

**Advancing Climate Literacy in  
Union Vocational Education and Training Programs in English  
Canada, Quebec, Europe and the US: Analysis, Findings and  
Lessons Learned**

**Appendix 9:  
Climate and Industry Research Team  
Initial Interview Summary**

# **Climate and Industry Research Team**

## **Initial Interview Findings**

*“We are Teaching the How, But Not the Why” Comment from a trades’ training instructor:*

### **Executive Summary**

In the summer and fall of 2021 the English Canadian CIRT team conducted a series of in-depth interviews with construction trades’ training directors and instructors. This was during the Covid-19 pandemic, so the interviews were held on Zoom rather than in person. The interviewees were recommended by CBTU and were representative of its 14 affiliates. The objective was to ensure that the CIRT interviewers would be exposed to the views and experience of each of CBTC’s affiliates. The individuals were selected on the basis of their knowledge about the VET programs of their respective unions. All interviewees were experienced training directors or instructors, having worked both as journey persons and, subsequently, as training instructors. All had responsibility for overseeing individual union training programs and/or supervising other trainers in their unions. CBTU affiliates are members of international unions. Consequently, two of the interviewees were directors of training programs developed in the US, but delivered in Canada. Some interviewees were based in union owned and managed VET systems, while others worked in training schools jointly trusteeed with employers, as part of Joint Trades’ Training Trust Agreements financed through multi-employer collective agreements.

CIRT interviewers formulated a set of questions designed to assess the extent to which union VET programs included instructional content related to climate literacy. They also included broader questions probing the challenges instructors saw in incorporating climate-related content into the curriculum of apprentices and upgrade programs for working trades. The questionnaire was designed to cover all trades and, consequently, contained questions more appropriate to some trades than others. However, CIRT interviewers tried to ensure that key issues relevant to each trade were also investigated during the interviews. In some cases, this meant following up with further trade specific questions to ensure the interview captured all relevant information. As is typical with the interview process, CIRT learned things not anticipated in the original questionnaire. This information was subsequently incorporated into this report.

Before the interviews CIRT sent trades trainers a one-page overview outlining a list of issues and questions CIRT planned to cover. These indicated that the focus was to identify the extent to which union VET programs promoted ‘climate literacy,’ broadly defined for apprentices, journey workers, trades’ instructors and, in some cases, pre-apprentice programs. CIRT interviewers

wanted to ensure that interviewees had time to consider the issues in advance of the interviews so they would be prepared for the questions.

As could be expected, there were significant differences in the training programs of the 14 unions, reflecting the different work of their respective trades, the size and resources of their training facilities, the geographic locations and, in some cases, differences between the Canadian and US contexts. This was reflected in the content of the answers. CIRT interviewers also found that some of the most interesting curriculum material relating to climate change and used by several Canadian CBTU affiliates had been developed in the US by their international unions.

The interviews revealed that the term climate literacy was not customarily used by trades' trainers to describe curriculum content that focused on climate change or environmental and energy-related issues. Rather, instructors used a variety of other words such as: 'green', 'sustainability', 'environmental responsibility', 'energy saving', 'conservation', 'LEED', 'Energy Star', 'Net Zero' and similar terms. However, interviewees felt that they understood what was meant by the term climate literacy.

CIRT Interviewers found that many of the concepts and trade skills instructors were teaching included significant components of the knowledge, skills and competencies needed to implement net zero construction practice. However, in teaching their apprentices, instructors were not describing the curriculum content using the language or terminology of climate change or climate literacy. Instead, they were explaining the use of various trade skills with environmental or climate impacts simply as ways to implement 'energy savings' or 'cost savings'. Consequently, they were not linking the knowledge, skills and competencies included in their curriculum to the goal of reducing the climate footprint of buildings and infrastructure.

The interviews revealed that many training programs included instruction on specific skills, working practices and technologies whose impact is to reduce energy consumption and GHG emissions in buildings, on construction sites, in the selection and use of materials and the management of waste and recycling. These included, for example, instruction in installing ground and air source heat pumps, geothermal systems, hydronics, solar hot water systems, solar panels, wind turbines, LED lighting, HVAC systems, mechanical insulation, thermal insulation, water conservation systems, and so forth. Some programs emphasized environmentally sustainable practices such as soil conservation, drainage and good site preparation or the need to shift to less polluting and energy intensive machinery such as from diesel to electric equipment. While the emphasis on energy reduction practices was normally about cutting costs, several VET programs also contained material informing apprentices that reducing energy consumption, following sound recycling and waste management practice or shifting from diesel to electric equipment was also good for the environment and the climate.

Several programs also explicitly dealt with climate change, in pre-apprentice, apprentice and skilled trades upgrading. One electrical apprentice and pre-apprentice program contained detailed course material outlining the principles of climate science and the direct contribution of the construction industry in meeting Canada's climate objectives. Its purpose was also to stimulate a broader conversation among apprentices about their role – and the role of their trade - in meeting the climate crisis. Two programs incorporated climate-focused content from the US Urban Green Council's GPRO program. Another program included courses that contained extensive discussions about energy and climate change originally developed for a grade 12 public school program but subsequently incorporated into the apprenticeship curriculum for electricians.

As noted, CIRT found that VET programs that explicitly addressed climate change were the exception. Most programs did not provide students with information about the impact of the building sector as a contributor to GHG emissions or that it accounted for 18% of Canada's total. Nor did they discuss the positive contribution the building sector could make to lowering Canada's carbon footprint if it were committed to a comprehensive net zero program. Cutting energy use in the construction process and in the operations of buildings are critical elements in addressing climate change. But this information was missing from the curriculum of most programs, as was the fact that governments are calling on the industry to play a critical role in implementing their climate change agenda in the coming years. CIRT interviewers this as a gap in the curriculum for most trades. Similarly, they felt that there could have been a clearer link between learning specific skills and the value of these skills in addressing climate change.

Interviewees noted that a major barrier to including more climate change information in Canada's construction VET programs is the overall lack of demand for low carbon construction in the specifications of those commissioning projects. Where developers, architects and engineers did not require projects to meet stringent environmental and energy standards, the scope for trades' workers to implement low carbon construction was correspondingly limited. Trades' training programs did not control what the industry demanded. They had to respond to what contractors and those paying for construction projects wanted. The industry's lack of focus on climate change also limited opportunities for apprentices and working trades to promote the issue in their day-to-day work. And this, in turn, affected what instructors felt they could include in the curriculum. However, they did feel that despite the constraints on job sites, they could prepare their apprentices for the changes in the industry which are anticipated in the coming years.

Instructors also noted that because many of today's apprentices will become supervisors and project managers in the future, providing apprentices with the background in climate science as well as a solid grounding in building science at the beginning of the careers would have long term benefit for the success of the industry in addressing the issue.

Another major barrier instructors noted was the lack of references to climate change in the Red Seal Standards which form the basis for the curriculum being used by training centres across the country. Interviewees were generally supportive of the Red Seal system. But they also noted some of its limitations, including the relatively slow pace of modernizing the Standards in the context of a rapidly changing industry in which new technologies and working practices were being introduced constantly. CIRT interviewers found that the training programs that included material on climate change did so outside the scope of the formal Red Seal program. This indicated a need for the Red Seal program to review what it includes on climate issues with the view to considering changes in the content of its curriculum guidelines.

Interviewees volunteered a great deal of information about their pre-apprenticeship, apprenticeship and trades' upgrading programs. Where their programs addressed issues related to climate literacy, they highlighted the content of the relevant curricula and shared some of it with the interviewers. CIRT concluded that training instructors felt climate change was a topic that merited much more attention in the curriculum. Most were clearly interested in exploring how this could be done. Some expressed the view that addressing it was overdue, given how workers in the industry have been affected by increasingly intense climate related incidents in recent years, such as dramatic heat waves, hurricanes, floods and so forth. While there were differences in how – and how quickly – different interviewees felt the issue should be addressed, this was more a question of how best to proceed rather than reservations about the need to address climate issues in the training programs in the first place.

