

## Green Retrofit Economy Study

### TECHNICAL MEMO: SUMMARY OF WORKFORCE SUPPLY

(June 2022)

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## 1. The Retrofit Workforce

The workforce required to conduct large building retrofit projects includes decision makers, design and consulting occupations, construction trades, as well as those involved in building performance and management once the project is complete. Retrofit projects share many of these workers with the broader construction sector and other industries, resulting in competition for talent and a shortage of workers in some occupations and regions.

This summary report describes the types of occupations within the large building retrofit economy in Canada. The report looks at the skills and competencies needed for deep carbon and energy saving retrofit projects; explores the current training system; and discusses key barriers and opportunities associated with the workforce required to scale up the green retrofit economy and meet the anticipated demand in the coming decades.

The occupations relevant to large building retrofits can be categorized into four main groups found in the table below.

Occupation Group	Description	Examples
<b>Decision Makers</b>	These occupations make decisions that underlie when and where building retrofit projects happen.	<ul style="list-style-type: none"><li>• Policy makers</li><li>• Building owners</li><li>• Finance and lending</li><li>• Planning professionals</li></ul>
<b>Designers &amp; Consultants</b>	Once a decision has been made to undertake a retrofit project, these occupations help to determine how the project will be conducted.	<ul style="list-style-type: none"><li>• Engineers and technologists</li><li>• Architects and drafters</li><li>• Building energy modelers</li></ul>
<b>Construction Team</b>	These are the hands-on trades and professionals that work onsite to execute the project.	<ul style="list-style-type: none"><li>• Construction managers</li><li>• Building trades</li><li>• Product specifiers</li></ul>
<b>Building Performance</b>	Once complete, these occupations ensure the success of the project and ongoing performance of the building.	<ul style="list-style-type: none"><li>• Commissioning professionals</li><li>• Building managers</li></ul>

To assess the supply of occupations in the retrofit workforce, the occupations above are matched to National Occupation Classification (NOC) codes to the extent possible. While this system does not precisely define and quantify all of the occupations and evolving roles in the green retrofit economy, it does allow for a reasonable quantification of which occupations are currently experiencing or forecasted to experience supply constraints in the coming decade. For the purposes of quantification, this study focuses on the Designers and Consultants, Construction Team, and Building Performance occupation groups.

The table below lists the relevant occupations sorted by ascending NOC code and their relevance to retrofit measures.

Group	NOC	NOC Title	Role	Relevance to Retrofit Measures
Designers	0211	Engineering managers	Manage the activities of an engineering firm	All
Building Performance	0714	Facility operation and maintenance managers	Property managers; manage projects from client side, including business case and coordination	All
Designers	2132	Mechanical engineers, technologists, and technicians	Heating, ventilation, A/C and plumbing design. solar thermal applications.	All
Designers	2133	Electrical and electronics engineers, technologists, and technicians	Electrification of heating, electricity servicing, lighting and controls, renewables, and storage.	Electrical, mechanical, renewables
Designers	2151	Architects, technologists, and technicians	Primary design lead	All
Construction Team	2234	Construction estimators	Cost and order materials and equipment	All
Designers	2253	Drafting technologists and technicians	Draftsperson; prepare designs and technical information	All
Building performance	2264	Construction inspectors	Building inspectors and officials; Inspect construction and maintenance for building code and safety specs	All
Construction Team	7202	Contractors and supervisors, electrical trades	Manage performance through construction	Electrical
Construction Team	7203	Contractors and supervisors, pipefitting trades	Manage performance through construction	Mechanical
Construction Team	7204	Contractors and supervisors, carpentry trades	Manage performance through construction	Enclosure
Construction Team	7205	Contractors and supervisors, other construction trades, installers, repairers and servicers	Manage performance through construction	Enclosure, mechanical, , Renewables
Construction Team	7235	Electricians (except industrial and power system)	Installation of wiring and electrical components, lighting, controls	Enclosure; mechanical; renewables
Construction Team	7251	Plumbers	hot water distribution for heating & potable water	Enclosure; mechanical; renewables
Construction Team	7252	Steamfitters, pipefitters	Heating and hot water distribution	Mechanical, renewables
Construction Team	7253	Gasfitters	Installation and repair of gas lines and equipment	Mechanical
Construction Team	7271	Carpenters	Insulation installation and general construction	Electrical, Enclosure
Construction Team	7284	Plasterers, drywall installers	Finishing post-retrofit	Enclosure
Construction Team	7291	Roofers and shinglers	Roof insulation and membranes	Enclosure; renewables
Construction Team	7292	Glaziers	Architectural glass and metal installers; Window and door installation	Enclosure; renewables
Construction Team	7293	Insulators (mechanical)	Insulation and sealing of mechanical systems	Mechanical; renewables
Construction Team	7301	Contractors and supervisors, mechanic trades	Manage performance through construction	Mechanical; renewables
Construction Team	7313	Refrigeration and A/C mechanics	A/C, heat pump, and VRF installation	Mechanical; renewables
Construction Team	7441	Residential and commercial installers and servicers	Solar PV, battery storage, and solar thermal installation	All

## 2. Skills & Training

Canada's broader construction workforce has the potential to benefit greatly from retraining initiatives related to the green retrofit economy. Careers in construction and building retrofits offer a relatively stable job prospect over the next 30 years, as the sector is growing and helping to respond to the ongoing climate crisis.

Many initiatives are already underway, creating significant green job opportunities across a range of occupations - from entry-level to professional - across Canada.<sup>1</sup> New entrants and existing professionals will find the green retrofit space to be an attractive proposition. They will have access to jobs with lifelong careers, with competitive wages and paid training, while having the opportunity to provide social and environmental benefits to the community. Therefore, a business imperative exists to improve training and development related to high performance buildings.

To support a growing green retrofit economy in Canada, existing practices need to be leveraged to complement the emergence of innovative new approaches. The skills requirements for green retrofits are often not bound to specific roles or occupations - especially among the trades. For example, plumbers will need to gain new skills and knowledge of manufacturer specifications to install geothermal systems. As retrofit economy gains momentum, established occupations will benefit from knowledge and practical know-how of low-emissions technologies and systems.<sup>2</sup> Given the interconnectedness of systems and the high-level of precision involved, green retrofits require cross-disciplinary and collaborative practices among occupations. Hence, training and education pathways will need to be modernized to meet skill demands.

Skills requirements for retrofits include hands-on techniques, knowledge of project approaches and practices, familiarity with new products and technologies, and an overall understanding of efficient building systems. While these skills are acquired through a mix of training methods and education pathways, onsite practical experience and mentorship are notable training mediums, especially for trades.

### Case study: Building it Green Project

In addition to supporting the growth of retrofit-specific skills and training opportunities highlighted in this report, an opportunity exists to develop more introductory climate and energy literacy training programs that bring together professionals from a range of industries..

**Canada's Building Trades Union (CBTU)** is running the **Building It Green** project to address the construction industry's workforce needs in delivering low-carbon infrastructure project. Through research and industry consultation, the multi-phased study will develop green literacy and climate awareness curriculum that will prepare skilled trades workers to meet Canada's climate goals. The pilot project will go through curriculum development, implementation, and evaluation, before being publicly available for the broader audience.

<sup>1</sup> See more: <https://www.pembina.org/pub/deep-retrofit-skills-training>

<sup>2</sup> See more: [https://www.ilo.org/skills/pubs/WCMS\\_166822/lang--en/index.htm](https://www.ilo.org/skills/pubs/WCMS_166822/lang--en/index.htm)

## **Skills Considerations Across the Green Retrofit Economy**

### **Building as a system approach**

Building as a system approach takes a holistic approach to building systems. In other words, systems are designed, installed, and operated to collectively maximize performance of a building. Typical building approaches tend to separate out the different occupations in the construction ecosystem by their specific functions. Given the interconnectedness and complexity of systems in high performance buildings, trades will need to gain an insight into the roles of other occupations and understand the impact of their own work within the broader system. Thus, system-based approaches to training will be key to develop a whole-building understanding among construction trades.

### **Green literacy on energy and climate**

Green literacy plays a pivotal role for developing and maintaining high-performing buildings. Green literacy refers to the understanding of ecological implications of construction activities on the broader ecosystem – including environment, building performance, and market infrastructure. It also includes the awareness of how designing, bidding, and constructing processes can relate to broader sustainability interventions – including energy efficiency, GHG emissions, and climate adaptation and resiliency.

Having a basic knowledge of climate change and sustainability principles is important for workers to understand the value proposition of the green retrofit products and technologies they use. This knowledge will also prepare them to work aligns with local, regional, and national targets, as well as the ESG goals of the companies involved in the project.

### **Technical skills are transferable and specific to equipment and occupations**

Technical skills include knowledge of practices and technologies, as it relates to specific occupations and equipment. in construction activities. As construction becomes more complex and multi-disciplinary, trades need to develop additional technical skills crossing the boundaries of their traditional roles. Some of the technical capabilities necessary for low-carbon buildings include performance testing, air sealing, proper installation practices of building envelope and HVAC systems, and adaptive lighting systems.

### **Key soft skills are missing**

Trades will require a diverse set of soft skills to navigate through the added technical and logistical complexities of retrofits. Increased collaboration and communication will be necessary among the trades to work through complex maintenance of building elements and other interdependent systems. Additionally, all occupations will require integrated problem solving and critical thinking skills to implement a multi-disciplinary approach to design and project delivery. Retrofit projects cause disruptions to building occupants; thus, trades and other onsite professions will need to develop skills to engage and

manage relationships with tenants and owners. These include communication and negotiation skills that are often missing from existing training curricula.

### **Digital skills are necessary for the workforce of tomorrow**

New technologies, such as artificial intelligence (AI) and automation, are at the foundation for building systems in sustainable buildings. These powerful tools enable real-time data monitoring and analysis to predict occupant behavior and reduce energy consumption, increasing energy efficiency and consequently reducing costs and GHG emissions. AI can also support energy audits without onsite visits by assessing real-time data. In the retrofit market, automation will play a significant role, as advanced robotics will be able to support building envelope retrofits in confined or unsafe spaces. Trades and occupations will be increasingly required to build digital skills and literacy, as building systems become digitized and automated. These include technical knowledge to interact with the technologies, as well as sharing project information using digital tools.

### **Understanding the business case**

Financial professionals and building owners are often missing the full picture when making decisions about undertaking retrofit projects. Owners can be reliant on marketing advisors and property managers to advise on the return on investment (ROI) of a project, and these advisors in turn can rely on backward looking data. Data gaps related to the full value of new technologies and retrofit outcomes can lead to regressive advice being given to owners. More standardized information about predicted energy, carbon, and cost savings can enable more successful outcomes about project funding and approval. The reliability of the data providers is also an important aspect and as such, owners need to seek and consult with experts who have access to right information.

Retrofit aggregators can play a significant role in making the business case. These are service providers that bundle multiple similar buildings into a large retrofit project. By designing a unified retrofit plan for multiple sites, aggregators can take advantage of economies of scale and reduce both costs and completion time. Because of the nature of the aggregation approach, companies can make consortiums and dedicate resources for innovative and low-cost solutions. Thus, aggregators can help address not only the financial and technical gaps, but also knowledge gaps in retrofitting solutions. A successful example of this approach can be seen in the Netherlands with the Energiesprong approach that provides net-zero retrofits for social housing with pre-fabricated solutions.



### Summary of Skills & Knowledge Gaps

Industry stakeholders engaged through this study highlighted a range of skills and knowledge gaps. These are organized by occupation group in the table below.

Occupation Group	Skills & Knowledge Gaps
<b>Decision Makers</b>	<ul style="list-style-type: none"><li>• Life cycle analysis</li><li>• Assessment against current and planned building requirements and regulations</li><li>• Creating a business case for retrofits</li><li>• Assembling multiple buildings into one investment</li></ul>
<b>Designers &amp; Consultants</b>	<ul style="list-style-type: none"><li>• Fundamentals of energy and resource efficiency</li><li>• Energy modeling and building science</li><li>• Integrated design process</li><li>• Passive techniques (orientation, envelope design)</li><li>• Integration of building HVAC systems, renewables, controls</li><li>• Communicating the benefits of energy efficient design</li><li>• Programming, data analysis, data visualization</li></ul>
<b>Construction Team</b>	<ul style="list-style-type: none"><li>• Familiarity and installation of new equipment and technologies</li><li>• Hazardous materials and remediation</li><li>• Importance of air tightness in building envelope</li><li>• Familiarity and certification for variable refrigerant flow (VRF) heat recovery systems</li></ul>
<b>Building Performance</b>	<ul style="list-style-type: none"><li>• Assurance that equipment has been installed correctly</li><li>• Fine tuning building systems post-retrofit (commissioning)</li></ul>

## Training Requirements & Current State of Training Available

The current training landscape is based on established construction industry standards that equip professionals to fulfil market demands. As retrofit activity increases, training pathways will need to adapt to meet evolving standards for building performance in terms of carbon reduction and energy efficiency.

### Training pathways

While the training pathways for construction trades and professionals fundamentally vary in structure, duration and concerned training bodies, there are differences in these pathways by specific occupations and provinces.

Design and consulting professionals such as architects, engineers, and managers receive their foundational training and certification through post-secondary institutions and other accredited organizations, such as professional associations. Once certified, they can pursue additional professional credentials to further their knowledge in specific areas. While mostly voluntary, certain construction professionals must continue their education to maintain their professional certification. This is often in the form of continuing professional development (CPD) credits. Green building professionals can continue their professional development either through certifications from professional associations or through credentials that are based on leading industry standards (e.g., LEED, Passive House Canada).

