I was just stunned. I was like, this is a LEED project?! ... There's not a thing here that's reminiscent of a LEED project at all!" The apprentice could appreciate the logistical and financial challenges associated with managing and developing this particular project, which involved the construction of a major hospital in a remote location. What the apprentice could not rationalize was how or why the decision was made to pursue LEED designation if these challenges were known and would obviously impair the project from performing to LEED standards; "you've got to follow through on it, or you gotta say, 'no, we cannot make it to this standard.' Because, to me, I think it just ruined the name of LEED." He expressed a serious concern about lack of accountability as a result of an absence of oversight or enforcement; "Like, you have a safety supervisor – you could just have a "green supervisor" – and LEED projects don't have that, and that is absolutely insane to me." This example therefore relates to the idea of the need for third party objective inspection or supervision within the industry, when it comes to demanding standards of practice.

"Like, you have a safety supervisor – you could just have a 'green supervisor' ... I think if you're gonna have a safety supervisor walking around, making sure everyone's ok, you should be making sure that you're doing your part for the environment because they are getting all these incentives to do it." ~ Second-year apprentice

Regardless of which approaches are taken, these apprentices made it clear that change within the industry will require a dramatic shift in current industry culture. Their responses also made clear that such a cultural shift will require not only external pressures acting on the industry, but also internal initiative and willingness on the part of industry leadership to set examples.

"Yeah, it is about trying to shift a culture and that's the way it'll happen, but somebody's gotta kind of start doing it. You need to have the one, like, general contractor that goes 'we're building green buildings; 100% green buildings; the most efficient we can build; we're gonna press this and we're gonna emphasize it every morning and we're gonna make a big deal about, about how we're saving the climate.' You would be able to make an impact that way, but I just haven't found a site that does something like that yet." ~ Second-year apprentice

Research Limitations and Challenges

The interview setting posed several unique challenges that may have influenced the research process. Because the interviews took place during class, it was apparent to all members of the class, and to the instructor, which apprentices had participated and which hadn't. Therefore, while confidentiality of interview content was observed, complete anonymity in regards to participation in the research process was impossible. This may have influenced some apprentices' willingness to participate in the research

process. Another factor that may have influenced participation rates is the existing limitation around on classroom time. While interviewing at the program location may have increased the convenience of participating, interviewing during classroom and shop hours may have been a disincentive for apprentices already challenged by limited in-class time. Apprentices were asked to commit anywhere from thirty minutes to one hour of teaching, study, or project time which, particularly for the fourth-year cohort who were days away from writing their final Red Seal exam, might have been too much.

In regards to the interview rooms, both of the private office spaces used for each of the interviews had windows. It was therefore possible for classmates to see interviewees and vice versa during the interview process. It is possible that this degree of visibility may have created distractions as well as discomfort during the interview process, although, this was not readily apparent during the interviews. The second-year interviews took place in the instructor office adjacent to the workshop and other trade instructors had access to the office space in order to use the printer and fax machine. The very first second-year interview was interrupted when an instructor from another trade needed to make use of the photocopier. This may have contributed to a sense that this interview environment was slightly less private. Despite these various challenges, apprentices who volunteered to be interviewed seemed eager and willing to share and were genuinely interested in contributing to the research process. There were no obvious signs of concerns regarding the nature of the research process and their willingness to share openly is reflected in the quality and quantity of content provided in the transcripts.

The volunteer nature of apprentice participation in this research project introduces several limitations. First, the lack of random sampling could have introduced biases in terms of the types of participants represented in each sample and, therefore, the views and opinions presented in the findings. The evaluation of the demographic distribution and group characteristics presented in the findings suggests that each sample was fairly representative of their respective class demographic. However, this does not necessarily mean that the views and opinions expressed by the interviewees were equally representative. Second, full participation of both classes was not achieved through volunteer participation. Instead, the sample size for each cohort was relatively small (less than 50% of total class size for both years). When considering that an apprentice class consists of less than 25 students, the sample size would always have been inherently small. As a result of these limitations, the findings may not provide a complete representation of the MI apprentice experience across program years.