Every instructor interviewed went out of the way to help CIRT with the research. They made time in their busy schedules to meet with CIRT interviewers on Zoom. All offered to provide further information if needed to follow up on issues they discussed in their interviews. In addition, many agreed to send more details of their training programs, including sections of their curricula relevant to the research, which subsequently they did. CIRT interviewers found this additional material extremely useful and plan to use it in to inform the Project's work in this project in the coming months.

In the following pages CIRT interviewers have set out their findings from the conversations with trades' directors and instructors. Given the nature of the topics covered, inevitably there has been some overlap among the issues highlighted by the interviewees. Consequently, there is a certain amount of repetition in some of the accounts covered in the various topic areas. But this has been to avoid overlooking information relevant to these topics.

In providing this account of the interviews, CIRT interviewers chose to restrict its scope to the major comments and insights of those interviewed. This report was not envisioned as a literature review and hence it does not include references to the very large volume of academic literature

on climate change, or the more specialized research on role of the construction sector in mitigating and adapting to climate change which CIRT has provided to the CBTU's Climate Literacy Project in other venues.

Finally, this account is based on interviews carried out in English Canada and the US. It does not include information from the province of Quebec. CIRT's Quebec team is responsible for carrying out a parallel set of interviews to ensure that a Quebec perspective fully informs the analysis. These findings are to be presented in a separate report based on interviews in that province.

# Summary of Key Interview Findings

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## **1. Role of Red Seal Standards and Provincial Curricula in Determining the Climate Content of Apprenticeship Programs**

An ongoing theme of the interviews was the extent to which the curriculum is determined by the current Red Seal Standards. As CBTU members know, these Standards establish the core skills apprentices must master to get their interprovincial trades qualification. This, in turn, requires trades trainers to focus their apprenticeship programs on developing the knowledge and skills to enable apprentices to pass their Red Seal exam. Provincial curricula directives are largely based on the Red Seal Standards, although provinces may add to, or modify, what is included in the Red Seal requirements. The combination of provincial curriculum guidelines and Red Seal Standards shape what is included in the curriculum of trades' training programs across the country.

The benefits of having a national system based on Red Seal standards was generally supported by interviewees because it enables qualifying journey workers to have their credentials accepted in different provinces. Although not fully implemented in some trades and in some regions, in principle, standardization of curriculum means apprentices receive broadly the same course content at each level of their program, regardless of where they do their training. This enables them to transfer credits from one province to another during their apprenticeship. It ensures that Red Seal qualified journey workers have a similar set of skills for the practice of their trade when they graduate. And it provides for consistency in what is being taught in training institutions in the provinces. Several of the interviewees indicated that they had participated in committees involved in revising the Red Seal requirements for their specific trades, so they have had input into the process.

However, we heard a number of criticisms of the Red Seal system from the trainers we interviewed. One was how difficult it was to modernize, or upgrade, the content of the Red Seal requirements due to the lengthy time between each revision of the Standards. This is often 4 or 5 years and, in some cases, longer. Given the pace of change in the industry, this meant that skills needed for new technologies, or major changes in construction practices, were not being introduced in a manner that paralleled what was actually happening on job sites. This delay is also significant from the perspective of attempting to introduce any material that discusses climate literacy in the curricula.

A second concern of instructors was that some of the skill requirements were simply outdated. Apprentices were expected to learn skills, such as how to read an oscilloscope, that were no longer being used in the industry and which they would never be likely to need on the job. Several felt the curriculum was using valuable classroom time to teach irrelevant requirements.

Another issue was that some curriculum content covered skills that almost all apprentices would have already learned, either in high school computer programs, or through their involvement with laptops, home computers, iPads, cell phones and so forth. One instructor commented that allocating time to teach skills such as how to use word processing software ignored the reality that apprentices already had these skills coming into his program and, consequently, did not see the value of devoting class time to this issue.

With respect to climate literacy, the Red Seal Standards, as posted in the pdf files on its web site, (and the corresponding provincial curriculum based on these Standards) contain almost no information about climate issues or the role of the trades in meeting Canada's climate change commitments. (We have shared a separate short paper on this issue with CBTU which is posted on in its collection of materials for this project on its web site.) Of course, as we note further on, the Red Seal Standards do cover most of the skills required to work on low carbon construction projects or implement LEED, R-2000, Passive House or other third-party standards designed to reduce energy consumption and promote environmental sustainability. And we are aware that many instructors do speak about climate issues in the programs they teach and in demonstrating specific skills. But in doing so, they are going beyond the Red Seal requirements.

Moreover, while the Red Seal Standards cover almost all the skills needed for implementing low carbon construction. These skills are not presented as a way that the building trades can have a positive impact in addressing climate change. Consequently, while the skills being taught are critical to implementing effective low carbon construction, discussion about how they contribute to lowering GHG emissions or meeting Canada's climate commitments is not currently included in the detailed descriptions of how to perform these skills. As one interviewee insightfully said: "We are teaching apprentices the 'how' but not the 'why'.

Several interviewees noted that provincial trades' curriculum requirements were sometimes not properly aligned with the Red Seal Standards. This meant that some of the provincial course material was not directly applicable to helping apprentices pass their Red Seal exams. Although not a climate-related issue, it underscored some of the problems instructors had with the system.

One instructor noted that the absence of climate curriculum material in the Red Seal Standards left him in an awkward position because he felt he did not have relevant climate literacy content to use in his training program. As someone without a scientific background he felt uncomfortable raising the issue with apprentices because this was not his area of expertise. He emphasized that it would have been helpful to have had curricula covering climate issues provided to him so that he would be able to introduce the subject into the classroom without feeling that he was 'out of his depth'

Another training director took the view that it was critically important for apprentices to master the Red Seal Standards first, before attempting to add other components. He felt additional education and training on climate issues should best occur through specialized modules or short courses after students had completed their apprenticeship and began to work as fully qualified journey persons. For him, amending the Red Seal Standards to include issues like climate literacy was a challenging task that could take years to achieve, largely for reasons noted above. So it was best to focus on skills training.

However, other instructors said the opposite. They felt that what was happening to the climate was affecting the work of their trade and should be covered in the material provided to apprentices. They also felt that there was considerable room to introduce climate literacy if some of the outdated requirements were deleted as part of a process of revising the overall Red Seal requirement for each trade. They were also concerned to give apprentices an understanding of the future challenges the industry would be facing. One indicated he wanted to be able to show his grandchildren what he had done to secure their future.

A constant theme of our interviews was the need for the training programs to focus more on ‘soft skills’. These involve learning how to communicate effectively with all those involved in carrying out the work on a building site including architects, engineers and, most importantly, other trades. Instructors felt the Red Seal Standards could do much more to emphasize the importance of these ‘soft skills’ and provide illustrations of how instruction about them can be integrated into the curriculum.

While the above observations have focused on the Red Seal Standards, similar comments applied to the detailed curricula provincial governments provided to trades’ training schools.

Interestingly, we found that some of the most innovative curriculum content on environmental sustainability and climate change has been developed in pre-apprenticeship programs and journey worker upgrade modules. We believe the reason is that these programs are not subject to the same constraints as the Red Seal curriculum, so some instructors have had the scope to develop course content that specifically deals with these issues.

Given the concerns that many instructors voiced about the limitations of the current Red Seal Standards, making changes to them to make them more relevant to today’s construction industry and including information about the role of the construction trades in addressing some of our climate issues would seem to be an important issue to raise in the revisions periodically being made to the Red Seal Standards. Of course, this requires cooperation between the 10 provincial Directors of Apprenticeship, the Federal Government, the industry and the unions. What is needed, perhaps, is a much greater sense of urgency in this process, both to recognize the importance of keeping on top of the increasingly rapid technological and organizational changes

taking place in the industry and to ensure that the Standards provide apprentices with a basic understanding of how climate change is going to affect the industry and their trade in the coming years.