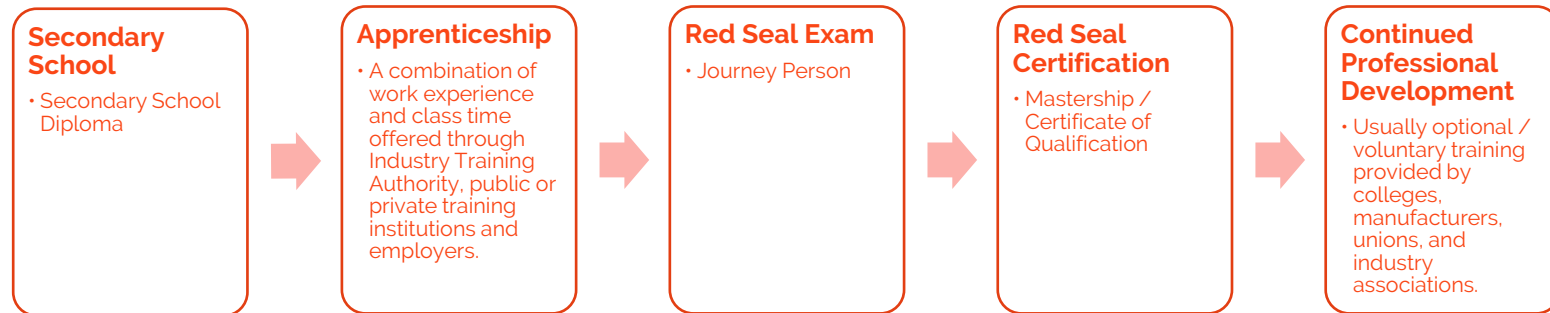
Construction trades can complete their foundational training from multiple pathways with some differences across occupation types. Designated trades regulated through an oversight organization often go through recognized apprenticeship programs, which include in-class and on-site requirements, while other trades may have voluntary apprenticeship programs. Continuing education programs for trades are offered by unions, colleges, industry training providers, and product manufacturers. Mostly voluntary, many of these programs do not offer credentials and often lack standardized learning objectives.

The Red Seal Program was created in partnership with the federal government, provinces, and territories to establish standard criteria to evaluate tradespeople in Canada, and to enable worker mobility across provinces. The Red Seal Endorsement is a certification provided to tradespersons who have passed the Red Seal Examination and have achieved the proficiency needed for the trade according to a national standard.<sup>3</sup> Thus, a tradesperson with a Red Seal Endorsement can work anywhere in Canada without the need to recertify in the province of their employment. Trades can also upskill through an expanding network of training providers, or through hands-on project work experience.

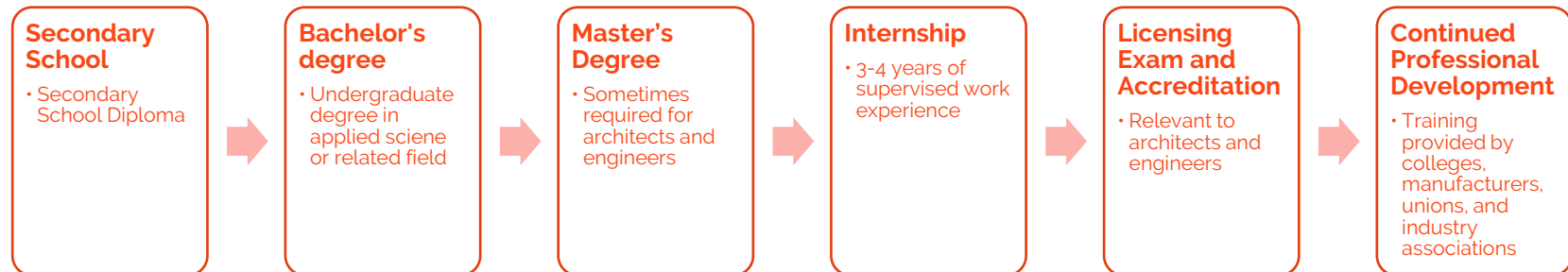
The figures below illustrate the typical educational pathways for trades and consulting professionals.

<sup>3</sup> <https://www.red-seal.ca/eng/about/pr.4gr.1m.shtml>

**Figure 1: Common education pathway for construction trades**



**Figure 2: Common education pathways for engineers, architects, and construction managers**



## Current State of Training

A scan of current training initiatives suggests limited availability of green retrofit focused courses and programs, especially outside of major urban centers. The existing offerings such as courses and certifications mostly cover some aspects of green retrofits, such as energy efficiency and alternative energy. These offerings are usually provided through post-secondary educations, in-house training by developers, industry and trade associations, and specialized training centres.

Non-profit organizations such as Passive House Canada offers several online and in-person courses to designers, architects, planners, builders, and policy makers at all knowledge levels. Courses vary from basic understanding of passive house building to certification exam preparation.<sup>4</sup> Canada Green Building Council, another non-profit organization, is a key provider of green building focused courses and workshops. Product manufacturers also offer training and guides to educate designers and trades on product specifications and technologies.

The current green building training offerings available to design and consulting professionals and trades differ significantly. Post secondary courses and programs on green building are mostly developed for engineers, architects, and other building professionals, with a limited number of programs that target tradespeople. Many energy efficiency and net-zero related training offerings for continuing education do not provide CPD,<sup>5</sup> potentially disincentivizing tradespeople to pursue those skills.

Additionally, apprenticeship curriculum is often not up to date with climate and building science knowledge, as the review and approval cycle of new curriculum happens periodically and struggles to keep up with the pace of industry. Unions also offer a number of green building skills to their members, many of which are relevant to large building retrofit projects that tend to employ a significant amount of unionized labour.

The training initiatives available for continued education for green retrofit skills is still a niche market, but notable progress has been made in this regard through peer-to-peer learning, on-

## Examples of Leading Resources

### Post Secondary Courses

- Endeavour Canada Sustainable Building Design
- Holland College Heritage Retrofit Carpentry Program

### Demonstration Projects

- Prefabricated Exterior Energy Retrofit (PEER) Pilot Project
- Future Homes Ottawa (FHO) initiative

### On-the-Job Training

- Butterwick Projects, Sundance Housing Cooperative
- iHuman Youth Society's Solar Install and LED Retrofit Project

### Dialogues and Case Studies

- Zebx's Deep Emission Retrofit Dialogue Series
- EGBC Case Study Series on Low-carbon Retrofit

<sup>4</sup> <https://www.passivehousecanada.com/>

<sup>5</sup> A notable exception here is the Energy Efficient and Sustainable Housing CPD Course from UBC Sauder School of Business, designed for consumers, real estate professionals, and government officials. <https://www.sauder.ubc.ca/programs/real-estate/credit-programs/professional-development/cpd126-energy-efficient-sustainable-housing>

site training, case studies, and some post-secondary courses. Examples of leading training initiatives are illustrated in the sidebar above. Additional training initiatives are listed in the provincial profiles appendix.

### Case Study: Coordinated Municipal-level Initiatives

The following training initiatives are examples of municipal-level leadership happening across Canada through the LC3 network that have the potential to be scaled to other regions. Many of these initiatives are including social and equity considerations in efforts to support the retrofit workforce.

- **TAF (Greater Toronto and Hamilton Area, ON):** *Building Up* - a Toronto-based non-profit social enterprise- was awarded a one-time grant by The Atmospheric Fund (TAF) for an apprenticeship program focusing on low carbon construction and retrofit skills. The goal of the program was to provide on-the-job retrofit training opportunities and capacity building for individuals facing barriers to employment. Through the 16-week long program, participants gained skills in green and low-carbon construction practices as it relates to enclosures and heating, cooling and ventilation systems.
- **The Climate Innovation Fund (hosted by the Alberta Ecotrust Foundation (Edmonton and Calgary, AB):** iHuman Youth Society's *Solar Install and LED Retrofit Project* provides an example of a holistic model to mitigating climate impact and bringing social benefit through deep retrofit. The youth participants of this program received compensated training through Newo Global Energy, and the Bissell Centre, to complete solar and LED retrofits at iHuman building. Some of the trainees were hired by the training organisations for future work.
- **Metro Vancouver Zero Emission Innovation Centre, ZEIC (Metro Vancouver, BC):** Zero Emissions Building Exchange (ZEBx), a participating organization at the ZEIC offers a *dialogue series* on deep emission retrofit, in collaboration with BOMA BC. The dialogue brings together industry experts to showcase emerging retrofitting solutions and strategies for commercial and residential buildings.
- **Ottawa Climate Action Fund (Ottawa, ON):** The pilot *Future Homes Ottawa (FHO)* initiative is community collaboration that seeks to develop examples of neighbourhood-driven deep energy retrofits in Ottawa. Led by the Ottawa Energy Collective and Enviro-Centre, the project will foster retrofit capacity in trades by illustrating best practices in neighbourhood demonstration projects.

### 3. Current State of Workforce Supply

Several key occupations in the green retrofit workforce are already projected to face a significant supply deficit in the coming years. As many of these occupations are also projected to be in high demand with retrofits scale-up, a scarcity of these occupations could be a substantial obstacle to meeting retrofit targets.

With the onset of the global pandemic, Canada experienced tight labour markets in several regions of the country. Employment levels outpaced the labour supply, leading to historically low unemployment levels across the country. The impending wave of retirement in the construction industry was accelerated by the pandemic restrictions, as many older workers in the core working age group left the labour force earlier than anticipated. As more construction workers continue to retire, the labour force pressure will continue rise in the coming decades. Other contributing factors to the tight labour market include the lack of diversity and inclusion in the construction workforce.<sup>6</sup>

Immigration and inter-provincial mobility can help to mitigate skilled labour shortages. However, current Canadian immigration policies favor white collar workers and impose multiple obstacles for internationally trained blue-collar immigrants for recertification in skilled trades, including stringent Canadian work experience requirements, repetitive and costly language testing, and long processing times.<sup>7</sup> Thus, these factors pose significant barriers to immigration, limiting the potential to attract skilled trades.

The introduction of new technologies and skills required to decarbonize buildings has further intensified existing workforce supply and training challenges. Many organizations are striving to address these issues, and in order to meet the demand for retrofit projects, existing initiatives will need to be scaled up and out. A wide range of organizations are already involved in a team effort to solve workforce supply and skills training concerns across Canada: businesses across the supply chain, labour unions, colleges and universities, professional and industry associations, First Nations, non-profit organizations, and all levels of municipal, provincial, and federal government departments.

<sup>6</sup> <https://www.reuters.com/world/americas/canada-plans-double-homebuilding-decade-where-are-workers-2022-04-10/>

<sup>7</sup> <https://www.cbc.ca/news/canada/toronto/ontario-foreign-trained-immigrants-proposed-legislation-labour-shortage-changes-1.6218928>

## Workforce Supply Projections

A useful data source available to compare provincial labour market supply for the construction sector is the Construction and Maintenance Looking Forward highlights reports from BuildForce Canada, which cover many of the construction trade occupations relevant to large building retrofits.<sup>8</sup>

According to BuildForce Canada labour indicators (the non-residential market ranking and estimated apprenticeship certification requirements), carpenters and steamfitters are most likely to experience labour market shortages over the next three years to 2025. A shortage of these occupations in the short run could limit retrofit activity, as these occupations are expected to be in high demand with retrofit market growth. Additionally, a recent [Canadian Occupational Projection System \(COPS\) Assessment of Projected Labour Market Conditions](#) estimates that mechanical engineers and technicians are projected to be in short supply over the period of 2022-2028 (Table 5).

**The labour market outlook for these trades has been made without factoring for a significant increase in retrofit activity.** Tighter markets are expected for most trades over the short run, reflecting the growing demand as non-residential construction activity starts to peak from 2022 following a pandemic slowdown. In other words, the availability of skilled labour is expected to be limited (or generally not available) by the short term increases in demand. As such, employers across industries will compete to attract the required talent.

## BuildForce Canada Non-residential Market Ranking

The non-residential market ranking is a barometer of the local labour supply responsiveness in face of short-term increases in industry demand in the non-residential construction sector (industrial, commercial, and institutional large building projects). Table 3 below provides a breakdown of market rankings over the period of 2022-2025 indicating overall labour conditions of surplus/balance/shortage<sup>9</sup>.

### Occupations in Short Supply

The following retrofit occupations are likely to see a supply shortage (at a national level) in the near term, even without factoring in a scale up of retrofit projects:



- Carpenters
- Steamfitters, pipefitters, and sprinkler system installers
- Plasterers and drywall installers
- Refrigeration and air conditioning mechanics
- Mechanical engineers and technicians

<sup>8</sup> <https://www.constructionforecasts.ca/en/highlights>

<sup>9</sup> The rankings represent the average of scores over the period of 2022-2025 collected from BuildForce Canada Non Residential Market Ranking by provinces.

**Table 3 Non-Residential Market Ranking of Construction Trades and Occupations (2022-2025)**

	Province									
	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
Carpenters	3.0	3.5	3.0	2.8	2.5	3.8	3.5	3.3	3.0	3.3
Construction estimators	3.3	3.4	3.0			3.5	3.7		3.3	3.0
Contractors and supervisors	2.8	3.4	2.8	2.8	2.5	3.5	3.6	3.3	3.3	3.0
Electricians	3.0	3.5	3.0	2.8	2.5	3.8	3.1	3.3	3.0	3.3
Gasfitters	3.0	4.0					3.6			
Glaziers	3.3	3.5	2.8				3.4	3.0	3.0	3.5
Insulators	3.5	3.4	3.0	3.0	2.8	3.3	3.2		3.0	3.0
Plasters and drywall installers	3.3	3.8	2.8			4.3	3.6		3.0	3.3
Refrigeration and air-conditioning mechanics	3.3	3.5	2.8	2.5	2.8	4.0	3.2		3.0	3.5
Residential and commercial installers and servicers	3.3	3.4	2.8	2.8	2.8		3.6		3.8	3.5
Roofers and shinglers	3.0	3.8	3.0				3.5		3.0	3.3
Steamfitters, pipefitters, and sprinkler system installers	3.5	3.6	3.0	2.8	2.3	3.5	3.8		3.0	3.0

## Market Rankings

<b>1</b>	<b>Excess supply</b>	Workers meeting employer qualifications in local markets exceed the demand at the current offered rate of compensation and other current working conditions.
<b>2</b>	<b>Potential surplus</b>	Workers meeting employer qualifications could potentially exceed the demand at the current offered rate of compensation and other working conditions.
<b>3</b>	<b>Balanced conditions</b>	The availability of workers meeting employer qualifications is in line with anticipated completions of projects.
<b>4</b>	<b>Potential shortage</b>	Workers meeting employer qualifications are generally not available in local markets to meet any increase in demand.
<b>5</b>	<b>Excess demand</b>	Needed workers meeting employer qualifications are not available in local markets to meet current demand so that projects or production may be delayed or deferred
	<b>No data</b>	



Based on the market rankings, Ontario, British Columbia, and Nova Scotia are projected to experience shortages of the relevant trades in the near-term. The labour pressure in these markets is caused by increases in projects and investment growth. Other trades that are at risk of undersupplying labour across several regions include carpenters, residential and commercial installers, drywall installers, steamfitters, and air condition mechanics.