Conclusions

The findings from the interviews highlight several important trends that speak to the impact of the 'Green Awareness' training. The second-year apprentices, who had all received both components of the 'Green Awareness' course, provided far more content and detail overall in their interviews. Their interviews were, on average, twice as long as their fourth-year counterparts and they were far more engaged by questions targeting how issues of sustainability, energy conservation, "green construction practices" and climate change are addressed within their trade and throughout the construction

industry. This suggests that the 'Green Awareness' course components had some measurable impact on a MI apprentice's willingness, interest, or ability to engage in discussion on climate and industry-related issues. Lacking the context provided by the 'Green Awareness' course content, fourth-year apprentices were far more likely to relate responses back to practical or superficial aspects of their trade, rather than focusing on the environmental or climate implications.

In general, the fourth-year responses reflected the type of entrenched industry culture that both cohorts described as pervasive within construction. This is a culture characterized by a profit-driven, business model approach to building development that promotes an "every-person for themselves" type of job performance. The second-year apprentices also expressed feelings of frustration and a certain degree of acceptance of the current industry context and culture. However, they were more likely than the fourth-years to emphasize the positive traits of their trade and their sense of interest, investment, and pride in performing their trade. This was evidenced by differences in attitudes regarding the industry, the MI trade, the apprentice classroom experience, etc. (optimism versus pessimism). In particular, the heightened awareness of the environmental impact of their trade as presented through the 'Green Awareness' training was directly linked to the pride in their trade and a desire to do their jobs well (better sense of why their job is important and how it can make a meaningful difference).

Both cohorts were consistent in their perception of how the MI trade is viewed by other trades in the industry. They felt that many in the industry were dismissive of them as a lower status or "sub-contracted" or "second" trade. They also perceived a declining industry interest in the value of MI and the work of the trained insulators who installed it. Feelings of being "less-visible" or even "ignored" by industry professionals, industry employers, job-site leadership and other trades were pervasive. These perceptions had a direct influence on apprentice morale and attitudes towards the industry. The MI apprentices voiced significant concerns about their working relationship with other trades. They articulated the need for better communication, collaboration, and understanding across the trades as critical to the success of any construction project, and for ensuring best practices and sustainable practices on job sites. They felt that tensions across trades were ultimately a major barrier to achieving a better overall working environment.

Current industry culture and organizational structure were the second major barriers to effective communication, collaboration, and best practices in the field. They described the industry as large, unwieldy, and hierarchical with entrenched cultural norms. These conditions have been further aggravated by the relatively recent boom in the construction industry in BC, particularly in the lower mainland. The apprentices perceived a general lack of understanding, awareness, and interest regarding environmental issues and the role of the industry in contributing (or mitigating) impacts on global climate. This represents a serious challenge for engaging and motivating the industry towards sustainable practices. An ingrained fear and distrust of change and a comfort or even desire to maintain the "status quo" on job sites contributes to this barrier. There is the added challenge of working within a large, complex, diverse industry where most coordination occurs at a high level and little is done to integrate at the bottom. This hierarchical gap between decision-makers and workers on the ground produces unrealistic decision-making in regards to timelines, building design and

implementation, further contributing to these systemic problems. These problems present serious barriers to the implementation of knowledge acquired by MI apprentices in the 'Green Awareness' course components, as well as baseline best practices for MI (and for other trades).

While many of the sub-themes that emerged from this research were shared by all the apprentices, significant differences emerged between industrial and commercial sector priorities, and their associated implications for workplace culture. The different types of projects undertaken in the two sectors, along with associated differences in the nature of the work performed, and the degree of company investment in the respective projects had major implications for their respective workforces. This was apparent from the contrasting responses by interviewees to questions about workplace training and standards of performance. This was also apparent in their descriptions of workplace culture; specifically, their interactions and relationships with other trades, with site leadership and employers, and with industry professionals. These findings indicate that the challenges to adopting more sustainable construction practices are somewhat different in the two sectors. Consequently, efforts to addressing these challenges need to consider sector (and site-specific) context.