The Red Seal is a Canadian system. So, our interviews with US based interviewees did not address the issue because the certification, or accreditation systems for US skilled trades varies somewhat from the Canadian practice. Consequently, we are not aware of the extent to which some of the points discussed above on the Red Seal system would apply to US training programs.

## **2. Instructor Flexibility in Designing the Curriculum**

As noted in the preceding section, the Red Seal Standards place constraints on the ability of instructors to shape their curricula and are largely silent on climate change. This raises the issue of whether there is scope to include information about this issue beyond what is in the current Red Seal Standards. The interviews revealed that there were divergent views about the extent to which instructors could – or should - modify the curricula. Some trainers felt that they had to teach only what was in the Red Seal Standards (and corresponding provincial requirements), feeling that they had very little control over the course content of their programs. Helping students passing their exams was the priority.

However, others felt that they had considerable flexibility as long as they covered the basic Red Seal skill requirements. In fact, most instructors indicated that they had modified the content of their training programs to include what they felt apprentices needed to know when they went on building sites. Given Canada's geography, it is not surprising that many instructors customarily amended parts of the curricula, giving more emphasis to some skills than others. This reflected the reality that job requirements vary on a regional basis and according to the industrial mix in each province. Some of the skills needed in the maritime climate of BC for building in a coastal rainforest, were different from skills needed in much drier and colder central Canada. Skills relevant to shipbuilding would not be all that relevant in Saskatchewan. Skills needed in major resource projects would be more relevant in Alberta than PEI. Thus, a number of instructors indicated that, as a practical matter, they deliberately gave more time to focus on Red Seal skills needed in the key industries in their region, while giving less attention to skills which would not be in high demand. One instructor said that they 'borrowed time' from teaching one skill so they could give more time to another they knew was important in their area. This did not mean they were ignoring the Red Seal requirements. They just applied them flexibly.

Beyond this, a number of interviewees said that where there were obvious gaps in the Red Seal Standard skill requirements, they deliberately modified parts of the curriculum to ensure that apprentices were receiving training that corresponded to current working practices in the

industry. They believed that apprentices should be learning skills that would be needed in their everyday work on the job – skills that reflected the demands of a rapidly changing industry. Where the Red Seal Standards did not cover relevant knowledge, or skills, instructors simply added them to the curriculum. They did not want to see their apprentices going to work unprepared for the demands they knew they would face on the job. So, in practice, trades’ trainers already exercise varying amounts of discretion over how they apply the Red Seal requirements, indicating there is scope even within the current Red Seal for including climate material in the curriculum. However, the extent of the scope varies from trade to trade.

Turning to the issue of climate related material currently being included by some instructors, most interviewees indicated that they cover building standards such as LEED, Energy Star, ASHRAE, R-2000 or Passive House. But as noted earlier, most did not connect these voluntary building standards to climate change, teaching them as systems that apprentices needed to learn because parts of the industry were adopting them. However, several trades’ training directors indicated that they had incorporated a significant climate awareness or climate literacy component into their curricula. the details of which are included in the next section of this report.

### **3. Inclusion of Climate Science Content in Curriculum**

As we noted in our introduction, there are few explicit references to climate science in the curriculum of the programs we examined. While apprentices are learning important skills necessary to implement low carbon construction, this material is not presented to them from the perspective of mitigating or adapting to climate challenge. From one perspective, this gap in the training programs is a missed opportunity to inform apprentices that their work and the work of their trade can make a very great contribution to meeting the climate challenge. It also means they are not being given an opportunity to discuss how the emerging climate crisis will be affecting the industry that will employ them in the future.

One interviewee indicated that he was using Green Building Council GPRO modules in the curriculum he was providing to his trades’ instructors for use in their apprenticeship programs. GPRO is perhaps the most well-known climate related training program in North America. It has been used extensively by some building trades unions in the US where it was originally developed. As part of its discussion of green construction methods, GPRO includes material on climate change and its impact on the construction industry. Some of its curriculum is in the form of short, general courses designed to provide an overview of how climate change is affecting the construction industry in general. But it also has developed a number of trade specific courses to enable practicing journey workers to learn concepts and skills that they can immediately apply in their current jobs. (We provide more information on GPRO in the next section of this report)

Another program that explicitly addressed climate issues was developed for a pre-apprenticeship program delivered to Grade 12 students as part of the union's efforts to attract more young people into the trade. The material was subsequently added to the first year of the union's apprenticeship program as well. The instructor had put together an 11-module textbook and made it available on-line for the students, incorporating interactive teaching methods. The modules explained the greenhouse effect and the science of GHG emissions, discussed impacts of various kinds of energy (wind, solar, hydro, geothermal, nuclear and various fossil fuels) reviewed the development and expansion of renewable electricity globally, and in Canada, and explained the history of the development of photovoltaics. It discussed the impacts of various energy sources on the environment and on carbon emissions. It also examined a range of other environmental issues such as pollution and resource depletion. The text was thorough and well researched, covering a broad range of climate and environmental issues, including their economic, social and workplace implications.

The director of the training school had decided that the union should develop this course content because there was nothing comparable available in the Red Seal or elsewhere. It reflected his view that it was important to expose the students to information about climate issues to give them an understanding of the future impacts on the construction industry and their trade. Apprentices needed to grasp the broader changes in the environment and the climate so that they would be prepared to deal with these changes during their careers.

Turning to a third training program that explicitly included climate literacy material, the training director of a national US union noted that it had developed five courses varying from 4 days to 20 days of instruction dealing with the principles of green construction and their application to specific aspects of the work of the trades his union covered. Successful trainees of this program could add a 'Green Advantage' certification to their trades' qualification. The package of training material included an introductory course on the principles of green construction and a more advanced course to expand on concepts and information presented in the initial course. It also dealt with issues of climate justice as essential to a 'green' transition of the US economy. In addition, there were three separate courses dealing with specific components of three sub trades represented by the union. Developed about a decade ago with funding from the US Federal Government, these courses were available for the union's apprentices to download and use to study for their Green Advantage certification.

To assist our research, another CBTU member union had shared with us copies of two of its 'green' construction handbooks which it had developed for its apprenticeship training program. The manual outlined why green construction was important for its trade from a technical perspective and from the perspective of current jobs and future employment. It argued that the union needed to address the problem of climate change in its training program and referenced

several well-known scientific studies, such as those of the Intergovernmental Panel on Climate Change as important sources for background information.

The manuals noted that the trade was involved both in infrastructure that promoted green energy and infrastructure that supported construction of green buildings. The manuals referenced and explained the approach to greening the industry being promoted by the Green Building Council and emphasized that acquiring knowledge and skills for low carbon construction increased the value of the work of members of the trade for contractors and the employability of union members. It pointed out that there were five areas of construction that should be considered in evaluating whether a project was green. These were site planning, use of materials and resources, water use, energy use and, where relevant, the resulting indoor air quality. It also provided apprentices with an overview of the LEED system and encouraged them to become accredited. Finally, it suggested that apprentices should make use of the environmental and energy concepts included in the handbooks in how they managed their own lives.

In our interviews we noted that the scope for including climate literacy material in training programs varies significantly among the trades. Arguably, it is somewhat easier for trades installing hydronics, heat pumps, HVAC systems, mechanical insulation, solar water, solar electric, LEED buildings, vehicle charging stations and so forth to discuss the broader climate and energy conservation rationale for these systems and technologies. By the nature of their work, other trades may not appear to be obviously involved in areas which are as directly linked to climate issues, so the opportunity to discuss climate issues may appear less obvious. However, as we noted in the introduction, all trades contribute to the industry's output in their different ways. And the work of all trades is essential for the industry, as a whole, to move towards low carbon production outcomes. This broader perspective needs to be considered in thinking about how climate issues can be incorporated into trades' training for all trades.