### BuildForce Canada Estimated Apprenticeship Certification Requirements

This supply risk indicator evaluates the anticipated supply of new journeypersons against the certification of qualification (CoQ) requirements to meet future employment and replacement demand across all construction sectors. It provides an indication of the trade demand and supply equation, as the focus is on the flow and balance of new entrants.

Table 4 Estimated construction certification demand and projected target of new entrants by trade, 2022 to 2027

	Province									
	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
Carpenters	At risk	Balanced conditions	Balanced conditions	At risk	No data	At risk	Balanced conditions	Ample supply	Ample supply	At risk
Construction Electricians	Ample supply	Ample supply	Ample supply	Ample supply	Ample supply	Ample supply	Ample supply	Balanced conditions	Ample supply	Balanced conditions
Glazier	At risk	At risk	No data	No data	No data	No data	At risk	No data	Ample supply	No data
Gasfitters	Ample supply	At risk	No data	No data	No data	At risk	No data	No data	No data	No data
Insulator	At risk	At risk	Ample supply	No data	No data	No data	No data	No data	No data	At risk
Refrigeration and air con..	Ample supply	Ample supply	Balanced conditions	Ample supply	Ample supply	Ample supply	Ample supply	Balanced conditions	No data	At risk
Steamfitters	Ample supply	Balanced conditions	Balanced conditions	Ample supply	Balanced conditions	At risk	Ample supply	No data	Ample supply	At risk

At risk

Balanced conditions

Ample supply

No data

Certifications required exceed projected completions

Certifications required in line with projected completions

Projected completions exceed certifications required

Based on the projected trend of new registration, most trades are expected to meet or exceed the construction industry's employment and replacement demand. Carpenters and gasfitters are at the highest risk of potentially undersupplying the number of new journeypersons by 2027. Other trades including glaziers and insulators are at risk of not meeting the target number of new entrants required to fulfill demand requirements across several regions.

### Canadian Occupational Projection System (COPS)

The Canadian Occupational Projection System (COPS) is a method of workforce supply analysis that combines recent labour market conditions and projections of labour demand and supply to identify potential imbalances over a period of time. This dataset published by Employment and Social Development Canada (ESDC) provides an estimate of total job seekers, job openings, and surplus labour force at the NOC code level. The most recent dataset provides an outlook to 2028.<sup>10</sup>

**Table 5 COPS: Summary of future labour market conditions of design and consulting occupations**

Design and consulting occupations	Future Labour Market Condition
Engineering managers	Balance
Facility operation and maintenance managers	Balance
Mechanical engineers	Shortage
Electrical and electronics engineers	Balance
Architects	Balance
Mechanical engineering technologists and technician	Shortage
Technical occupations in architecture, drafting, surveying, geomatics	Balance
Construction inspectors	Balance

*Please Note: Additional insight on workforce supply can be gained through provincial labour market outlook reports, however, these are not developed with a consistent approach nationwide so caution should be used when making comparisons between them. Data from BuildForce Canada and COPS is also included in the Provincial Profiles appendix to this report.*

<sup>10</sup> <https://lmic-cimt.ca/projects/work-words/occupation-outlooks/canadian-occupational-projection-system/>

## 4 Workforce Challenges & Opportunities

This study found a variety of challenges and associated opportunities related to the supply of workers and skills across the green retrofit economy. These challenges are presented in the table below and grouped into six themes.

Theme	Challenge	Opportunity
Supply Constraints	Not enough people to do the work at the scale needed (especially construction trades).	Expand and expedite training and certification programs.
	Shortage of entry-level labour to keep pace with anticipated retirements, as well as increased demand from a dynamic market.	Articulate the benefits of in-demand retrofit jobs and the associated career pathways that can follow.
	Lack of energy advisors or green building liaisons to communicate between building users and developers/contractors.	Incentivize energy advisor training that is specific to green retrofits to improve information and knowledge sharing.
Training Methods	Methods of training delivery do not suit the needs of industry and professionals.	Develop new methods of delivering training that consider seasonal fluctuations in activity, remote learning opportunities, on-site demonstrations, etc.
	New entrants into the workforce are still lacking practical experience with retrofit materials and techniques.	Connect retiring professionals with new entrants as a way of providing mentorship support.
	Limited knowledge of new technology among decision makers, consultants, and construction trades.	Foster partnerships between equipment manufacturers and training providers to ensure the workforce has an understanding of the benefits and proper technical requirements of equipment (e.g., cold climate heat pumps). Leaders in the industry need to be able to educate others through the supply chain and simplify technical details for a range of audiences.
	Keeping curriculum up to date with the latest climate literacy, building science knowledge.	Focus on offering a range of education programs from shorter, custom-made training programs (e.g., CIET certified energy manager training program) alongside trade certifications programs and intensive masters programs.
	Newly established training programs are under-subscribed (e.g., net zero building techniques).	Promote new training offerings to a wide audience through various channels and create incentives to participate.
Training Incentives		

<b>Energy &amp; Climate Literacy</b>	Current knowledge base is relatively limited to a few urban centres.	Focus on programs that foster collaboration among provinces and municipalities as these programs can improve energy and climate literacy among workers in urban and rural areas.
	Limited understanding among the trades about their roles and skills in constructing and maintaining net-zero building projects.	Develop and promote programs like CBTU's Building It Green that helps skills trades understand the importance of green constructions and retrofits, and their roles in achieving these goals.
	Lack of widely available and accessible information about how to decarbonize buildings.	Produce guidance material targeted at specific audiences, regions, and contexts. <sup>11</sup>
	Lack of standardized information about the expected ROI of various retrofit measures and project contexts.	Develop and disseminate better information about how to make retrofit projects result in positive investment returns. The Investor Confidence Project's Investor Ready Energy Efficiency certification and associated training program is addressing this need among project developers.
	Lack of familiarity with products for green retrofits among contractors and developers.	Focus on building familiarity through college curriculum and trades training programs.
<b>Market Infrastructure</b>	Policy gaps and market uncertainty make it hard for training providers to plan and establish new offerings.	Develop policy roadmaps such as the BC Energy Step Code which can give industry and training providers the certainty needed to make investments in new training offerings.
<b>Affordability &amp; Access</b>	Programs are only available in some regions and are cost prohibitive.	Prioritize affordable access to training, support partnerships between large urban training providers and regional colleges

<sup>11</sup> See the Carbon Leadership Forum's Embodied Carbon Toolkit for Building Owners: <https://carbonleadershipforum.org/clf-owner-toolkit/>

## Appendix I – Occupation Framework

	Designers & Consultants	
NOC	NOC Title	Alternate Title
0211	Engineering managers	Managers
0714	Facility operation and maintenance managers	Property/Facility managers
2132	Mechanical engineers, technologists and technicians	Mechanical engineers and technicians Also includes energy modellers
2133	Electrical and electronics engineers, technologists and technicians	Electric engineers and technicians
2151	Architects, technologists and technicians	Architects; also includes energy modellers
2234	Construction estimators	Quantity surveyors, cost consultants
2253	Drafting technologists and technicians	Drafters
2264	Construction inspectors	Building or bylaw officials

	Construction Trades	
NOC	NOC Title	Alternate Title
7202	Contractors and supervisors, electrical trades	Contractors/First-line supervisors
7203	Contractors and supervisors, pipefitting trades	Contractors/First-line supervisors
7204	Contractors and supervisors, carpentry trades	Contractors/First-line supervisors
7205	Contractors and supervisors, other construction trades, installers, repairers and servicers	Contractors/First-line supervisors
7235	Electricians (except industrial and power system)	Electricians
7251	Plumbers	Plumbers
7252	Steamfitters, pipefitters	Steamfitters
7253	Gasfitters	Gasfitters
7271	Carpenters	Carpenters
7284	Plasterers, drywall installers	Drywall installers
7291	Roofers and shinglers	Roofers
7292	Glaziers	Architectural Glass and Metal Technician/ Specialty glass façade and curtain wall providers
7293	Insulators (mechanical)	Insulators
7301	Contractors and supervisors, mechanic trades	Contractors/First-line supervisors
7313	Refrigeration and air conditioning mechanics	Refrigeration and Air Conditioning Systems Mechanics
7441	Residential and commercial installers and servicers	Installers

Category	NOC	NOC Title	Role	Relevance to Pathways	Occupational Profile
Designers	0211	Engineering managers	Manage the activities of an engineering firm	All	
Building performance	0714	Facility operation and maintenance managers	Property managers; manage projects from client side, including business case and coordination	All	Y
Designers	2132	Mechanical engineers, technologists, and technicians	Heating, ventilation, A/C and plumbing design. Solar thermal applications.	All	Y (combined profile of engineers)
Designers	2133	Electrical and electronics engineers, technologists, and technicians	Electrification of heating, electricity servicing, lighting and controls, Renewables and storage.	Electrical, mechanical, renewables	Y (combined profile of engineers)
Designers	2151	Architects, technologists, and technicians	Primary design lead	All	Y
Decision makers	2234	Construction estimators	Cost and order materials and equipment	All	Y
Designers	2253	Drafting technologists and technicians	Draftsperson; Prepare designs and technical information	All	
Building performance	2264	Construction inspectors	Building inspectors and officials; Inspect construction and maintenance for building code and safety specs	Enclosure; renewables	
Construction Team	7202	Contractors and supervisors, electrical trades	Manage performance through construction	Electrical	Y (combined profile of supervisors)
Construction Team	7203	Contractors and supervisors, pipefitting trades	Manage performance through construction	Mechanical	Y (combined profile of supervisors)
Construction team	7204	Contractors and supervisors, carpentry trades	Manage performance through construction	Electrical; enclosure	Y (combined profile of supervisors)
Construction team	7205	Contractors and supervisors, other construction trades, installers, repairers and servicers	Manage performance through construction	All	Y (combined profile of supervisors)
Construction team	7235	Electricians (except industrial and power system)	Installation of wiring and electrical components, lighting, controls	All	Y
Construction team	7251	Plumbers	Hot water distribution for heating & potable water	Enclosure; mechanical; renewables	Y (combined profile of HVAC)
Construction team	7252	Steamfitters, pipefitters	Heating and hotwater distribution	Mechanical	Y (combined profile of HVAC)
Construction team	7253	Gasfitters	Installation and repair of gas lines and equipment	Mechanical	Y (combined profile of HVAC)
Construction team	7271	Carpenters	Insulation installation & general construction	Enclosure	Y
Construction Team	7284	Plasterers, drywall installers	Finishing post-retrofit	Enclosure	Y (combined profile of HVAC)
Construction team	7291	Roofers and shinglers	Roof insulation and membranes	Enclosure; renewables	
Construction team	7292	Glaziers	Architectural glass and metal installers; Window and door installation	Enclosure; renewables	
Construction team	7293	Insulators (mechanical)	Insulation and sealing of mechanical systems	Mechanical; renewables	
Construction team	7301	Contractors and supervisors, mechanic trades		Mechanical; renewables	Y (combined profile of supervisors)
Construction team	7313	Refrigeration and air conditioning mechanics	A/C, Heat-Pump and VRF installation	Mechanical; renewables	Y (combined profile of HVAC)
Construction team	7441	Residential and commercial installers and servicers	Window and door installation. Solar PV, Battery Storage & Solar Thermal Installation	All	Y

## Appendix II - Provincial Profiles

### Contents

- Current workforce (all provinces)
- BC
- Alberta
- Saskatchewan
- Manitoba
- Ontario
- Quebec
- Atlantic Canada

### Notes on provincial profiles:

- Data presented in Figure A and B in each profile is from BuildForce Canada
- Data on “occupations at risk of potential shortage” section is from the following sources:
  - Trades: Build Force Canada Non-Residential Market Ranking of Construction Trades and Occupations (2022-2025)
  - Designers/Consultants: Provincial labour market outlook reports and supporting data tables

*Please Note: Learning resource examples featured in the profiles are based on a scan of materials available online and simply meant to provide a sample of the range of learning resources available across Canada.*

# Atlantic Canada

## Summary of Trades Workforce Supply

As the existing workforce ages and retires, the overall construction sector in Atlantic Canada may face a challenging situation in which there will be insufficient number of new entrants to keep pace with employment and replacement demands. The construction industry will need to recruit additional workers from a pool of interprovincial and international immigrants, as well as attract workers displaced from other industries. The six-year workforce outlook for Atlantic Canada is summarised in Figure A.

Within the non-residential construction sector, the region is projected to experience a drop in labour supply growth by 2027 (Figure B).

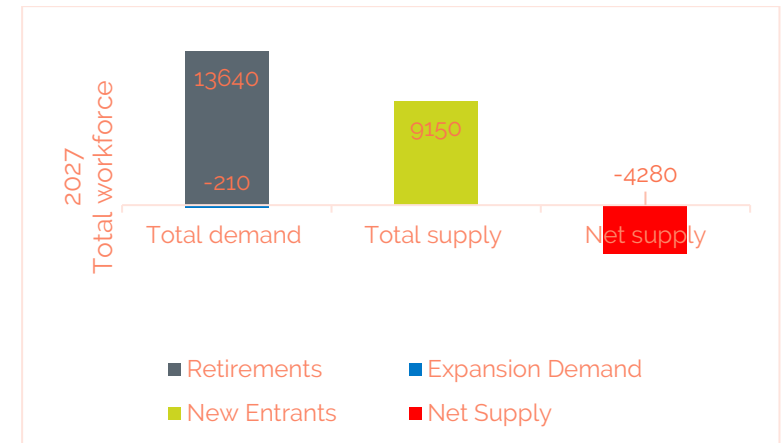


Figure A: Six-year workforce outlook by province

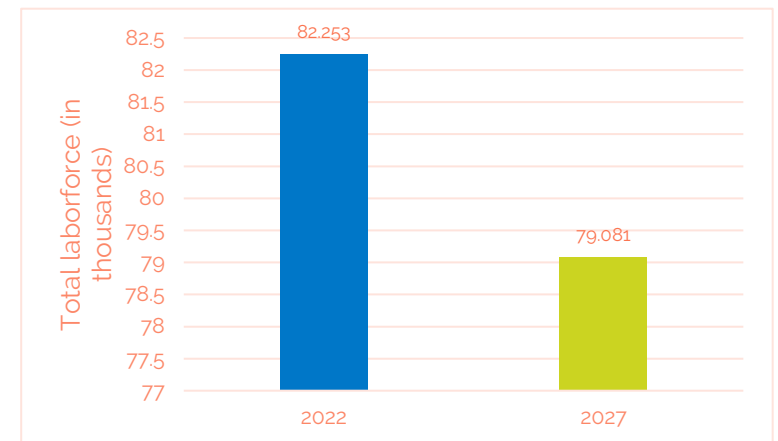


Figure B: Change in construction labour force in the region

## Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025:

- NS: Carpenters, Construction Estimators, Contactors and Supervisors, Electricians, Drywall Installers, Refrigeration Mechanics, Steamfitters
- NB: None
- NL: None
- PEI: None

**Designers/Consultants:** None



# Training Landscape

## Oversight

The organisations responsible for overseeing trades training requirements in the specific provinces include:

- Nova Scotia Apprenticeship Agency (NS)
- Apprenticeship and Trades Certification Division (NL)
- Apprenticeship and Occupational Certification of the Government of New Brunswick (NB)
- PEI Apprenticeship Board (PEI).