The findings also support the adoption of a multi-prong approach to shifting industry culture especially within the commercial sector. The apprentices emphasized the need for change through increased education, promotion, and awareness within the industry workforce. They all agreed that external pressure would be required to implement widespread industry adoption of sustainable development practices. External pressure could include third-party inspections or audits, government policy intervention and pressure from the public. They saw government intervention, in particular, as an essential component to ensuring consistent standards across the industry. While second year apprentices were slightly more optimistic about the fate of sustainable and "green" construction practices in the province, both cohorts expressed considerable scepticism as well, highlighting the long path the industry has still to go before environmentally sustainable practices are adopted as the norm.

The views expressed by the MI apprentices on the overall culture of the industry suggest that the issues facing the MI trade are not unique to their trade. Increased coordination and collaboration amongst trades – and reducing the current silos separating trades - would benefit all areas of project development and construction. Similarly, the lack of sufficient time and space mechanical insulators experience in performing their jobs to the standards to which they have been trained are also faced by other trades within the commercial sector (though possibly to differing degrees). Closer relations with other trades would help generate solidarity in the cause of improving workplace conditions, work expectations and the overall quality of work, subsequently strengthening the impact of worker-led efforts to 'green' industry culture. It is also necessary to address the current gap between conditions for workers on the ground and the decision-making of developers, architects, planners and engineers - the top decision-makers – which currently contributes to unrealistic expectations about work schedules and job performance, across the board.

These findings regarding the experience of insulator apprentices are significant for other reasons. The BC Insulators were prepared to allow an independent research team to evaluate the strengths and weaknesses of their efforts to introduce a 'Green Awareness' course into the MI apprenticeship

program, knowing that this research could produce findings that were critical both of the new course content as well the overall apprenticeship training program. However, the BC Insulators saw the research as essential in order for them to understand more fully how the program was being received by its apprentices and, consequently, what changes it might need to make to facilitate a more effective approach to promoting climate literacy, both in the classroom and on the job.

Behind this motivation, was the recognition that a key requirement for implementing low carbon construction was the commitment of its own members to this enterprise. Its administration of the apprenticeship program provided a vehicle for changing the culture of the trade, as its younger members would be exposed to climate change research as well as information about the way in which their trade could play a central role in mitigating global warming in the construction industry. Of course, the BC Insulators understood that introduction of this new course content into the apprenticeship program would only represent one component in their larger, multi-faceted campaign to change the culture of the industry. But it is nevertheless an important component, whose long-term impact will complement the various other parts of the union's broader campaign to educate the building industry of the critical importance of MI in reducing energy consumption and GHG emissions.

Recommendations

The preceding discussion has highlighted the numerous barriers facing both the BC Insulators and the industry more broadly, in addressing climate mitigation and sustainable practices within construction. The challenges go beyond the training system for MI apprentices and include legislative and regulatory frameworks, the economic pressures within which construction operates and the roles of numerous industry partners including developers, professionals, project managers, contractors and many others. The scope of the problem is therefore substantial. The following recommendations however, are grounded in the specific findings of this research and therefore focus on issues raised by the apprentices in their interviews – issues that reflect the experience of MI apprentices, both in the classroom and in the workplace. The recommendations also reflect the conclusions that the researchers themselves have reached as a result of the information provided by the interviewees. The first set of recommendations are intended for the BC Insulators themselves. They relate to the 'Green Awareness' course content, making suggestions about how it can be more effective. They also address broader issues associated with the apprenticeship program itself that may be helpful to the BC Insulators in addressing some of the limitations identified by its apprentices. The second set of recommendations is for the Provincial Government, and focuses more broadly on some immediate changes the government could make to strengthen the apprenticeship program and also to reinforce efforts to adopt better, more sustainable construction methods. The final set of recommendations targets the industry itself, and specifically changes that employers can and should be making. This is far from a comprehensive package of industry reforms, as the researchers have been mindful of the need to base their proposals on the results of the interviews and not on a root and branch assessment of the industry's capacity to implement low carbon construction.