We are aware that the question of how information about climate change should be included in the curriculum of the trades' training system is not for us to decide in this report. But it is an issue that we think will increasingly be on the agenda in the future considering what climate scientists are saying about the impact of GHG emissions on global temperatures in the coming years.

#### **4. The GPRO Model for Introducing Climate Literacy into the Training System**

We noted earlier that several instructors said that they had been using GPRO. This is an approach to environmental and climate awareness that is closely aligned with this project's focus on climate literacy. GPRO originated in New York as an initiative by the Urban Green Council. It has been adopted by a number of construction union training organizations across North

America. It is supported by the US Green Building Council and its Canadian counterpart, the Canada Green Building Council.

GPRO explicitly discusses the relationship between buildings and climate change and provides students with an understanding of the basic elements of high performing construction practices that reduce energy use and GHG emissions. GPRO offers a wide range of courses. Some are targeted at the broader construction industry, including contractors, owners, project managers, architects and engineers. But others are focused on providing training for the trades. The courses are modular, lasting from several hours to several weeks and designed to enable workers to upgrade their knowledge and skills associated with low carbon construction.

GPRO emphasizes a ‘whole building approach’ that involves co-ordination among all those working on building sites, including architects, engineers, planners, contractors and trades’ workers. It also emphasizes the need for effective communication among all those involved in sustainable construction processes, including subcontractors and the trades they employ. It stresses system thinking in which all aspects of a building project are conceived of as an integrated whole rather than a bundle of separate components.

GPRO teaching methodology includes in-classroom training, on-line homework and on-site exposure where feasible. GPRO awards certificates for some of its more rigorous courses, based on successfully passing exams. Trades who complete their courses can add them to their resumes. GPRO has developed specific upgrade courses for plumbers, electricians and several other trades. These offer training in some of the latest green technologies. However, their focus is also practical: to enable workers to apply what they have learned in GPRO courses to their construction work immediately, so the training emphasizes providing ‘hands on’ skills applications.

Another important aspect of GPRO is its focus on bringing everyone involved in a project in at the beginning. It advocates bringing the skilled trades into the construction process at the design stage as members of the project team to ensure their knowledge of building practice is incorporated into how construction projects are organized. This is consistent with some of the research on low carbon construction which emphasizes the importance of teamwork and shared responsibility for the outcome of projects.

One Canadian training director indicated that his union had experimented with GPRO curricula in a limited way with mixed results. However, another was an enthusiastic supporter of the system. He indicated that his union was using the program in a major new instructor training program for 80 union trainers based on GPRO principles. His involvement is discussed in the next section.

## 5. Support for Instructors on Climate Literacy

Every union or training facility had its own arrangements for instructor training. In most cases, this was also linked to programs provided by their international unions, although some instructors indicated that they had graduated from the public college and university system in Canada, and one had been a US university faculty member previous to joining the union's training centre. Several trades' trainers had chosen to obtain certification in specific 'green' training systems, such as the Green Building Council's LEED points system for low energy construction. They had done so both to upgrade their own knowledge base and to enable them to incorporate this knowledge into their teaching programs.

As noted above, one national training director is using GPRO content as part of his program for training instructors in his union. He acquired a Master's GPRO certification in several trades from the New York based Urban Green Council. This qualified him to train instructors in his unions with the GPRO system and award them GPRO credentials. He had piloted this approach in one local and was now providing training in the system for 80 instructors across Canada.

Several of the interviewees were based in the US. They also shared with us what their unions were doing on climate related training. We noted above that one national US union training organization had established a "Green Advantage" program. This was the result of a successful application for government funding about a decade ago to develop climate related curriculum material. From this money, it had developed five teaching modules to add to its training program. Instructors from the union's training centres across the US can download the 'Green Advantage' lesson plans study guides, interactive modules and exams from the union training web portal. It also contains training videos for instructors to show in their classes.

Perhaps reflecting the polarizing controversies in the US over climate change, we learned that even though the courses were readily accessible to all instructors, they had not been that widely used in recent years. However, the training director – who had been an enthusiastic supporter of their development - indicated that recently there had been renewed interest in them, perhaps reflecting the emphasis on climate issues of the new US federal government.

Overall, we think there is considerable training material already available in the CBTU's affiliated unions for helping instructors for developing a climate literacy component for their training programs. Given the limited number of trades' instructors we have interviewed, we suspect that there is much more out there than we have thus far identified. And, of course, there is already considerable material developed by CLC affiliates outside the building trades and from other organizations such as the Canada Green Building Council both through its LEED program and through other initiatives it has pursued in recent years.

## **6. Inter-Trade Co-operation and Low Carbon Construction**

There is extensive research, particularly in Europe, about the need for greater cooperation, communication and consultation among all stakeholders on building sites if they are going to succeed in implementing low carbon construction. This reflects the experience that quality standards must be very high. If any component of the work is not done properly, the overall goal of minimizing energy consumption and GHG emissions will not be achieved. As we note in our discussion of some of the weaknesses of LEED elsewhere in this report, failure of one, or several, components of the work can result in completely undermining the environmental objectives of a project. The ‘performance gap’ between project specifications and measured outcome has been the subject of a large volume of literature in recent years. While there are a variety of reasons for it, a major one is the failure of all participants in a construction project to work effectively together.

All interviewees were agreed on the need for - and benefits of - more cooperation among trades. As noted earlier, the term customarily used was soft skills. One training director commented that too often architects, planners, engineers and other trades did not recognize the importance and value of his trades’ work and were not sufficiently concerned as to whether the scheduling and organization of his trade’s work gave his members the time on job sites to do the work properly.

One interviewee felt that what was needed was for all trades to develop a better understanding of how buildings were an integrated system rather than a collection of siloed contracts and sub-contracts. For projects to be implemented effectively, all trades needed to adopt a system-wide understanding based on the principles of building science. This concept needed to be reinforced in the curriculum. Apprentices needed to understand how their work had to be integrated properly with that of the work of other trades on building sites. This approach is consistent with what we have learned about the experience of low carbon construction in Europe.

One interviewee noted how new technology could facilitate greater cooperation on building sites. Sophisticated software now enabled engineers and trades’ workers to model an entire project and plan the work of each trade throughout the building process. Buildings could be constructed theoretically in 3-D models and every component thought through in advance and every trade consulted as appropriate. If used correctly this could ensure that work schedules and assignments were effectively coordinated to ensure input from all trades.

While modelling has been in place in parts of the industry for many years, such as computer models used in ship construction, the availability - and affordability - of new software is making this level of planning feasible on many more projects. The interviewee noted that the key to making this approach succeed was to include everyone in the initial planning and organizing of the work. Through computer modelling software, coordination of the work of each trade could be

done before projects even put shovels in the ground, significantly reducing the likelihood of trades failing to take account of the requirements of each other's work as they tried to meet tight schedules. However, the interviewee felt that the key to success was to ensure that all trades were 'in the tent' at the beginning so their knowledge and expertise would inform project planning.

However, he also noted that this also placed an onus on his trade to remain on top of this technology so that it could demonstrate that it could deliver high quality work using the latest innovations in construction practices.

These developments in technology can also facilitate more effective low carbon construction. Their use can reinforce the view that buildings are integrated systems in which all the components must fit together properly, and all trades need to understand how their work relates to that of everyone else on a building site. Making the connection between the use of new technology and successful low carbon construction opens the door to a conversation about how the resulting improvements in building quality can be a part of the process of developing effective climate change strategies.

## **7. Links Between Environmental Sustainability and Climate Change**

One area that our interviews highlighted was the extent to which some of the training programs include a focus on protecting and preserving the environment, activities which fit well within a broad definition of promoting climate literacy.