Some of the notable training organizations and institutes include:

- New Brunswick Community College (NBCC), NB
- Holland College, PEI
- Efficiency Nova Scotia
- Building Traders Advancement College of Nova Scotia
- Ecology Action Centre, NS
- College of the North Atlantic, NL
- Academy Canada, NL
- Nova Scotia Construction Sector Council (NSCSC).

## Examples of training initiatives and learning resources

- *Holland College Heritage Retrofit Carpentry Program* – targeted for carpenters, this program provides skills to upgrade and restore heritage buildings to meet structural and energy efficiency standards.
- *Ecology Action Centre Better Building Speaker Series* – hosted by different industry professionals, this series provides insight into different aspects of energy efficiency and net-zero new construction and retrofitting.
- *Efficiency Nova Scotia Building Optimization Program* - focuses on recommissioning measures for existing buildings including operational improvements, system performance optimization, and energy usage reduction

# Quebec

## Summary of Trades Workforce Supply

With 28,800 workers retiring from Quebec's construction labour force, the province will need to recruit an additional 18,900 workers to maintain labour force requirements over the decade. This demand will be met by the 25,100 new entrants from the local population. The six-year workforce outlook for Quebec is summarised in Figure A.

Both residential and non-residential sectors are forecasted to have growth in labour force over the decade as indicated in Figure B.

## Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025:

- Residential and Commercial Installers

**Designers/Consultants:** Mechanical Engineers and Technologists, Electrical Engineers and Technologists, Construction Inspectors (*Over 2021 -2023*)

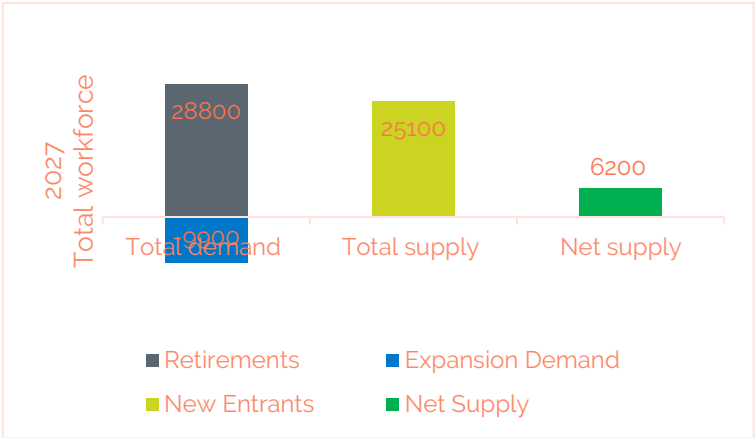


Figure A: Six-year workforce outlook

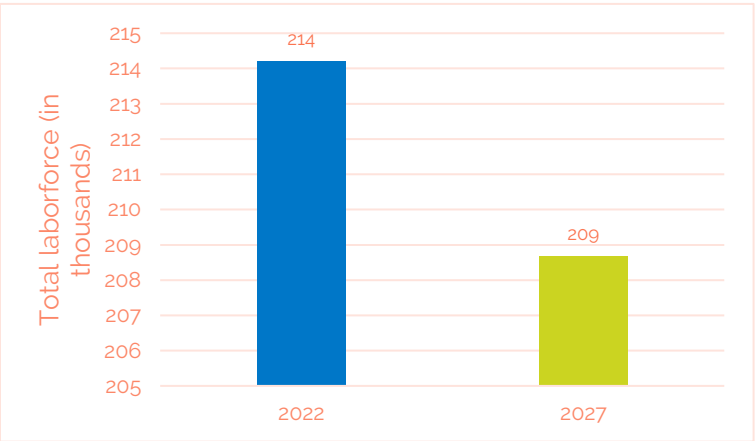


Figure B: Change in construction labour force

# Training Landscape

## Oversight

The Commission de la construction du Québec (CCQ), created in 1987, is responsible for applying the Act on Labour Relations, Vocational Training, and Workforce Management in the Construction Industry (Act R-20), which provides a legal framework for the industry.

Some of the notable training organizations and institutes include:

- Aviron Quebec

## Examples of training initiatives and learning resources

- *Aviron Quebec DEP-Plumbing and Heating Certification Program* – Provides advanced skills in installation and maintenance of plumbing and heating systems.
- *Exemplary Green Building Initiatives* – Resource from Quebec City showcasing case studies on renovation and other green building projects
- *Sustainable Architecture Training Program* – Diploma program where students learn how to design and draft eco-friendly buildings

# Ontario

## Summary of Trades Workforce Supply

Ontario's construction industry is projected to demand 67000 surplus workers, as it faces a wave of attrition from 56,300 retirements, and additional demand growth of 10,700 workers (Figure A). The estimated entry of 53,000 new entrants from the province only partially offsets anticipated retirements. This means the remaining labour gap will need to be met through interprovincial and international migrant workers.

Both residential and non-residential sectors are forecasted to have growth in labour force over the decade as indicated in Figure B.

## Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025:

- Carpenters
- Construction estimators
- Contractors and Supervisors
- Gasfitters
- Drywall Installers
- Residential and Commercial Installers
- Roofers and Shinglers
- Steamfitters

**Designers/Consultants:** None

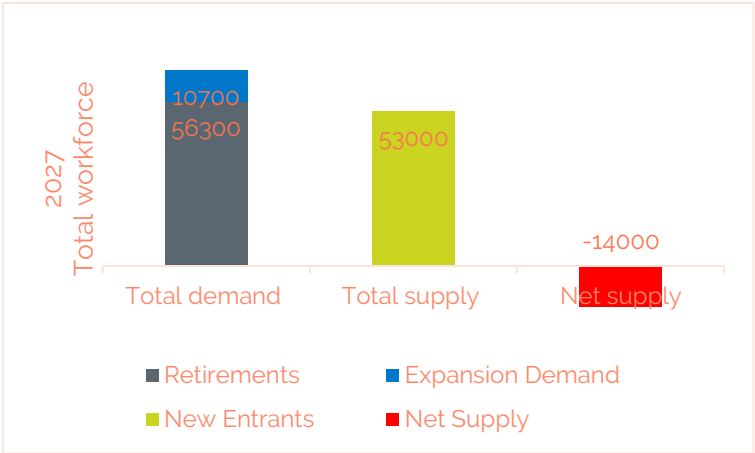


Figure A: Six-year workforce outlook

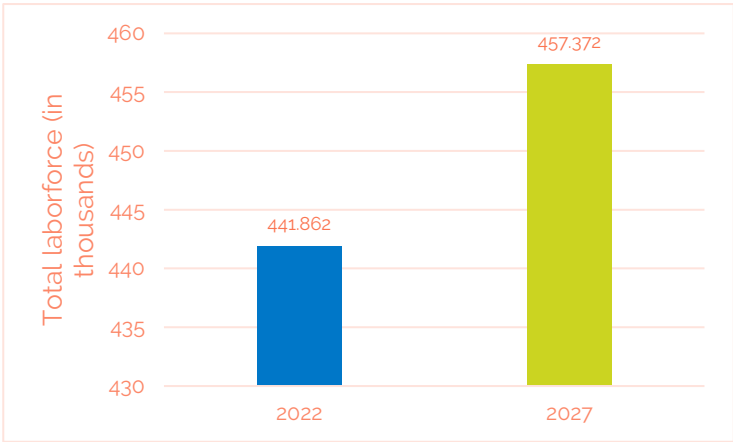


Figure B: Change in construction labour force

# Training Landscape

## Oversight

Ministry of Labour, Training & Skills Development is responsible for regulatory decisions for the skilled trades and jobsite inspections

Skilled Trades Ontario replaces the Ontario Colleges of Trades. At maturity, Skilled Trades Ontario will be responsible for apprenticeship and skilled trades training and certification in Ontario, including:

- registering apprentice training agreements issuing certificates
- developing apprenticeship program standards
- assessing individuals who have not completed an Ontario apprenticeship

Some of the notable training organizations and institutes include:

- Humber college
- Mohawk College
- College of Carpenters and Allied Trades
- Ontario Masonry Training Centre
- Finishing Trades Institute of Ontario.

## Examples of training initiatives and learning resources

- *Humber College Heating, Refrigeration and Air Conditioning Technology* – advanced diploma program on energy systems for commercial and industrial buildings
- *College of Carpenter & Allied Trades (CCAT) Mass Timber Program*- the four course covers the hard skills involved in mass timber construction as well as the underlying green principles such as carbon sequestering, insulation factors for wood versus metals, renewable resources, life cycle of trees/wood, forest management, supply chain issues
- *MURB Design Guide* – comprehensive resource from City of Toronto with implications for retrofit projects
- *Emissions of Materials Benchmark Assessment for Residential Construction* – benchmark study of the carbon footprint of over 500 residential buildings, focusing on the Greater Toronto area.

# Manitoba

## Summary of Trades Workforce Supply

Manitoba's construction and maintenance industry will expect to see insignificant change in the labour force. With an aging labour force, 4,500 workers are expected to retire by the end of the decade. This turnover in workforce should be met by the 5,400 new entrants to labour force from the young graduates from the local populations, exceeding the industry's total labour demand. The six-year workforce outlook for Manitoba is summarised in Figure A.

Within the non-residential construction sector, Manitoba is projected to experience a drop in labour supply growth by 2027 (Figure B). Thus, the sector may have to rely on workers from other industries to meet market requirements.

### Occupations at risk of potential shortage

**Trades:** None

**Designers/Consultants:** Facility Managers, Mechanical Technologists, Electrical Technologists, Architects and Technicians, Construction Estimators, Drafting Trade, Construction Inspectors *(Over 2021 -2025)*

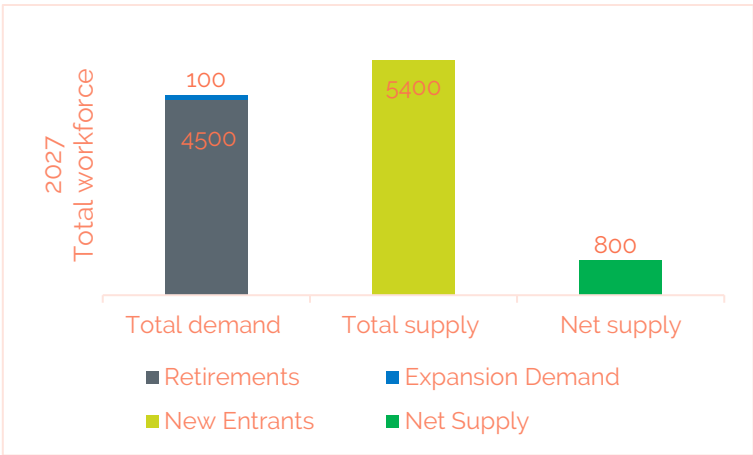


Figure A: Six-year workforce outlook

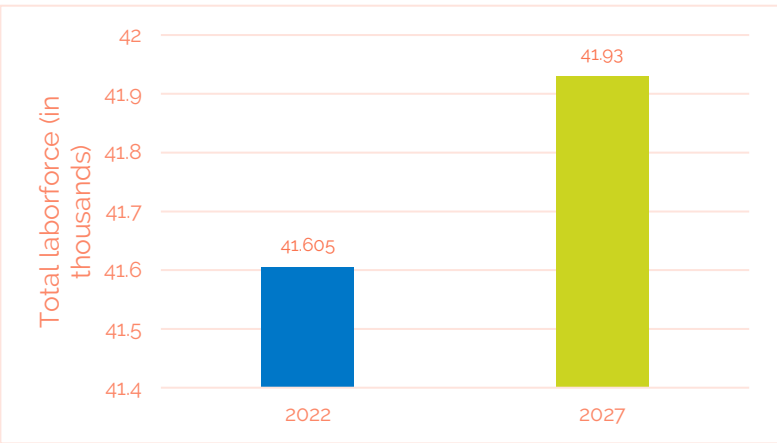


Figure B: Change in construction labour force

# Training Landscape

## Oversight

Apprenticeship Manitoba is responsible for overseeing trades training requirements in the province. Some of the notable training organizations and institutes include:

- Manitoba Institute of Trades & Technology
- Red River College
- Manitoba Building Trades Institute
- Brandon Neighbourhood Renewal Corp (BNRC)

## Examples of training initiatives and learning resources

- *Brandon Energy Efficiency Program (BEEP)* – seeks to improve energy and water efficiency of existing homes and also builds energy and water efficient affordable housing in Brandon and surrounding communities. Program designed for individuals who have barriers to employment.
- *Red River College Energy Micro-Credentials* – this three-months micro-credential program provides an accelerated pathway to become a certified energy advisor
- *Passive House for The Trades* – This five-week course offered exclusively through Manitoba Building Trades Institute will give skilled trades professionals in Manitoba a practical understanding of standardized sustainable building practices and Passive House Certification standards.

# Saskatchewan

## Summary of Trades Workforce Supply

Saskatchewan's construction industry will require 6,500 workers by 2030, to replace 5,000 workers going in retirement as well as to meet an additional 1500 workers demanded (Figure A). With moderate rate of construction growth, the province can demand on its younger age demographics to meet its hiring needs as 5,300 workers enter the workforce. It should be noted that key trades may be at risk of undersupply during peak construction periods, and simultaneous growth in maintenance/renovation and new construction. Over the scenario period, Saskatchewan will experience net decline in non-residential related labour supply as shown in Figure B.

### Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025:

- Glaziers
- Refrigeration Mechanics
- Residential and Commercial Installers

**Designers/Consultants:** Architectural Technologists (Over 2019-2023)

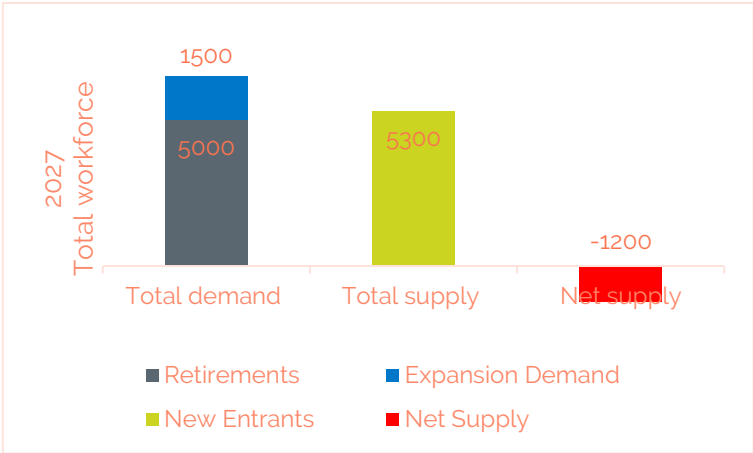


Figure A: Six-year workforce outlook

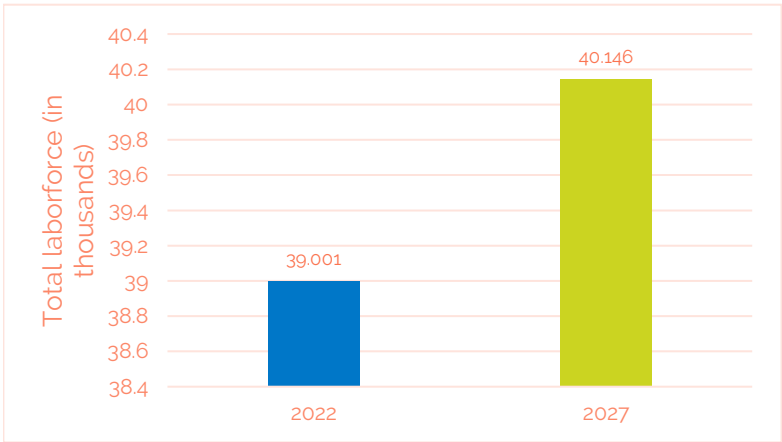


Figure B: Change in construction labour force



# Training Landscape

## Oversight

Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) is responsible for overseeing trades training requirements in the province.

Some of the notable training organizations and institutes include:

- Saskatchewan Polytechnic

## Examples of training initiatives and learning resources

- *Saskatchewan Polytechnic Building Systems Technician* - this one-year certificate program offers comprehensive training in maintaining and operating electrical, ventilation, refrigeration, and water treatment systems.
- *BOMA e-Energy Training* - focuses on energy efficiency knowledge and competencies for building officials.
- *Saskatchewan Environmental Society Building Operator Training (BOT) Program* – this program is designed to introduce custodians and building operators to energy conservation principles, new technologies, and facility retrofits that will save energy and money.

# Alberta

## Summary of Trades Workforce Supply

As construction activities, especially in institutional buildings, is expected to rise, the industry will need to recruit and retain new workers to meet growth requirements. The expected retirement of 22,600 workers, along with expansion demand of 2,400 workers will necessitate additional 25,000 workers to be recruited over this decade. The projected growth in population, as largely driven by the younger working age group, will be a key factor to meet the labour demands. About 23,000 newly certified journeypersons are expected to enter the workforce by 2027. The six-year workforce outlook for Alberta is illustrated in Figure A.

Over the forecasted period, both residential and non-residential sectors are forecasted to have growth in labour force as indicated in Figure B.

## Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025:

- Insulators
- Steamfitters

**Designers/Consultants:** Engineering Managers, Facility Managers, Electrical Engineers, Mechanical Engineers and Drafting Professions (over 2019-2029)

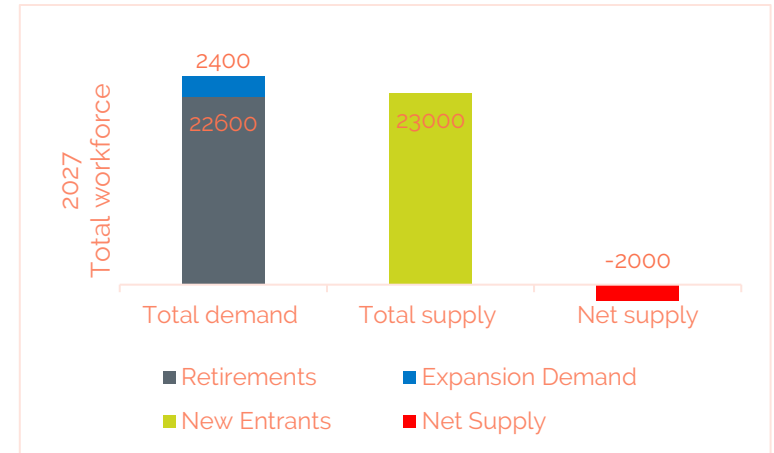


Figure A: Six-year workforce outlook

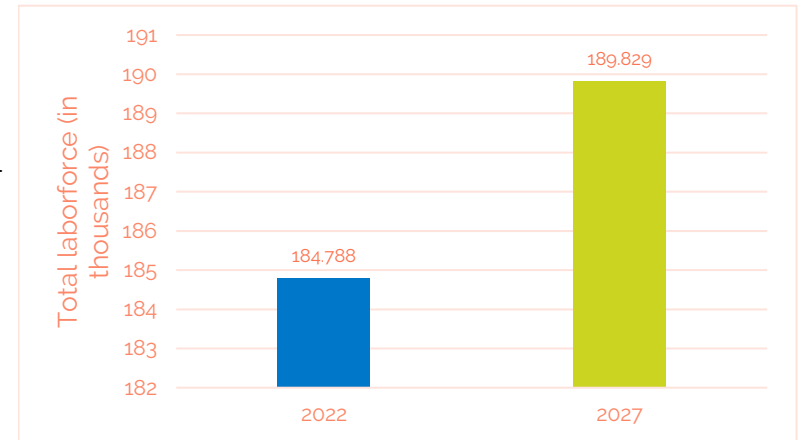


Figure B: Change in construction labour force

# Training Landscape

## Oversight

Alberta Apprenticeship and Industry Training (AIT) is responsible for overseeing trades training requirements in AB. Some of the notable training organizations and institutes include:

- Northern Alberta Institute of Technology (NAIT)
- Southern Alberta Institute of Technology (SAIT)
- Red Deer College
- Energy Efficiency Alberta

## Examples of training initiatives and learning resources

- *SAIT Sustainable Building Fundamentals* – covers topics including green building project management, and other energy efficiency, building science, and environmental concerns related to the construction industry.
- *NAIT Alternative Energy Technology Diploma* – provides skills in design and integration of alternative energy sources.
- *Series of Solar Energy training courses* – training courses for professionals who are actively involved or interested in solar PV, energy efficiency and renewable energy to advance their skills, employability, and business offerings.

# British Columbia

## Summary of Trades Workforce Supply

As indicated in figure A, the construction sector is projected to see a contraction in industry demand of 400 workers by the end of this decade. The industry also faces the challenge of replacing a wave of 25,100 workers who are expected to retire. Given retirement and expansion demands, the sector will need to employ an additional 24,700 to meet its requirements. The supply of 22,000 new entrants will partially offset demand. Thus, the labour gap will need to be met by labour mobility from other industries or other provinces.

The province is expected to have a net deficit in labour for non-residential sector by 2027 (Figure B).

## Occupations at risk of potential shortage

**Trades:** Based on non-residential market rankings, the following trades are at the risk of being undersupplied by 2025

- Carpenters
- Electricians
- Glaziers
- Drywall Installers
- Refrigeration Mechanics
- Roofers and Shinglers
- Steamfitters

**Designers/Consultants:** All (over 2021-2031)

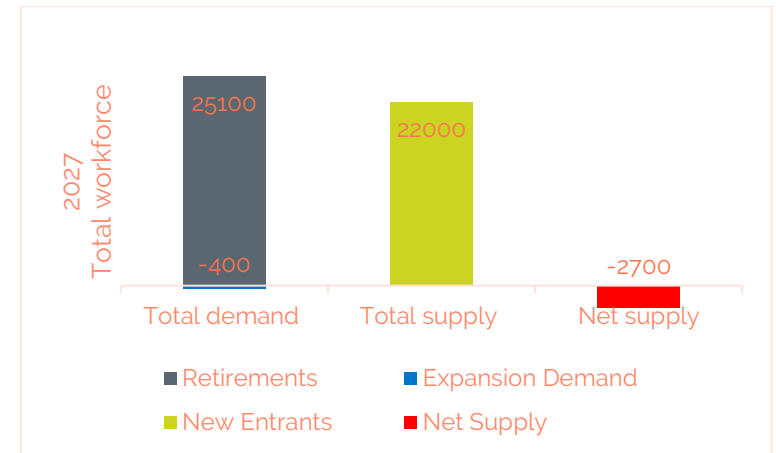


Figure A: Six-year workforce outlook

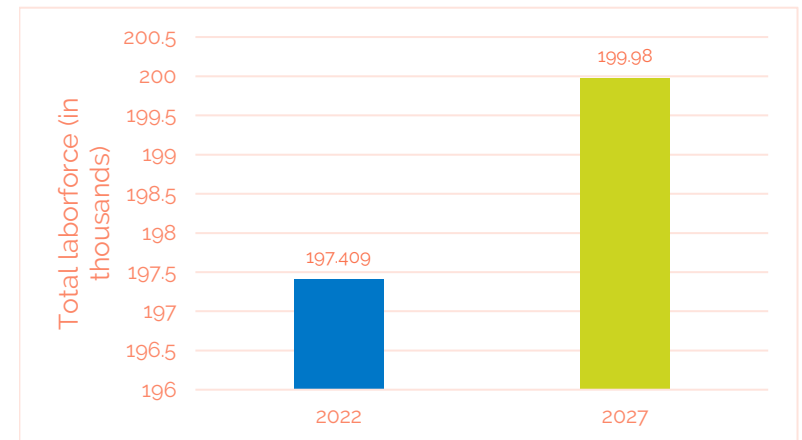


Figure B: Change in construction labour force

# Training Landscape

## Oversight

Industry Training Authority (ITA) is responsible for overseeing trades training requirements in BC, although recently, a new Crown agency - SkilledTradesBC – has been announced to replace the former organization.

Some of the notable training organizations and institutes include:

- BCIT
- Selkirk College
- Camosun College

## Examples of training initiatives and learning resources

- *BCIT Essentials of Net-Zero and Passive House Construction Micro-credential* – provides applied understanding of the unique requirements of Net-Zero and Passive House design and construction.
- *BCIT Supervising Net-Zero and Passive House Construction Micro-credential* – focuses on skills, knowledge, and tools unique to supervising construction on Net-Zero, Net-Zero-Ready, or Passive House construction projects.
- *BCIT Sustainable Energy Management Advanced Certificate* – this certification aims to support employment opportunities in the emerging field of sustainable energy management, with focus on the energy demands of commercial, institutional, industrial and community facilities
- *Building Code for Residential Builders* – builds competencies in how to read, interpret and use the B.C. Building Code (2018).
- *Solar Photovoltaic (PV) Course* – CSA and the National Electrical Trade Council (NETCO) have partnered to develop a third-party, independent personnel certification program for Construction Electricians installing photovoltaic (PV) equipment
- *EGBC Introduction to Deep Retrofits of Existing Buildings Through Case Studies* – video resource from Engineers and Geoscientists BC

# Territories

## Summary of Trades Workforce Supply

The construction workforce in the territories is supplemented by the workers of bordering provinces. Thus, labour force trends in those provinces have major impacts on the construction labour market in the Yukon, Northwest Territories, and Nunavut. The territories in general faces recruiting challenges for skilled trades and occupations, which got accentuated by the COVID 19 pandemic and the impending wave of retirement across all the provinces.

Figure A below shows the labour outlook for relevant construction trades and occupations over 2022-2027:

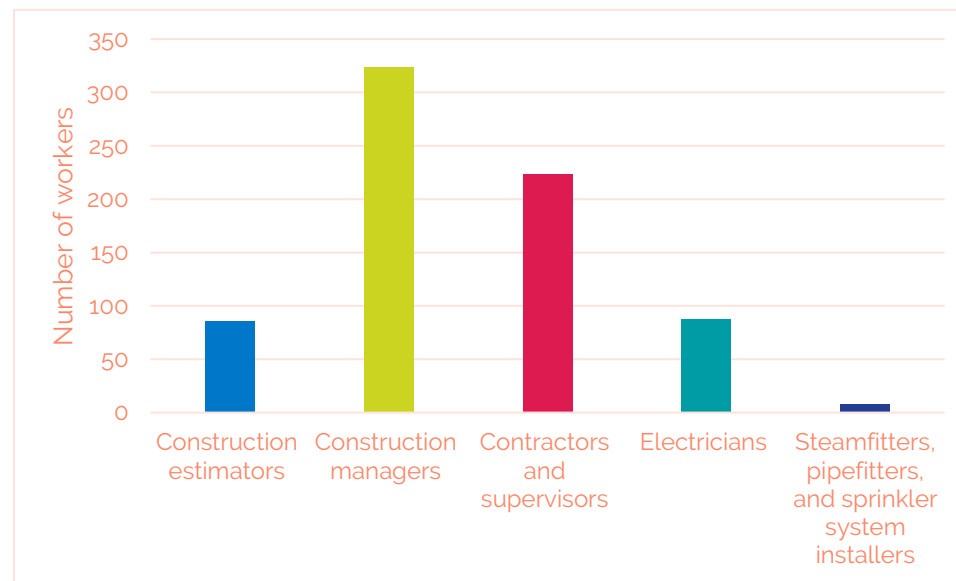


Figure A Construction trades demand by territory, 2022-2027

# Training Landscape

## Oversight

- The Department of Education, Culture and Employment (ECE), through the Labour Development and Standards division, administers and oversees the trades training in the Northwest Territories. ECE helps to plan, maintain, and execute approved trade and occupational training programmes that help to create a competent northern workforce.
- Additionally, there are five Trades Advisory Committees for the carpentry, plumbing, electrical, heavy equipment technician, and housing maintenance trades.