BC INSULATORS

Regarding the 'Green Awareness' course:

1. The research findings identified an important gap in the classroom implementation of the 'Green Awareness' course. The link between the role of MI and mitigating climate change was not adequately underscored. The course content should more clearly describe this link. Explicitly identifying how building energy consumption, associated carbon emissions, and global climate change are connected can reinforce the importance of MI in mitigating climate change and facilitate constructive discussion amongst the apprentices about the role of construction in global warming.
2. The program could also make use of outside climate change experts to provide short background presentations on climate science and the significance of reducing energy use in buildings. This would ease the burden on the instructor and further validate the importance of addressing climate change. It would also support the BC Insulator's efforts to encourage apprentices to become climate ambassadors.
3. Opportunities to 'problem-solve' challenges in implementing best practices (particularly knowledge and skills acquired through the 'Green Awareness' training) outside of the classroom would be beneficial, especially if based on real life case studies. This will help to bridge the gap between class and work realities for apprentices and provide them with tools to engage in productive conversations with other trades on the role of sustainable practices in the workplace.
4. The reality that trades operate in 'silos' creates problems in understanding how each contributes to the overall work process. It also negatively impacts workplace culture, worker morale and overall project quality. Consequently, opportunities for dialogue with other trades (both at BCIT and in the field) should be pursued to bridge the divides across the different trades, to promote understanding and respect, to encourage collaborations and facilitate better recognition of the value of each trade's work. These types of activities or events should be considered not only for apprentices, but also for working tradespeople. For example, in Germany they overcome this problem by requiring all construction trades apprentices to take a "universal" first-year curriculum together, before branching out into their respective trades. (Calvert 2015c; Calvert 2011)
5. The apprentices identified education as essential in shifting existing industry cultural norms, underscored by an absence of understanding or interest in climate-related issues within the industry. We therefore recommend that the 'Green Awareness' course content be adapted for a mature, experienced tradesperson audience. It should be promoted as a continuing education opportunity for current union (and non-union) members through refresher training programs. Given the ongoing need for members of the trade to learn about advances in technologies impacting their work, incorporating climate issues should be a deliberate part of any continuing education program for qualified trades workers.

Regarding the overall MI apprenticeship program:

1. We recommend incorporating opportunities for regular apprentice feedback on course content and structure, including an instructor performance review, to the apprentice program. This process will facilitate program enhancement and quality improvement.
2. The interviews indicate that MI apprentices have identified the current position of the program within BCIT as a challenge to program delivery and quality. We recognize that the unique arrangement between the BC Insulators and BCIT for the apprenticeship program creates challenges, but believe that these can be overcome with a commitment by both parties to working collaboratively. We therefore recommend that the BC Insulators engage in dialogue with BCIT to strengthen relations with the college and to improve the apprentice experience on-site.
3. We also recommend that the union executive review how current investments in the program are allocated, in light of points raised by the apprentices. Specifically, it should consider the feasibility of adding a program assistant or classroom teaching assistant to support the current instructor.
4. Finally, our research findings suggest that the BC Insulators should strengthen the connection between the union's overall campaign initiative and the classroom. Union officials should consider visiting the classroom and speaking to their apprentice cohorts directly about the 'Green Jobs, Great Jobs' campaign and the vision the union leadership has for the future of the trade.

PROVINCIAL GOVERNMENT

1. The issue of sufficient class-room time is clearly a major concern for MI apprentices, as well as their instructor. This concern can be linked to the level of government financial support for trades training in the province (particularly MI). The government should reassess its approach to investing in trades training in light of the significant impact the trades have on the quality and long-term energy efficiency of buildings, and the corresponding need for a well-qualified workforce to implement the Province's stated climate objectives. This means both financial support and the willingness to allow apprentices to spend more time in the classroom. It should also review its requirement for employers and contractors regarding their support for skills training and their employment practices, in order to support the apprenticeship system more fully.
2. The 480 hours of classroom time for MI apprentices is far lower than for most other trades. There is a strong argument for the provincial government increasing this requirement at least to the level of the average for the other trades so that insulation apprentices have adequate classroom time to master the competencies of their trade, as well as to learn the emerging skills required to implement low carbon construction. This will also help to address underlying perceptions by other trades of mechanical insulators.