For example, one interviewee described a program for teaching apprentices how to operate heavy equipment. It included training material and on-the-job examples to inform them of the impact their equipment could have on the environment and, in particular, on drainage, soil erosion, vegetation and topsoil. It provided apprentices with instruction in how to avoid triggering unnecessary water run-off and soil erosion as well as how to avoid the adverse consequences of re-directing stream flows. The rationale for this focus was not explained in terms of climate literacy but rather on the need for apprentices to develop an understanding of the environmental impact of their trade and, consequently, the importance of taking care of the physical environment as part of being a responsible trades person.

The instructor noted, for example, that it takes 1,000 years to create an inch of topsoil. But careless operation of heavy equipment could easily destroy what it had taken centuries to build up. Once destroyed, this was not something that could easily be replaced. There was a similar emphasis on taking steps to avoid pollution such as how to dispose of liquids like engine oil and chemicals used in the construction process. Years ago, the practice had, unfortunately, often been simply to drain these fluids into the ground. However, the curriculum now informed apprentices

of their responsibility to ensure that proper disposal practices were followed to avoid polluting the environment.

A number of other training instructors indicated that they regularly stress the importance of conserving energy in the use of equipment as well as minimizing air pollution from the operation of machinery. For example, not allowing diesel or gas engines to idle when not in use, even if leaving the machinery running was not a significant cost unless there was a good reason such as sub-zero temperatures for keeping it running. Instructors in several training programs indicated that they had deliberately acquired new, low energy machinery to demonstrate to students the advantages of shifting to environmentally friendly practices. They also explained the benefits of replacing diesel or gas equipment with non-polluting electric equipment. Another interviewee noted that recycling practices were being increasingly followed by his trade while earlier practice such as burning the coating on electrical wire to get the copper were no longer acceptable practices.

Apprenticeship programs were increasingly discussing the impacts of the industry on the environment. They were and encouraging apprentices to adopt environmentally responsible working practices. Encouraging apprentices to think about their impact on the environment is one element of climate awareness and something that a number of training instructors indicated they were emphasizing in their instruction.

## **8. Promoting Industry Awareness on How to Reduce Energy Consumption**

Reducing energy consumption is an important part of addressing climate change. While one reason for energy conservation is to save money, another is that limiting energy use reduces demand on energy sources that produce GHG emissions. One instructor noted that his program taught apprentices the use of infrared thermography cameras to measure the energy profile of building components. This technology enabled them to calculate the potential energy savings of installing, or refurbishing, mechanical insulation in the piping and duct work of HVAC systems. The same kind of technology can also be used to identify thermal bridges and other sources of heat loss in buildings and its use is becoming common in a number of trades.

In addition to assessing energy savings, he showed apprentices how to use the technology to explain to building owners and contractors the potential volume of greenhouse gas emissions that improved insulation could save, measured in tonnes of CO<sub>2</sub>. The technology opened the door for apprentices to engage in a discussion about why reducing emissions and energy use was important not only to save money but also to reduce the impact on the climate. Because contractors were slow to recognize the commercial value of the technology, the also union took the results of its thermography calculations to building owners and encouraged these owners to contact competent contractors to do the insulation work. This illustrated how technology could

be incorporated as part of the training of apprentices, promoting climate awareness in the broader industry among building owners and contractors and providing more work for the trade.

## **9. The Role of Voluntary Building Standards in Promoting Climate Objectives**

In our interviews, trainers discussed several of the voluntary low carbon energy standards that are currently in use. These standards are designed to recognize buildings that have lower GHG emissions, less energy consumption and higher standards of environmental practices such as water use or indoor air quality. They normally allow building owners to state that their building meets a higher level of performance than required by the building and energy codes. As we noted earlier, there are a number of different voluntary standards in widespread use today. Principle among them are ASHRAE (which is also included in some required codes), Passive House, R-2000, BOMA BEST and the Canada Green Building Sponsored LEED standard.

LEED was the most frequently noted of these. Because LEED focuses on reducing energy use, water consumption and related environmental objectives, its goal is clearly linked to climate literacy. All interviewees were familiar with the LEED point system. Several interviewees indicated that their training programs provided apprentices with an overview of the LEED standard as an option for promoting low carbon construction. One instructor felt that LEED was going to play a much greater role in the industry's future and, consequently, that apprentices would need to be familiar with it to enable them to keep abreast of developments in the building industry. LEED was here to stay.

Despite the climate and environmental goals of the LEED system, with which there was general agreement, several instructors felt that there were problems in how LEED was being implemented in practice. Some felt that the LEED point system was flawed, resulting in finished, highly rated gold or platinum LEED buildings failing to meet low carbon objectives. Among the reasons cited for the gap between design and performance was the lack of effective quality control on construction sites. There was no requirement for those working on LEED projects to be properly trained trades' workers. As a result, many LEED projects were being built by workers without the appropriate training and skills. Consequently, some building purchasers found that the energy profile of their LEED buildings was no better than conventionally designed buildings. Poor performance of the completed buildings undermined the reputation of this system as disgruntled purchasers concluded that they had not received good value for their money.

One trainer indicated that he felt that a weakness in LEED was that contractors were not required to use Red Seal qualified trades workers which undermined quality standards. He felt that the LEED system needed to be tightened up to require that only qualified Red Seal (or provincial equivalent TQs) be permitted to build these projects. This would encourage the industry to support more investment in workforce training while protecting the LEED system's reputation.

The LEED point system was also a subject of concern. Buildings could get a high point rating even if their energy performance was no better – in some case worse - than conventional projects in terms of their energy consumption. A LEED Silver or Gold rated building might have a very low score in an area critical to energy conservation but would still rank highly because of the points it received for other elements of the system. Consequently, LEED needed improvements both in its quality control over the building process and in the way in which points were allocated.

One interviewee felt that some developers were using LEED primarily as a marketing technique to promote their buildings compared to their competition. The idea of having a LEED building appealed to purchasers concerned about the environment and thus increased its value in the marketplace. However, without effective monitoring of the way LEED buildings were constructed and thorough measurement and inspection of the energy and environmental outcomes of completed buildings, many projects were not contributing significantly to meeting Canada's climate objectives.

Despite the concerns noted above, several interviewees noted that LEED and other voluntary building standards designed to promote low carbon construction do provide an important way to facilitate a discussion among apprentices about what the building industry can do to reduce GHG emissions and energy use. Consequently, despite the problems noted above, they have the benefit of contributing to the apprentices understanding of some elements of climate literacy.

## **10. Barriers to Expanding Climate Literacy in the Trades**

As noted, most training programs only deal with climate literacy in a very limited way, even though many cover important climate related skills and work activities. However, the reasons given by instructors for not including more information on climate issues varied considerably. As we discussed earlier, one key reason was the absence of references to climate literacy in the mandatory Red Seal and provincial curriculum standards. This constrained training institutions to focus, narrowly, only on the skills that apprentices would need to pass their exams. Without formal Red Seal requirements, individual training facilities were left on their own to decide whether they wished to address the issue and, if so, how much emphasis to place on it. Lack of references to climate change in the Red Seal Standards also impeded the development of teaching materials that would facilitate introducing climate issues into the apprenticeship curriculum.

In addition, several interviewees noted that they were not trained in climate science – that was not what their expertise included – and hence they felt somewhat awkward in broaching issues where they might be out of their depth. This underscored the significance of the lack of direction

and support from the Red Seal and provincial regulatory bodies. It also pointed to the need for these organizations to provide trades trainers with appropriate training material dealing with climate literacy.

However, there were other reasons as well. One was the lack of demand in the industry itself for a climate literate workforce. Although some contractors and industry professionals, such as members of the Canada Green Building Council or BOMA, were supportive of construction projects that would facilitate the application of low carbon building practices, this was not characteristic of most contractors or those commissioning buildings. Lack of employer demand for apprentices knowledgeable about low carbon construction principles compromised efforts by trades training schools to include this material in their curriculum. Absent demand from employers, there was less incentive to include climate issues in the curriculum.