## Examples of training initiatives and learning resources

- *Building Forever: Women's Pre-Trades Program*: Six women from the Northwest Territories will be funded to pursue a career in a skilled trade through this initiative. Partnership between the Government of the Northwest Territories, Gahcho Kué Mine (De Beers Group and Mountain Province Diamonds Inc.) and the Native Women's Association of the Northwest Territories.
- *Aurora College Apprenticeship Programs – Carpenter, Electrician (Construction), Heavy Equipment Technician, Housing Maintainer, Plumber/Gasfitter, Oil Heat Systems Technician*: Aurora College offers in-school apprenticeship trades training for six of the Northwest Territories' designated trades.
- *Retrofit Guide for Yukon*- A reference guide for homeowners and builders to achieve higher energy efficiency and cost savings. It is intended covers several possible retrofit programs for typical single-family homes in Whitehorse, YT. Energy Efficient Housing

## Appendix III – Occupation Profiles

1. Electricians
2. Contractors and Supervisors
3. Architects
4. Engineers
5. Construction Estimators
6. Mechanical Systems Trades
7. Residential and Commercial Installers
8. Carpenters
9. Facility Operation and Maintenance Managers

### Market Rankings

1	<b>Excess supply</b>	Workers meeting employer qualifications in local markets exceed the demand at the current offered rate of compensation and other current working conditions.
2	<b>Potential surplus</b>	Workers meeting employer qualifications could potentially exceed the demand at the current offered rate of compensation and other working conditions.
3	<b>Balanced conditions</b>	The availability of workers meeting employer qualifications is in line with anticipated completions of projects.
4	<b>Potential shortage</b>	Workers meeting employer qualifications are generally not available in local markets to meet any increase in demand.
5	<b>Excess demand</b>	Needed workers meeting employer qualifications are not available in local markets to meet current demand so that projects or production may be delayed or deferred
	<b>No data</b>	

*Please Note: Learning resource examples featured in the profiles are based on a scan of materials online and meant to provide a sample of the range of learning resources available across Canada*



# ELECTRICIANS

NOC 7241 – Electricians (except industrial and power systems)

Electricians lay out, assemble, install, test, troubleshoot and repair wiring and electrical components, lighting, and controls in retrofit projects. They play an important part in installation of solar renewable energy systems and electrification of plumbing systems. Electricians are also involved in digitization and automation of building systems.

*Typical education background:*

Electricians require an apprenticeship training.



## Relevant retrofit measures



Electrical



Envelope



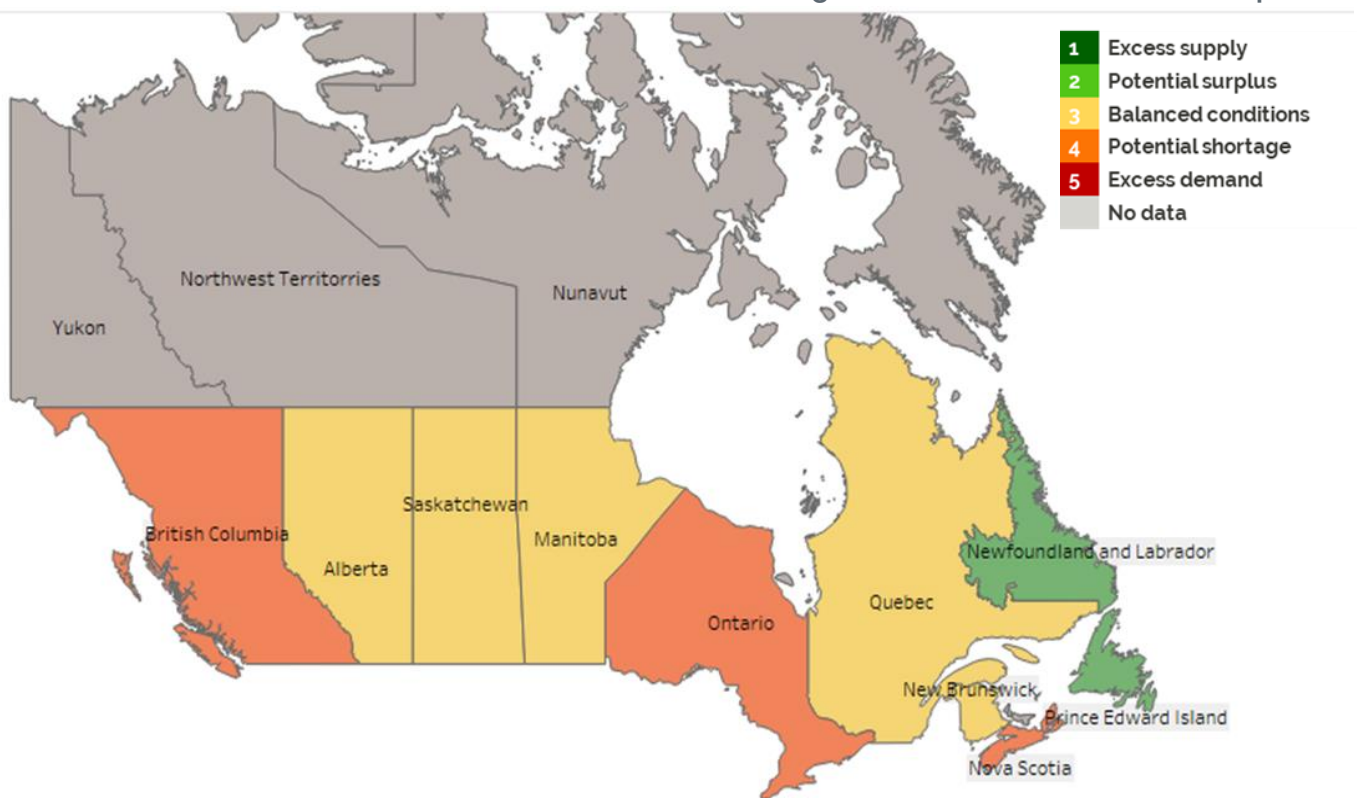
Mechanical



Renewables

## National Labour Market Outlook 2022-2025

BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations



## Key Competencies for Green Retrofits

- Installation and maintenance of **energy efficient** (e.g., LED lighting products) and **adaptive lighting systems** (e.g. occupancy sensor controls, daylight harvesting)
- Capabilities in **digitization, automation and plug load** including Building Automation System (BAS), EV charger installation.
- **Electrification of plumbing systems**, including electric water heating, heat pumps, small-scale combined heat, and power (CHP) systems
- Installation and maintenance of **photovoltaic systems, and energy storage**
- Knowledge on **low carbon building materials and embodied carbon**
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as energy efficiency
- **Soft skills** such as communication, problem solving, project coordination

<b>Responsible Organizations</b>	<p>Regulatory authorities for electricians exist in the 13 provinces and territories. Unions and professional associations that support training for electricians include the following:</p> <ul style="list-style-type: none"> <li>• <b>Canadian Electrical Contractors Association</b> is a federation of provincial and territorial electrical contractor groups that represent electrical contractors at the national level.</li> <li>• <b>The International Brotherhood of Electrical Workers</b> is a nation-wide union representing electrical workers across various sectors. It has chapters in major cities across Canada.</li> <li>• <b>NETCO</b>, an alliance of the Canadian Electrical Contractors Association and the International Brotherhood of Electrical Workers in Canada, is the authoritative, pan-Canadian voice of electrical contractors and IBEW local unions representing apprentices and journeypersons in every province and territory</li> </ul>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Electricians face an aging workforce and a smaller cohort of new workers.</li> <li>• Skills in digitization and automation are critical as more buildings use controls to optimize comfort and building performance.</li> <li>• Lack of awareness and implementation of building-as-a-systems principles and approaches.</li> <li>• Foundational training programs for installers do not include the sustainability skills required for green retrofits. These skills include technical skills, soft skills, and systems thinking.</li> <li>• Increased electrification of HVAC systems requires multidisciplinary skills in electrical and mechanical systems.</li> <li>• Curriculum for post-secondary institutes and apprenticeship programs can be enhanced to adapt to the new technologies and products pertaining to net-zero buildings.</li> <li>• Competition from new residential, commercial, and institutional building projects as well as work in the utility and power sector, within the construction sector may limit the number of workers available for retrofit projects.</li> </ul>
<b>Additional notes</b>	<ul style="list-style-type: none"> <li>• It is a compulsory trade in most provinces, meaning to work as an electrician, an individual must hold a Certificate of Qualification; non-compulsory in Yukon and Nunavut. Trade certification requirements for the trades differs by province; following is a list of provinces where trade certification is compulsory for electricians: <ul style="list-style-type: none"> <li>○ Construction Electrician: NL, NS, PE, NB, QC, ON, MB, SK, AB</li> <li>○ Electrician (Domestic and Rural): ON</li> <li>○ Residential Electrician: NL</li> </ul> </li> </ul>

- |  |   |
|--|---|
|  | <ul style="list-style-type: none"><li>○ Electric Motor System Technician, Electrician (Signal Maintenance) and Winder Electrician: no province requires trade certification</li></ul> |
|--|---|

### Examples of Learning Resources

- [Humber College](#): Electrician Pre-Apprenticeship Program
- [International Brotherhood of Electrical Workers \(IBEW\)](#) : Electrical apprenticeship
- [IBEW Local 353](#): Electrical Vehicle Infrastructure Training Program (EVITP)
- [Centre for Continuing Education and Professional Studies](#): Solar PV: Installation for Electricians
- [National Electrical Trade Council \(NETCO\)](#): Annual Educational Education Conference

# CONTRACTORS AND SUPERVISORS

NOC 7204 Contractors and supervisors, carpentry trades,  
NOC 7205 Contractors and supervisors, other construction trades, installers, repairers and servicers,  
NOC 7301 Contractors and supervisors, mechanic trades

Contractors and supervisors oversee and co-ordinate the activities of various tradespersons, installers, repairers, and servicers. They supervise the implementation of building design and lead the procurement of materials, equipment, and services.

Typical education background:

Contractors and supervisors require certification and job experience in the trade that they supervise. Certification can involve post-secondary diploma and/or apprenticeship training. Most contractors or supervisors have a trades background and following on-site trade experience, they can move to a supervisory role



## Relevant retrofit measures



Electrical



Envelope



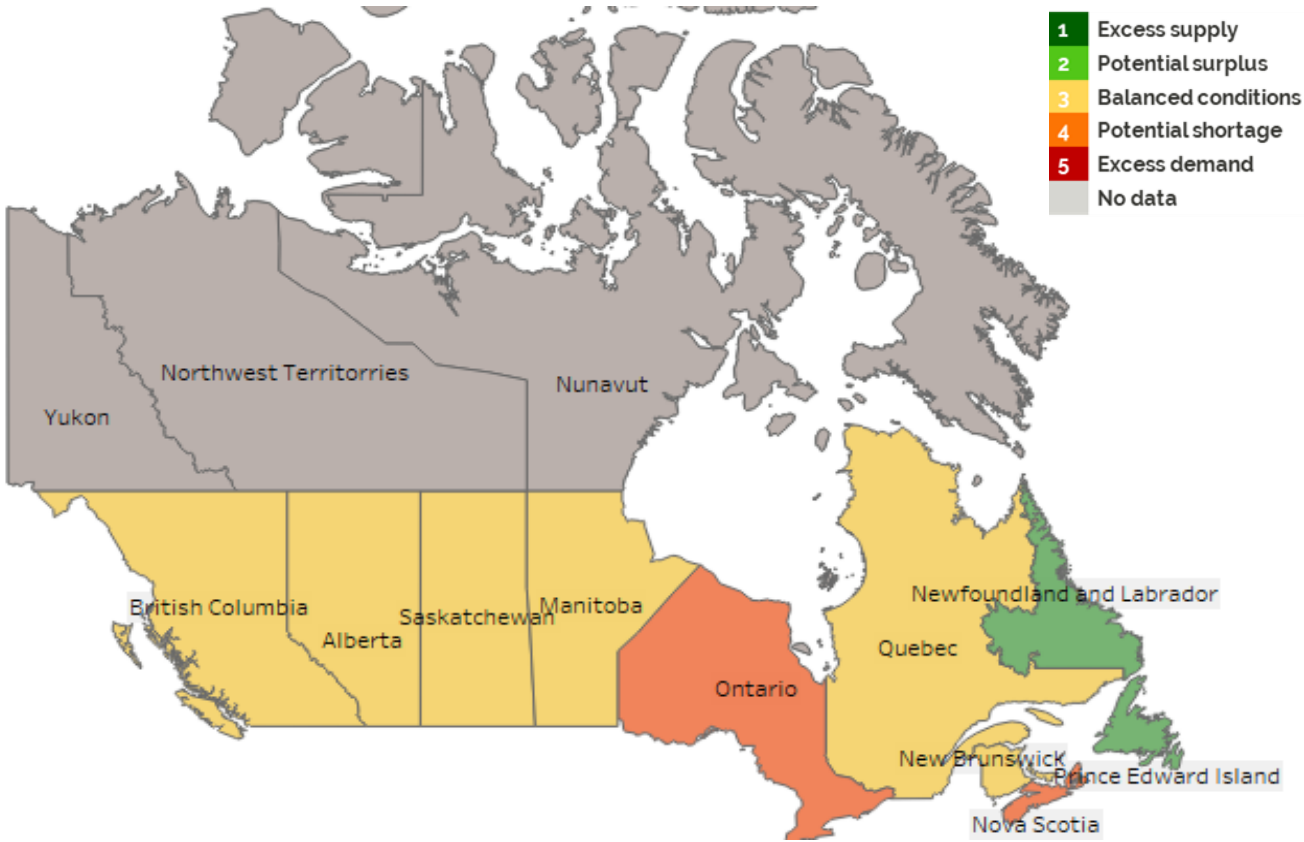
Mechanical



Renewables

## National Labour Market Outlook 2022-2025

### BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations



### Key Competencies for Green Retrofits

- **Expanded knowledge of supply chains** for energy efficient and low carbon equipment, materials, and technology
- **Interdisciplinary skills** in mechanical, electrical, and plumbing systems, as well as digital technology
- **Assessment of existing building**, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- **Understanding the amount of building preparation required**, for demolition, services disconnect and materials remediation.
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency, indoor environmental quality
- **Low carbon materials**, embodied carbon in construction and performing Life Cycle Assessment (LCA)
- **Adaptive and resilient building strategies**
- **Soft skills** such as communication, negotiation, problem solving, project coordination

<b>Responsible Organizations</b>	The <b>Canadian Construction Association (CCA)</b> is the national association representing contractors (general, trade, civil), manufacturers, service providers, and suppliers in Canada. There are multiple associations at the provincial level to which membership is voluntary.
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Contractors and supervisors face labour shortages due to an aging workforce, as there is a wave of impending retirements in the next decade.</li> <li>• There is a shortage of people with the skills and experience to fill the middle management roles.</li> <li>• Contractors and supervisors require knowledge and experience in different technical areas including mechanical and electrical areas. Current training approaches can be enhanced to meet the growing demand for multi-disciplinary skills in the green building space.</li> <li>• Due to the key role of contractors and supervisors in a project, it is difficult for employers to have these key roles take time off for training purposes while projects are happening.</li> <li>• Contractors and supervisors require a broad range of soft skills to communicate across the project team and facilitate the integrated design required for retrofitting. The current scope of training is not sufficient to adequately develop these skills.</li> </ul>

### Examples of Learning Resources

- **Merit College of Construction:** Supervisor Training Program (STP)
- **Construction Association of Nova Scotia:** Leadership Excellence For Managers & Supervisors Full Program
- **Ottawa Construction Association:** Construction Supervisor Training (CST) Program
- **The BCIT Zero Energy/Emissions Buildings Learning Centre (ZEBLC):** Supervising Net-Zero and Passive House Construction micro credential
- **CCA:** Construction 101 and beyond program
- **BuildForce Canada:** Construction Management - multiple courses
- **Building to Electrification (B2E) Coalition:** Case studies and other resources



# ARCHITECTS

NOC 2151 - Architects,

NOC 2251 - Architectural technologists and technicians

Architects conceptualize, plan, and develop designs for the construction and renovation of commercial, institutional, and residential buildings. Architectural technicians provide technical support during a project. In retrofitting projects, this group serves as the primary design lead.