3. The interviews raised serious concerns regarding current industry culture and priorities on job sites, and their negative impact on work-place practices and project-quality. This evidence indicates a low level of climate literacy on building sites and little incentive for prioritization of climate objectives. The government needs to recognize this as a major barrier to its own climate objectives and that the industry, as presently organized is not capable of implementing low carbon construction practices effectively. Accordingly, it should assess the various policy tools it has at its disposal – regulatory, financial, educational and research - with the goal of shifting industry culture in support of sustainable, low-carbon construction. This includes promoting/encouraging/legislating best practices and higher building standards (i.e. working against the lowest common denominator). It also means encouraging the creation of a workplace/work-site culture that fosters and encourages respect for skilled trades - low carbon construction cannot be done properly with a workforce that is largely unskilled.
4. Implementing comprehensive low carbon construction methods will require a major culture shift within the industry. This will entail not only external pressure in the form of higher building code standards and enforcement, but also encouraging collaboration and partnership across all sectors of the industry. In particular, government should commit to giving the trades and their unions a meaningful role, alongside other industry interest groups, in the development of training policies, building standards and the numerous other changes urgently needed to 'green' the industry.

INDUSTRY EMPLOYERS

1. Opportunities for promoting communication and collaboration across trades should be pursued in order to help bridge divides across the different trades, to promote understanding and respect, and to encourage collaborations and open up dialogues both at the management level and at the labour level. Employers should see the value of this investment in improving productivity, efficiency, and quality as well as creating better work-site morale.
2. The research identified communication as critical to the success of projects within the construction industry. Investment in tools and procedures that improve cross-trade communication on the job site could yield significant benefits for both employees and employers. Several of the apprentices suggested that employers could make better use of technology (e.g. developing or acquiring a cellphone App that could track the completion of project stages by the different trades).
3. The research highlighted the communication gap between decision-making processes at both the project design/planning and the project implementation stages. This gap presents significant challenges for tradespeople on the work site. The training received by industry professionals (e.g. engineers, developers and architects), as well as industry leadership (e.g. contractors and sub-contractors) about on the job working practices contributes to this gap. Employers should be adopting strategies that help to bridge knowledge gaps and encourage communication at all stages of the building process.
4. The apprentices identified leadership on the job-site leadership as a critical factor in both

workplace morale and job quality. Employers should recognize the importance of on-site leadership and work to implement systems for monitoring, evaluating and enhancing leadership quality.

5. Work-site incentive and recognition programs were also identified as an opportunity for shifting workplace culture, specifically as a way to promote communication, collaboration, quality, efficiency, and the use of sustainable practices on the job site. Job-site leadership could play a critical role in rolling out these programs on the ground. Apprentices identified workplace safety culture as an example of how this system might work.
6. Finally, the potential for "selling sustainable practices" should be seriously considered by employers as an incentive for investing in these recommendations. MI apprentices identified the market as ripe for investing in sustainable, long-term efficiency.

Future Research Initiatives

This research provides a number of insights into the challenges facing the MI apprenticeship program and, specifically, the implementation and subsequent impact of the 'Green Awareness' course. It has identified critical barriers to improving the performance of skilled tradespeople within the construction industry as well as the difficulties in promoting sustainable, high, quality construction practices in an industry characterized by a highly competitive, low bid culture. The findings highlight the need for an extensive review of the roles of government, industry employers, professionals and union leaders, as well as the overall approach to BC's trades training programs.

From a research perspective, there are several areas that merit further exploration to assess ways to further 'green' the province's construction industry. The BC Insulators' 'Green Awareness' initiative has been only one component of the union's broader campaign to promote greater energy efficiency in the construction sector. Its extensive efforts to document the critical role of MI and to provide the industry with technical information about best practices have been documented in an earlier study, which also reviewed the union's campaign to alert governments and industry to the need to raise building code standards and facilitate higher MI quality standards on construction projects. Evidence of the impact of these efforts on governments and employers needs to be further documented.