Another reason was the failure of those commissioning buildings to include specific climate and energy requirements in their specifications. Contractors build to the details included in their contracts. Unless the specifications indicate that specific low carbon approaches are required, including the use of qualified workers, contractors will continue to build in their customary way because this keeps their costs down and increases success in obtaining contracts.

The preceding factors indicate that training organizations need a more supportive industry environment to be able to promote low carbon construction practices in their curricula. This involves a cultural change in which saving energy and lowering GHG emissions become mainstream. At the same time, industry cannot move forward on this issue without being able to rely on a training system that ensures that workers have the relevant knowledge and skills. Both are needed.

## **11. Apprentice Interest in Climate Change Issues and Acquiring Climate Related Skills**

There is an ongoing debate about whether young people are more interested in examining climate issues than their older counterparts. The general view is that they are. But our findings were somewhat mixed on this question. When we asked trades' trainers about whether they felt their apprentices were concerned about - or motivated by - an interest in climate issues, we heard varying answers. Most felt that young workers were attracted to the trade because it offered an opportunity for relatively secure, well-paid employment. This is not surprising and perfectly reasonable. However, several instructors indicated that a significant portion of their students were also attracted to the trade because it would enable them to fulfil their desire to make a difference for the climate. Responses varied significantly among different trades as well.

One instructor noted that there were challenges in his trade about discussing climate issues because some jobs to which his apprentices were assigned involved projects that were the subject of criticism by environmentalists as not being sufficiently 'green' or climate friendly. Yet these projects were offering on-the-job training and work experience needed by apprentices to learn their trade and get their ticket. In this context, he found discussions about the broader question of climate change were a bit awkward and he tread carefully in raising climate related issues unless they arose naturally in classroom activities.

On the other hand, another instructor indicated that grade 12 students in his pre-apprenticeship program were very engaged the discussions he initiated on climate change. They wanted to explore the issue even further than he had time to spend on it in his classes. In his case, there was a great deal of interest among young people entering the trade in what they could contribute to the climate.

Several other instructors did not see a big difference in the attitudes of younger versus older apprentices when it came to climate issues. So, while the fairly widespread view is that young people are much more concerned about climate issues, our research seemed to indicate that young people were only marginally more focused on what their trade could do to promote climate issues.

## **12. System Thinking and Treating Buildings as Integrated Systems**

According to much of the literature, a key feature of effective low carbon construction is that it treats buildings as integrated systems in which all the components must fit together properly. Building science is the foundation for understanding the interconnection of the different elements associated with a construction project. Viewing buildings as integrated systems results in a focus on ensuring that everyone who contributes to the final product has an understanding of the role his/her trade plays and the importance of ensuring that the work assigned to his trade is performed to the highest standard. The practical application of building science involves teamwork, communication, collaboration and shared decision making during the various stages of a project.

As noted earlier, one of our interviewees repeatedly stressed the importance of adopting a whole systems approach to building projects. This applied not only in teaching this concept in the classroom to apprentices but also enabling apprentices to see it in their day-to-day activities as the appropriate way of organizing work on building sites. In his view, trades should be involved, wherever possible, at the beginning of the development of a project. It was essential that their understanding of the practical issues of carrying out their work informed how the project was planned and implemented. This required the trades to take a proactive approach in working with other trades on the team, as well as architects, engineers, planners and building commissioners to

solve problems collaboratively and come up with appropriate approaches to fulfilling the design specifications of a project.

Many other interviewees emphasized the importance of informing apprentices of the value of soft skills such as communication and cooperation among the trades as well as the importance of treating building projects as integrated systems, rather than as a group of siloed, individual sub-contracts.

We had hoped to hear more discussion about the importance of providing apprentices with a solid background in the principles of building science, but our sense is that the focus of much of the training is primarily on enabling apprentices to develop specific skills necessary to work in their trade. Of course, the two approaches are compatible. All trades need to know the core skills of their occupation. But we would have liked to see a bit more attention on the broader issue of providing a foundation in building science as part of the curriculum.

### **13 The Role of For Profit ‘Green’ Introduction to Construction Courses**

Several training directors raised the issue of the proliferation of private, short term training courses offering micro-credentials. These are often advertised as a way to a ‘green’ job performing environmentally sustainable work. Their promoters claim that they provide job hunters with an entry to construction, normally by giving them some sort of “green” skill certification qualifying them to install solar panels, roof and wall insulation and so forth. Some have also been promoted as being pathways into the trades. Interviewees noted that the lack of adequate provincial regulatory requirements for certain construction skills has facilitated the growth of this problematic approach to training along with ill thought-out government subsidy programs which provide cash to residential homeowners to do this work.

Most interviewees were particularly critical of these programs. The micro-credential courses ignored the real technical challenges involved in doing this work and the corresponding skill level needed to do it properly. They failed to recognize that this work needed a grounding in the fundamentals of the trade as well as knowing how to work safely on a construction project. While seeming to provide a pathway to a job, the view of interviewees was that these types of courses frequently disappointed those taking them because they were narrow in scope and did not provide either the skills or the pathway to do other forms of related construction work. They did not provide those paying for the courses with a real, employable career based on a well-rounded apprenticeship, leaving them vulnerable to unpredictable changes in demand for the work. And they gave the public the mistaken impression that anyone could do this kind of work without needing to learn the basics of a trade.

The training directors contrasted micro-credential training programs with properly structured pre-apprenticeship programs, emphasizing that the latter provided enrollees adequate time to learn about the industry and the trade. Some of these properly structured programs lasted 6 months and covered the basic knowledge and skills necessary to begin a proper apprenticeship, including a pathway to an apprenticeship. One instructor noted that his union's pre-apprenticeship programs provided 95% of those completing them with entry into a proper apprenticeship and credit for the time they had invested if they went on to complete their apprenticeship.

#### **14. The Role of Upgrading Courses for Qualified Journey Workers**

A number of the interviewees indicated that their programs provided upgrade courses for qualified journey workers. These were normally in specialized areas, often associated with learning skills associated with installing energy saving technologies such as hydronics, solar electric installations and wind turbines. There was strong support for these kinds of programs among interviewees whose programs provided these courses because they reinforced the principle of lifelong learning which they saw as essential for the future of their trades. As one interviewee said: "The days when you completed your Red Seal and closed the books on further learning are definitely gone". Continuous upgrading of skills was also a way to ensure that their employers would be capable of continuing to win contracts because their trades were fully capable of implementing the latest technologies and working practices.

One interviewee felt that a major area for expanding climate literacy was precisely in the areas associated with new, green construction components. Providing tailored upgrade courses for working skilled trades in environmentally relevant areas, as well as providing opportunities for learning new technologies was an important function of the training system. Union schools could – and should - play a major role in supporting this trend. Instructors also felt that these courses should be made available at times and locations which did not interfere with a workers' normal job such as on weekends or evenings so loss of income was not a barrier to participation.

#### **15. Health and Safety Training for a Changing Environment**

All interviewees noted that their programs provided pre-apprentices and apprentices with a solid background about safe working practices on building sites. This also included knowing about the numerous hazards construction workers face on the job, such as exposure to unsafe equipment, toxic chemicals, asbestos and numerous other risks. Health and safety were an area in which interviewees felt that their programs were generally doing a good job.

There is a scientific consensus that global temperatures are rising and that the increases are disproportionately happening in some regions in Canada. Temperatures in parts of the north are

now averaging over 2 degrees Celsius over previous decades, while other parts of the country are facing localized temperature increases far above what has been customary in the past. The dramatic events in BC this past summer with its record 49.6-degree Celsius temperature reading, the wildfires in BC, Alberta and Ontario and the floods in other parts of the country underscores how the climate is changing.