*Typical education background:*

Architects require a Master of Architecture degree through one of 12 university schools of architecture in Canada.

Technologists and technicians may have a combination of a certificate, diploma or degree and professional experience.



## Relevant retrofit measures



Electrical



Envelope



Mechanical



Renewables

## National Labour Market Outlook 2019-2028

### Canadian Occupational Projection System (COPS) Future Labour Market Condition

Design and consulting occupations	Future Labour Market Condition
Architects	Balance
Technical occupations in architecture, drafting, surveying, geomatics	Balance

## Key Competencies for Green Retrofits

- **Assessment of existing building**, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- **Integrated design skills**, such as integrating legacy systems with high-performance systems installation including mechanical and passive systems; integrating on-site renewable energy
- **Digital capture skills** including laser scanning (LIDAR) and photogrammetry and computer-aided design (CAD) skills
- **Understanding the amount of building preparation required**, for demolition, services disconnect and materials remediation.
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency, indoor environmental quality
- **Low carbon materials**, embodied carbon in construction and performing Life Cycle Assessment (LCA)
- **Adaptive and resilient building strategies**
- **Soft skills** such as communication, negotiation, problem solving, project coordination

### Responsible Organizations

Regulatory authority is held by eleven provincial and territorial associations under the **Regulatory Organizations of Architecture in Canada (ROAC)**.

Program accreditation is through the **Canadian Architectural Certification Board (CACB)**.

**The Royal Architectural Institute of Canada (RAIC)** is a national industry association with chapters in BC, AB, and NS.

<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Shortage of qualified professionals in some regions / outside of large urban areas.</li> <li>• Limited case studies and best practice examples reduce architects' ability to enhance their skills, as these tend to be the preferred mode of learning for architects to achieve ambitious energy and environmental performance standards.</li> <li>• Demand for zero carbon, energy efficiency and climate resiliency courses are limited as such courses are voluntary and are not directly tied to their professional skills or accreditation. These topics are taken less as competency and more like an industry-wide issue.</li> <li>• Cultural shift among architectural professions is required for an integrated and cross-disciplinary approach to building design, which has been difficult to achieve.</li> </ul>
<b>Additional Notes</b>	<p>Specific retrofit-related skill gaps include the following areas:</p> <ul style="list-style-type: none"> <li>• existing building assessments</li> <li>• design integration across mechanical and passive systems</li> <li>• onsite renewable energy integration</li> <li>• legacy system integration to new system</li> </ul>

### Examples of Learning Resources

- [Dalhousie University](#): Bachelor of Environmental Design Studies (BEDS)
- [Algonquin Centre for Construction Excellence](#): Green Architecture Ontario College Graduate Certificate program
- Canada Green Building Council (CaGBC) [courses and workshops](#); Core Concepts of Zero Carbon Building Education Bundle
- [Centre for Continuing Education and Professional Studies](#): Introduction to High Performance Homes
- [BC Hydro](#): Building envelope thermal bridging (BETB) guide
- [Okanagan College](#): Sustainable Building Technology Diploma

# ENGINEERS

NOC 2132 Mechanical engineers, technologists, and technicians,  
NOC 2133 Electrical and electronics engineers, technologists, and technicians

Mechanical engineers design and develop systems for heating, ventilation, air conditioning, and plumbing design. They are also involved in design of solar thermal applications. Electrical engineers are involved in electrification of heating, electricity servicing, lighting and controls, renewables, and storage.

*Typical education background:*

- Mechanical engineers require a Bachelor of Mechanical engineering from any of the 39 accredited post-secondary institutions in Canada.
- Electrical engineers require a Bachelor of Electrical engineering from any of the 37 accredited post-secondary institutions in Canada.
- Technologists and technicians may have a combination of a certificate, diploma or degree and professional experience.



## Relevant retrofit measures

### Electrical engineers



Electrical



Envelope



Mechanical



Renewables

### Mechanical engineers



Electrical



Renewables



Mechanical

## National Labour Market Outlook 2022-2028

### Canadian Occupational Projection System (COPS) Future Labour Market Condition

Design and consulting occupations	Future Labour Market Condition
Mechanical engineers	Shortage
Mechanical engineering technologists and technician	Shortage
Electrical and electronics engineers	Balance
Electrical and electronics engineering technologists and technician	Balance

## Key Competencies for Green Retrofits

- **Assessment of existing building**, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- **Integrated design skills**, such as integrating legacy systems with high-performance systems installation including mechanical and passive systems; integrating on-site renewable energy
- **Understanding the amount of building preparation required**, for demolition, services disconnect and materials remediation.
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency, indoor environmental quality
- **Low carbon materials**, embodied carbon in construction and performing Life Cycle Assessment (LCA)
- **Adaptive and resilient building strategies**
- **Soft skills** such as communication, negotiation, problem solving, project coordination



<b>Responsible Organizations</b>	<p><b>Engineers Canada</b> works on behalf of the provincial and territorial associations that oversee engineering practice and provide licenses to engineers.</p> <p><b>Institute of Electrical and Electronics Engineers (IEEE), Canada</b> is the constituent society of the Engineering Institute of Canada (EIC) for the technical fields of electrical, electronics, and computer engineering.</p> <p><b>The American Society of Heating, Refrigerating and Air-Conditioning Engineers</b> is a global professional association that seeks to advance practices in heating, ventilation, air conditioning and refrigeration systems design and construction. It has several chapters across major cities, and regions in Canada.</p> <p><b>Canadian Society for Mechanical Engineering:</b> established in 1970 with the goal of creating a single organization for Canadian mechanical engineers.</p>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Cultural shift among engineering professions is required for an integrated and cross-disciplinary approach to building design, which has been difficult to achieve.</li> <li>• Ageing workforce with almost 50% of the total workers retiring by next decade.</li> </ul>
<b>Additional Notes</b>	<p>Specific retrofit related skill gaps include the following areas:</p> <ul style="list-style-type: none"> <li>• existing building assessments,</li> <li>• design integration across mechanical and passive systems,</li> <li>• onsite renewable energy integration</li> <li>• legacy system integration to new systems</li> </ul>

### Examples of Learning Resources

- **Concordia University:** Master of Engineering in Environmental Engineering
- **Educational Program Innovations Center:** Environmental Engineering Training Courses
- **Centre for Continuing Education and Professional Studies:** Sustainable Building Fundamentals
- **Centre for Continuing Education and Professional Studies:** Net Zero and Zero Carbon Fundamentals
- **ZEBx:** Case studies and other resources
- **BC Housing:** Sustainability, Residential Design & Construction Guides
- **Sustainable Buildings Canada:** Green Buildings and retrofits guides

# CONSTRUCTION ESTIMATORS

NOC.2234 Construction estimators

Construction estimators analyze costs of and prepare estimates on construction projects. They also order materials and equipment required for the projects.

Typical education background:

Construction estimators usually need a combination of related education and experience. This often includes a post-secondary diploma in civil or construction technology or management. Other career pathways include several years of experience as a qualified tradesperson in a construction trade such as electrical or carpentry.



### Relevant retrofit measures

 Electrical

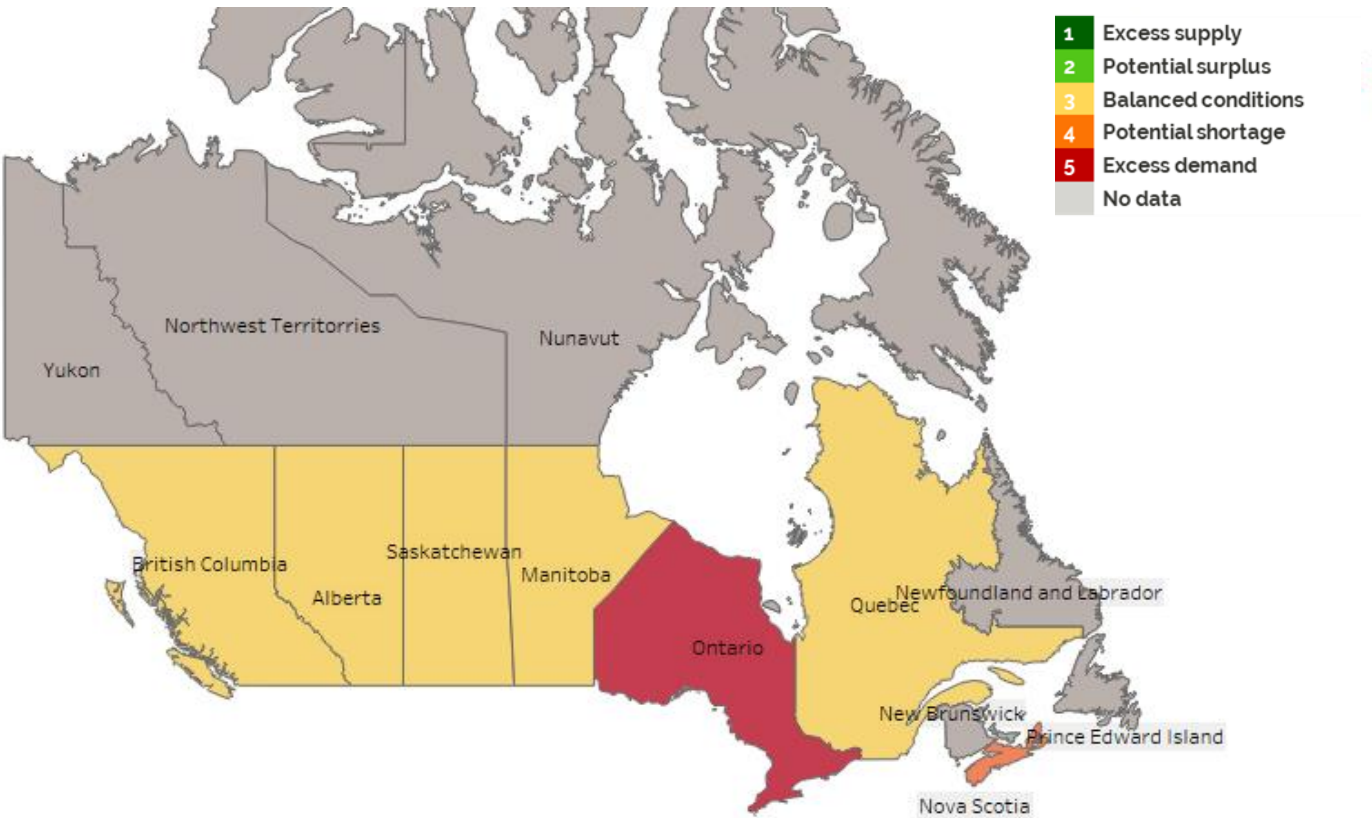
 Envelope

 Mechanical

 Renewables

## National Labour Market Outlook 2022-2025

### BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations



### Key Competencies for Green Retrofits

- **Assessment of existing building**, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- **Understanding the amount of building preparation required**, for demolition, services disconnect and materials remediation.
- **Business acumen, including** business case for optimizing cost and performance.
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency, indoor environmental quality
- **Knowledge on high performance and low carbon equipment, and materials.**
- **Performing life-cycle assessment (LCA) and calculating embodied carbon**
- **Adaptive and resilient building strategies**
- **Soft skills** such as communication, negotiation, problem solving, project coordination

<b>Responsible Organizations</b>	<p>Construction estimators are not regulated in Canada, but the <b>Canadian Institute of Quantity Surveyors (CIQS)</b> offers voluntary certification to use one of the following designations:</p> <ul style="list-style-type: none"> <li>• Professional Quantity Surveyor (PQS).</li> <li>• Construction Estimator Certified (CEC).</li> </ul> <p>There are several professional associations that support the training and development of these professionals:</p> <ul style="list-style-type: none"> <li>• <b>Canadian Home Builders' Association</b> is a federal not-for-profit organization, that works at national, provincial, and local level. Each level of the Association works with the government at their level.</li> <li>• <b>Royal Institution of Chartered Surveyors</b> advocate for and enforce the highest professional standards in land development, real estate, construction, and infrastructure management.</li> </ul>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Current training programs do not equip the professionals with the specific skills necessary for green retrofits.</li> <li>• Cost consultants often don't have the training to develop the awareness on systemic impacts of green retrofits, and associated cost savings. Thus, there may be variations in price premiums and cost advice.</li> <li>• Lack of regulation and requirements for training or certification for construction estimators, means that training and upskilling is largely voluntary.</li> </ul>

### Examples of Learning Resources

- **Fleming College**: Construction Estimator (Online)
- **BCIT**: Construction Estimating - School of Construction and the Environment
- **George Brown**: Construction Estimating Program (Distance Learning)
- **Build Force Canada - Canadian Construction Association (CCA)**: Introduction to Construction Estimating
- **Canadian Institute for Quantity Surveyors**: Construction Estimator Certified (CEC) designation

# MECHANICAL SYSTEMS TRADES

NOC 7251 – Plumbers

NOC 7252 – Steamfitters and pipefitters

NOC 7253 – Gasfitters

NOC 7313 – Refrigeration and air conditioning mechanics

This cluster of occupations is involved in the mechanical systems measures of a retrofit project. Plumbers install and maintain systems for hot water distribution for heating and potable water. Steamfitters and pipefitters lay out and repair piping systems for heating and hot water distribution. Gasfitters are responsible for installation and repair of gas lines and equipment. Refrigeration and air conditioning mechanics are involved in the installation and maintenance of air conditioning, heat pump and variable refrigerant flow (VRF) systems.