In addition, the BC Insulators have initiated a program to provide journeyman insulators with the skills needed to audit the energy performance of HVAC systems using advanced infrared technology. Referred to as the 'Salamander' project, the union has recently begun providing energy audits to a select number of building owners in both the public and private sectors in BC and Alberta. The union believes that identifying potential energy savings from retrofitting MI installations in existing buildings will encourage owners to carry out major retrofits, providing new employment for its members while reducing energy consumption and GHG emissions from existing buildings. The impact of this initiative needs to be assessed.

Looking more broadly at BC's system of apprenticeship for other construction trades, it would be valuable to compare what the BC Insulators have done with efforts by other training institutions – including BCIT – to build green awareness into their trades training programs. The goal of developing climate literacy is now shared by many training organizations in BC. However, their effectiveness in shaping worker attitudes and their impact on job sites merits further research. For example, it would be extremely valuable to survey the other trades programs in BC to determine the extent to which climate change issues are being incorporated into their curriculums and the extent to which their impact is being monitored and evaluated. Such a survey would also provide an opportunity to identify synergies and opportunities to share educational materials.

Targeted interviews of either the instructors and/or the students of other related trades programs (i.e. plumbing, electrical) would be extremely useful in providing context for responses garnered from the MI apprentices. It would be possible to adapt the research interview materials utilized for the current interview, to remove the 'Green Awareness' course content while maintaining the integrity of the employment, industry, and program experience content. This would provide a unique foil to the insulator perspective and would allow us to explore whether there is overlap in the types of challenges, concerns, or suggestions for improvement perceived across different (and related) areas of the trades.

Finally, conducting follow-up interviews with subsequent cohorts of MI apprentices would allow for two unique research opportunities. First, it would serve as a qualitative assessment of the long-term potential for transformative impact from the 'Green Awareness' training. Second, as a qualitative evaluation method, it would provide an extremely powerful source of feedback for enhancing and improving both the 'Green Awareness' course content, as well as the overall apprentice experience both in the classroom and on the job-site.

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Appendices

Appendix A: Course outline for Green Awareness Training "LEED 101: Green Building Basics and LEED" module

Class outline – 8 hours	
TIME	TOPIC
7:30 to 8:00	Introduction Brief explanation of USGBC and leadership Environmental energy and design
8:00 to 8:20	Construction work sites under LEED Certified – Silver – Gold – Platinum
8:20 to 9:30	"Greening of Southie" (example)
9:30 to 9:45	BREAK
9:45 to 11:00	"Greening of Southie" (example)
11:00 to 11:30	LEED scorecard exercise Play DVD: "Green Building Jobs of the Future"
11:30 to 11:50	LEED 101: Green Building Basics and LEED
11:50 to 12:30	LUNCH
12:30 to 3:00	LEED 101: Green Building Basics and LEED
3:00 to 3:30	Conduct 50 question exam

Appendix B: Course outline for Green Awareness Training “Green in Mechanical Insulation” module

Class outline – 8 hours	
TIME	TOPIC
7:30 to 8:00	Introduction Objective explanation of advantages and benefits of energy efficiency of mechanical insulation
8:00 to 8:20	What are Green Jobs? What is a Green Worker?
8:20 to 8:30	Definition of “Green Jobs” using “Measuring Green Jobs” from BLS Discuss/explain how mechanical insulation industry fits
8:30 to 9:00	Briefly discuss how revised “Green” thinking affects construction Weatherization, LEED, global warming and sustainability
9:00 to 9:30	Introduce “The Power of Insulation”
9:30 to 9:40	BREAK
9:40 to 10:30	Understanding and marketing “The Power of Insulation’
10:30 to 11:45	Mechanical insulation: Conserving energy for over 100 years
11:45 to 12:30	LUNCH
12:30 to 1:30	Mechanical insulation: Conserving energy for over 100 years (continued)
1:30 to 2:00	3E-Pus workshop
2:00 to 2:15	BREAK
2:15 to 2:30	Review for exam
2:30 to 3:45	Conduct exam
3:45 to 4:00	Closing remarks



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