Climate change means that construction workers are facing increasing hazards from temperature induced heat stroke, dehydration, cardiac failure and other temperature related events. The rise in other weather events, such as virulent storms, hurricanes and flooding is increasing the risks facing workers who have to repair the damage these events create. While storms, historically, have always downed power lines or resulted in localized flooding, the increasing ferocity of more recent storms exposes power line workers and other trades to greater hazards than in the past. The same is true of many other weather-related risks. All of this is to say that the changing climate is increasingly important as a driver of health and safety concerns for construction workers.

However, we did not hear that much about the link between health and safety training and the way in which the working environment is changing due to climate change. This is an area where there is a clear link between what is happening to the climate and the increasing exposure of construction workers to additional risks. This may have been because we did not press the issue in our questions. But it did not come up spontaneously in our interviews either. We assume that this challenge is being covered in some of the health and safety programs. However, we would have liked to have heard a bit more about the connection between the changing climate and the way in which measures to address it is being incorporated into health and safety programs. This is an area where all trades have the opportunity to develop a link between apprenticeship training and climate change.

## **16. Employer Influence on the Content of the Curriculum**

Earlier in this report, we noted that employers have a significant role in determining the content of the apprenticeship curriculum. One way is through their influence in shaping the skills that are included in the Red Seal Standards. Although they are only one partner in this process, along with provinces, colleges, unions and the Federal Government, the reality is that training programs are focused on giving the workforce the skills that employers need. So, their input is very significant in shaping the actual curriculum. The fact that the Red Seal Standards do not incorporate a significant climate literacy component is a reflection that the employers have not seen this as being all that important to date.

Because many training facilities are jointly managed by unions and employers, decisions about pre-apprenticeship, apprenticeship and upgrade courses for journey workers also reflect, to a

very large degree, the concerns and interests of employers. As noted, these are based largely on their demand for qualified labour. This impacts curriculum because training facilities want to ensure that their apprentices are job ready with the relevant skills needed to work on the projects contractors succeed in winning. Employers also influence the demand for post-apprenticeship skill upgrade courses for qualified working trades.

The market in which employers operate also influences curriculum content. Employer demand for low carbon skills is dependent on the specifications of contracts. These are determined by what those purchasing construction services want in the buildings they commission. To the extent that demand for low carbon construction remains limited, employer requirements for workers with a solid knowledge of building science and the skills, knowledge and competencies of green construction practices is correspondingly limited

Not surprisingly, a number of the trainers made the obvious point that contractors build according to the specifications in their contracts. If those who commission buildings and the engineers who they employ do not indicate that they are ‘green projects’ or that the contractors must use workers with specific skill sets and credentials, they will use the cheapest labour they can find. So upstream specification requirements significantly impact on what is practiced on job sites limiting the extent to which practices such as low carbon construction are being implemented.

Employers also affect the take up of climate related skills if they do not set a clear example that they expect apprentices to practice these skills on their construction projects. This also can create a conflict between what apprentices may learn in the classroom and what contractors ask them to do on the job. If contractors do not attempt to follow low carbon construction practices or cut corners in the implementation of standards such as LEED, this creates a disconnect with the classroom training apprentices are receiving. It sends the wrong message. And if instructors believe that the contractors employing their apprentices are not interested in promoting ‘green’ construction, then this may also affect the extent to which they feel it makes sense to cover climate issues in their curricula.

Of course, the training system cannot, on its own, magically generate employer demand for low carbon construction practices. And employers themselves are constrained as noted above to implementing what those commissioning buildings require. But to the extent that provincial and municipal building regulations and those commissioning construction services increase their demand for more climate friendly buildings, there is an onus on employers to support efforts to introduce these practices in the industry through supporting the training system.

## **17. Recognition of Higher Performance Standards Required for Low Carbon Construction**

As noted earlier, one of our interviewees strongly emphasized the need for members of his trade to adopt a lifelong approach to learning. It was essential that members of his trade keep on top of the numerous changes in technology and materials that were constantly being introduced into construction work. He noted that LEED projects were becoming more common and felt that this trend would continue, necessitating members of his trade to develop a clearer understanding of the underlying goals and principles of LEED and other low carbon construction methods and integrate them into their day to day working practices.

He also felt that the onus was on members of his trade to demonstrate that they were on top of the new technologies and could show the industry that they implemented them efficiently and competently. They had to demonstrate their value to the industry. Otherwise, they would face increasing challenges from contractors in the unorganized sector who could argue that the unionized skilled trades were not significantly better at implementing green construction practices and hence they, rather than unionized contractors should get the work.

On the question of the higher standards of performance required for low carbon construction, one interviewee noted that this could be illustrated by the problems that had occurred with ground source heat pumps and geothermal systems. Government subsidy programs encouraged installers with little or no background in plumbing, pipefitting and the electrical trade to enter the business. But lacking the appropriate trades training many did not understand the need to treat these technologies as integrated systems in which every component had to be installed properly and to precise specifications. As a result, many were not built right. Energy savings were far below expectations, giving the technology a poor reputation among disgruntled purchasers. Aside from the misuse of resources, poor installation practices tended to undermine the rapid adoption of these technologies despite their demonstrated excellence if put in place properly. This was one example of the ‘performance gap’ between the specifications of ‘green’ building technologies and systems and the actual performance of completed systems.

In discussing the role of LEED standards in buildings, one interviewee noted the importance of ensuring it was done properly. This meant by workers with the appropriate trades training. Because LEED bases the grading it gives to a building based on a total points system LEED can certify a building as meeting a gold or platinum standard even though an area critical to energy reduction may be deficient. There were also concerns that LEED was being used largely as a marketing technique by some developers rather than a serious method of meeting Canada’s climate objectives.

One trainer indicated that he felt that a weakness in LEED was that contractors were not required to use fully qualified trades workers. Non-union LEED installations often failed to deliver the full benefits due to the workers' low skill levels and lack of training. In the absence of enforceable regulatory standards, the only way to ensure that LEED was properly installed was to use unionized trades. Union members were fully trained, and unions placed a premium on keeping member skills current and on top of new technologies and working methods. While it might not be possible politically to implement a union only requirement, LEED projects should require that those working on them minimally, have a Red Seal.

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### **18. Climate Literacy and the Emergence of a More Representative Workforce**

Climate literacy, broadly defined, includes the view that the way society addresses the climate crisis should include principles of equity, inclusion and social justice. This has been reflected in the work of unions in developing models for a just transition to protect workers from the adverse effects of economic restructuring in response to climate change. This also means promoting measures that will facilitate a more representative workforce and address issues of under representation of various groups in our society.

Every interviewee indicated that his training programs were committed to providing greater opportunities to women, aboriginal people, immigrants and other groups who, historically, have been under-represented in the construction workforce. Interviewees provided numerous examples of initiatives that their training schools were taking to create a more representative workforce. In some cases, interviewees gave us quite specific data on the percentage of women, First Nations and others enrolling in pre-apprenticeship and apprenticeship programs. In others they lacked the data but said that addressing under representation was a priority.

Some union training facilities had established specific programs or courses for First Nations and other indigenous apprentices. One interviewee noted that twice a year the entire intake of apprentices into his program was composed exclusively of First Nations members. Another noted the effort his union had made to partner with various First Nations bands to encourage their members to apply to its apprenticeship program. Others had built connections with a wide variety of community organizations to recruit those traditionally excluded into their apprenticeship programs as well as setting up pre-apprenticeship programs to support the transition. Because tool belts, work boots and wool socks were difficult for women to find in the region where one training facility operated, it purchased these in bulk for its female apprentices.

It also provided links to local child-care facilities as well as limited subsidies to assist women overcome this barrier to apprenticeship. While support for a more representative trades' workforce intake was also a result of government programs that targeted these groups, much of it reflected decisions by instructors and their training facilities to pursue this goal.

At the same time, interviewees acknowledged that under representation in apprenticeship intake remains a problem and one that training schools were still finding difficult to overcome. Some programs had few or no women in a number of their courses. In others, representation of indigenous people, new immigrants and other traditionally excluded groups was not known because there was no effective system for collecting demographic data. This was acknowledged as a significant problem.

We also heard that there were ongoing problems on some work sites which were not welcoming to women, aboriginal apprentices and other under-represented groups. This resulted in a high rate of dropouts from some apprenticeship programs. It also meant that many of those who received their Red Seal left the trade a few years afterwards because they found the culture of the workplace too difficult to cope with. Instructors were aware of this problem and training schools had taken measures, such as mentorship programs, to address it. But it remained a major challenge which the industry will have to address more seriously in the coming years.

One area which, in retrospect, that we could have investigated in our interviews more thoroughly is how publicly funded community benefits agreements (earlier referred to as project labour agreements) can link the training expertise of unions with efforts to bring more diversity into the construction workforce while giving apprentices an opportunity to learn skills needed for green construction. These agreements normally include commitments to local hire and training as well as providing opportunities from groups underrepresented in the trades through outreach and mentoring programs. Community benefits agreements also open a pathway to the trades because they provide a commitment to ensuring that apprentices will get the work necessary for them to progress through their training and eventually get their ticket.

Unions are well positioned to support this development and hence can play a critical role in promoting them, as many have done in recent years. Community benefits agreements are generally well supported in the broader community because they offer training and employment opportunities to new groups of workers otherwise excluded from the construction industry. To the extent that they provide infrastructure needed to transition to a low carbon economy, they also can merge equity goals with climate objectives within a framework of unionized projects paying decent wages and providing good employment conditions.

## **19. Addressing the Impact of Climate Change on Vulnerable Communities**

A significant body of research indicates that the effects of climate change will fall disproportionately on the most vulnerable groups within our society. It is these groups that have the fewest resources and least capacity to adapt to the impacts of the adverse changes that climate change will bring in the coming years. In addition, some public policies, such as carbon taxes, intended to reduce our use of energy and other resources, also place an extra burden on those with low incomes because they have fewer resources to cushion the resulting price increases or to invest in energy conservation initiatives such as retrofitting their homes.

The building industry can play a major role in addressing this issue by constructing new buildings that meet net zero carbon targets and retrofitting the existing building stock to reduce energy use. In doing so, it can reduce the financial burden faced by building occupants, including those who are most vulnerable to energy price increases, while ensuring that the buildings themselves meet higher standards of occupant comfort, safety and indoor air quality. The building trades are critical to this process because they are the people who are qualified to perform this work and who are responsible for ensuring that building standards and design goals are fully met.

A climate literate workforce ideally should be mindful of the impact that its work will have on those who live and work in the buildings it constructs. It should also be aware of the broader societal benefits associated with its contribution to the building process. Traditionally, construction workers like to take pride in the exercise of their skills and the knowledge that the projects they work on are well built and durable. However, in the context of climate change, the exercise of these skills also has the broader effect of contributing to reducing society's carbon footprint and making a substantial contribution to addressing some of the disparities being created by climate change.

In our interviews we touched briefly on this issue. One trades director made the point that the skills he was teaching apprentices were not just to enable them to get a pay cheque. It was also to ensure a livable planet for his children and grandchildren. It was to give apprentices a sense of pride in the work they were doing and an understanding of their important contribution to society. It was to promote values which encourage workers to take responsibility for the quality of their contribution to the building process including their role as active participants in implementing measures to address climate change.

In some of our interviews with other trades' instructors we found similar views about the importance of doing a good job and ensuring that apprentices understood the value of their skills. However, we also found that many instructors were not emphasizing the link with climate change. As with some of our other observations on this issue, we concluded that the values being promoted were supportive of the development of climate literacy, but that the language in which they were expressed needed to be expanded to acknowledge the positive role the building trades

can make to addressing climate change, including advancing climate justice. While training programs cannot, in themselves, overcome the problem of disparities in living and working conditions faced by vulnerable groups in society, by ensuring that the future workforce is representative of vulnerable groups they can contribute to ensuring that their needs are better understood and better addressed by members of the trade.

## **20. Reducing Embedded Carbon**

One aspect of ‘greening’ the construction industry involves shifting to the use of materials which incorporate less energy or less embedded carbon. Promoters of low carbon construction believe that using more environmentally sustainable materials is necessary to maximize the reduction of GHG emissions. This means knowing about the carbon footprint of various building materials and taking steps to use those that have the lowest footprint. With some exceptions, instructors told us that occasionally they do talk about this issue. But, in general, providing this kind of information has not been a high priority in the curricula of their trades’ training programs. This is primarily because decisions on materials used in the construction process are made by building purchasers, architects, engineers and contractors who draft the specifications. So, on many building sites, the ability of the trades to influence selection of materials is quite limited. They don’t make the choices.

However, knowledge of the carbon and energy content of materials is relevant to the extent that trades have some influence over how the building process is organized and hence whether some materials are to be preferred over others. Moreover, trades may be more current on the newest options available than other stakeholders further up the decision ladder and may be able to use their knowledge to push for the use of more climate friendly options when the opportunity arises. And it should be remembered that some apprentices will end up being supervisors and project managers as their careers develop so having this knowledge can ensure that when they have more discretion over the selection of materials, they will make informed choices.

In addition to selecting more sustainable materials, another way to reduce the carbon footprint of the construction process is to minimize the generation of waste and recycle what cannot be used. Instructors told us that their apprenticeship programs cover issues such as waste management and recycling where trades have some control over these decisions. However, as with the selection of building materials, responsibility for these areas is largely under the control of employers.

Avoiding unnecessary use of water is another way in which energy use can be reduced as well as promoting conservation of this resource. One interviewee noted that his program did focus extensively on water conservation issues, and these were linked to environmental sustainability goals. He even told apprentices they should not be wasting water when they used their

toothbrushes! Saving all water – but especially heated or cooled water - was one important way to reduce energy consumption in addition to its other environmental benefits. As with the points noted on carbon emissions above, this issue is one that is consistent with having a climate literate perspective.

## **21. Conclusion**

Our interviews indicated that that most of the skills currently being taught are ones that the industry will need to address climate change in the future. The training instructors were clearly knowledgeable about what kinds of skills apprentices needed to practice their trade and their programs were providing these skills. Our main finding was that there was not enough connection between how skills were being taught and why they were critical to implementing low carbon construction practices. Apprentices were learning the how, but not the why. In addition, programs were not enabling apprentice to learn about the way in which their industry and the skills they learned could contribute positively to implementing Canada’s goal of reducing its GHG emissions and energy use.

We found that a major barrier to the development of a more climate literate workforce was the absence of training material in the Red Seal Standards. Climate change has not been a focus in the way the Standards have been developed in the past and this is reflected in the exclusive focus on skills training. Most instructors felt there was some scope even within the current Standards to include basic information about climate change and some were doing this. However, as one interviewee noted, it would be helpful if the Standards themselves included this material, both because it would confirm that it was appropriate curriculum content and because it would provide some basic information about what instructors should include on the issue in their training programs.

Another barrier was the lack of support in the industry for the development of a workforce that has the knowledge and competencies to implement low carbon construction successfully. Contractors build according to the specifications in the bids they win. If those who commission construction projects and the architects and engineers who they employ do not prioritize ‘green’ construction in the specifications, low carbon practices will not be encouraged. Despite the growing awareness of how the changing climate is affecting the industry, the culture from top to bottom is still not taking account fully of the way in which construction practices will need to change to respond to what is happening to the climate and the overall environment in the coming decades.

We also learned that interviewees believed that the training programs should place a greater emphasis on ‘soft skills’ such as the ability to communicate and collaborate on building sites, as well as the capacity to understand how the work of each trade fitted in with the others in working

on a construction project. We heard that there should be more emphasis on apprentices learning a systems approach to their work in which they could see how their specific tasks contributed to the overall success of a building project. The industry and the trades training system has the capacity to encourage the development of a climate literate workforce. It only needs a nudge to point it in the right direction.