*Typical education background:*

Mechanical systems trades may require a combination of diploma, certificate and/or apprenticeship training (depending on whether it is compulsory trade or not at a province)



## Relevant retrofit measures



Mechanical

Plumbers; Steamfitters and gasfitters; Refrigeration and air conditioning mechanics



Envelope

Plumbers



Renewables

Refrigeration and air conditioning mechanics

## National Labour Market Outlook 2022-2025

### BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations

	Province									
	Alberta	British Columbia	Manitoba	New Brunswick	Newfoundland and Labrador	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan
1 Excess supply										
2 Potential surplus										
3 Balanced conditions										
4 Potential shortage										
5 Excess demand										
No data										
Gasfitters	3.0	4.0					3.8			
Plumbers	3.0	3.5	3.0	2.8	2.5	4.0	3.8		3.0	3.3
Refrigeration and air conditioning mechanics	3.3	3.5	2.8	2.5	2.8	4.0	4.0		3.0	3.5
Steamfitters, pipefitters, and sprinkler system installers	3.5	3.8	3.0	2.8	2.3	3.5	3.0		3.0	3.0

## Key Competencies for Green Retrofits

- Knowledge on **high performance mechanical systems**, including efficient heating, cooling, ventilation and domestic hot water technologies, equipment, and associated distribution solutions
- Knowledge on **heat recovery systems** including heat recovery ventilators, heat scavengers and wastewater heat extractors
- Knowledge of **renewable solutions** such as solar hot water heating and photovoltaic systems
- Understanding of **air flow in mechanical and ventilation systems**.
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency, indoor environmental quality
- **Soft skills** such as communication, negotiation, problem solving, project coordination

<b>Responsible Organizations</b>	<p><b>The Heating, Refrigeration, and Air Conditioning Institute</b> of Canada is a non-profit national trade association that represents over 1,150 heating, ventilation, air conditioning, and refrigeration (HVACR) enterprises across Canada.</p> <p><b>Canadian Institute of Plumbing and Heating</b> assists its members in achieving success through advocacy, industry &amp; social networking, serving member interests and national &amp; regional support.</p> <p><b>Mechanical Contractors Association of Canada</b> is a national, non-profit business association of dedicated professionals working together for the promotion, improvement, and advancement of the mechanical contracting industry.</p>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Mechanical systems trades face labour shortages due to an aging workforce, as there is a wave of impending retirement by the end of the decade.</li> <li>• Current training programs can be expanded to equip the workforce with the specific skills necessary for green retrofits.</li> <li>• There is a gap in "building as a system" and "integrated energy design training" in manufacturers training programs, as these have a narrow focus on the equipment/upgrade.</li> <li>• Similar obstacles are found in mentor and apprenticeship-based trainings, which is a common model of training for HVAC trades. Additionally, envelope best practices and carbon training are limited for HVAC trades.</li> <li>• Lack of requirements or incentives for continuous learning which means training and upskilling is largely voluntary and can be a hurdle for mid-career professionals.</li> <li>• Cross-training tradespeople through other sector training presents an opportunity to overcome the lack of shared terminology and experience.</li> </ul>
<b>Additional Notes</b>	<ul style="list-style-type: none"> <li>• Barriers to retrofit specific training can be solved through curated and integrated training from other sectors, that is tailored to the experiences and need of this trade group.</li> <li>• Cost of available training is not a barrier for the trades, as these training are usually free or paid by product manufacturers. Product manufacturers often works with union training centers to develop training programs for new materials and techniques</li> <li>• Trade certification requirements for the trades differs by province; following is a list of provinces where trade certification is compulsory for each of the profession categories: <ul style="list-style-type: none"> <li>○ Plumbers: NS, PEI, NB, QC, ON, SK, AB</li> <li>○ Steamfitter-pipefitter: NS, PEI, NB, QC, ON, MB, AB</li> <li>○ Gas fitter: QC, AB,</li> <li>○ Refrigeration and air conditioning mechanics: NS, NB, QC, ON, MB, SK, AB</li> <li>○ Refrigeration and Air-Conditioning Mechanic (Residential): ON, MB</li> </ul> </li> </ul>

### Examples of Learning Resources

- **Algonquin Centre for Construction Excellence:** Heating, Refrigeration and Air Conditioning Technician Ontario College Diploma program
- **Saskatchewan Polytechnic:** Canada Ozone Protection
- **Centre for Continuing Education and Professional Studies:** Introduction to Smart Home Technologies
- **Centre for Continuing Education and Professional Studies:** Sustainable Materials and Methods



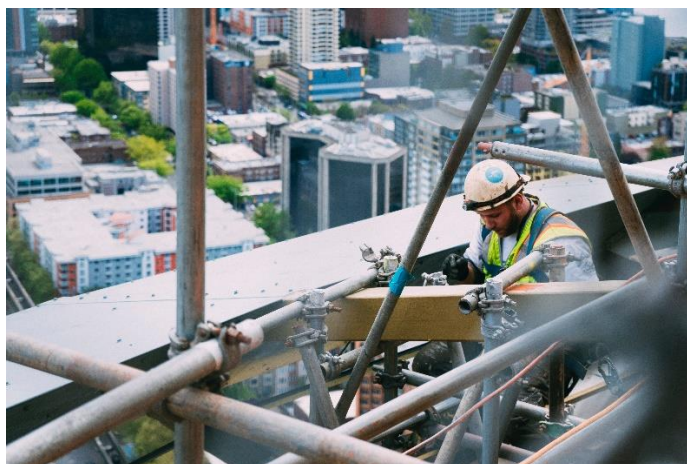
# INSTALLERS

7441 Residential and commercial installers and servicers

Residential and commercial installers install and service a wide variety of interior and exterior prefabricated products such as windows, doors, electrical appliances, and water heaters at residential and commercial properties. They are involved in the installation of solar renewable systems such as solar PV, battery storage and solar thermal systems

*Typical education background:*

Installers require secondary school education, as well as on-job-training in installation, repair and servicing.



## Relevant retrofit measures



Electrical



Envelope



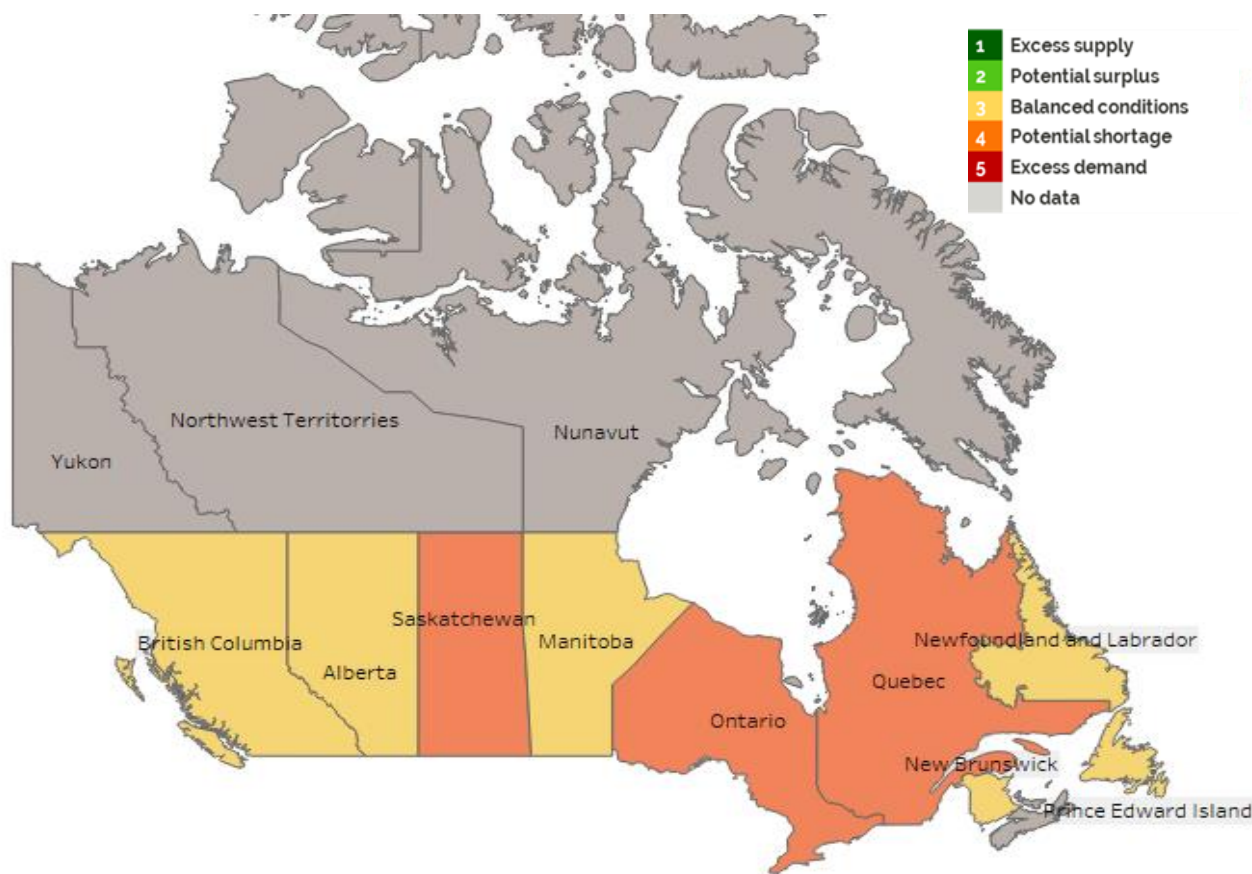
Mechanical



Renewables

## National Labour Market Outlook 2022-2025

BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations



### Key Competencies for Green Retrofits

- **Knowledge in digitization, and automation** including Building Automation System (BAS).
- **Installation and maintenance of photovoltaic systems**
- Knowledge on **low carbon building materials and embodied carbon**
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as water efficiency, energy efficiency
- **Soft skills** such as communication, problem solving, negotiation, project coordination

<b>Responsible Organizations</b>	<p>Professional associations that support training for the trades include the following:</p> <p><b>Canadian Home Builders' Association (CHBA)</b> represents the residential and commercial industry of Canada. Currently, its members belong to over 9,000 companies including home builders, renovators, land developers, trade contractors, product and material manufacturers, building product suppliers, lending institutions, insurance providers, and service professionals.</p> <p><b>Fenestration Canada</b> is a national organization that represents and promotes all areas of the window and door manufacturing sector, including developing and supporting high quality standards in the production, design, marketing, distribution, sales, and installation of all types of window and door products.</p> <p><b>Canadian Solar Industries Association (CanSIA)</b> is a national trade association representing the solar energy industry throughout Canada.</p>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• The lack of training and certification requirements and regulations related to installers can lead to variable quality of work and equipment performing below specifications.</li> <li>• There is limited knowledge and experience in digitization and automation among installers. These trades will need further upskilling for repairing and programming building controls that are linked to achieving optimal comfort and building performance.</li> <li>• Foundational training programs for installers do not include the sustainability skills required for green retrofits. These skills include technical skills, soft skills and systems thinking.</li> <li>• Cost of living in the large urban centers is a key barrier for installers to partake in more retrofit projects, as these activities tend to be concentrated in urban areas.</li> <li>• Lack of awareness and implementation of building-as-a-systems principles and approaches.</li> <li>• Lack of mentorship and on-site training on green retrofit practices.</li> <li>• It could be difficult to track the on-site ad-hoc training which tends to be common for installers.</li> </ul>

### Examples of Learning Resources

- **Fenestration Canada:** The Fenestration Canada Installer Program
- **Canadian Solar Institute:** Comprehensive training for Solar PV Design and Installation
- **NSCC:** Solar Photovoltaic (PV) Panel Installation Training

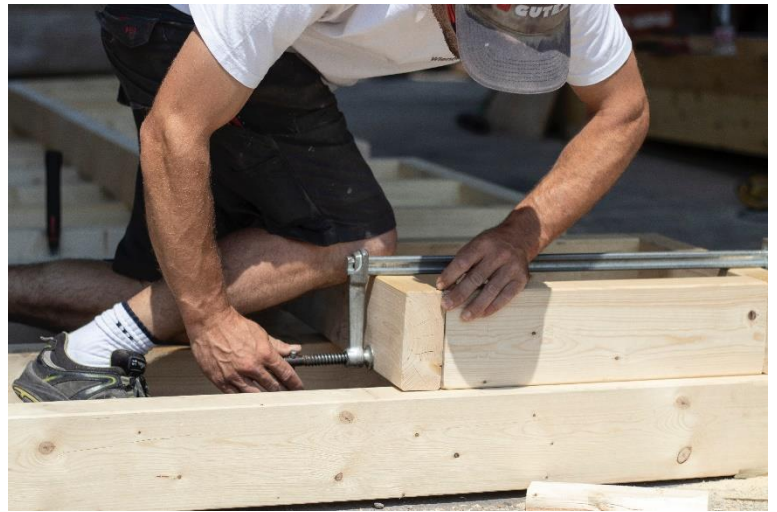
# CARPENTERS

7271 - Carpenters

Carpenters maintain and repair structures and components of structures made of wood, wood substitutes, lightweight steel, and other materials. They play a significant role in constructing an airtight building envelope.

*Typical education background:*

Carpenters may require a combination of diploma, certificate and/or apprenticeship training. Carpentry is a non-compulsory trade in many provinces



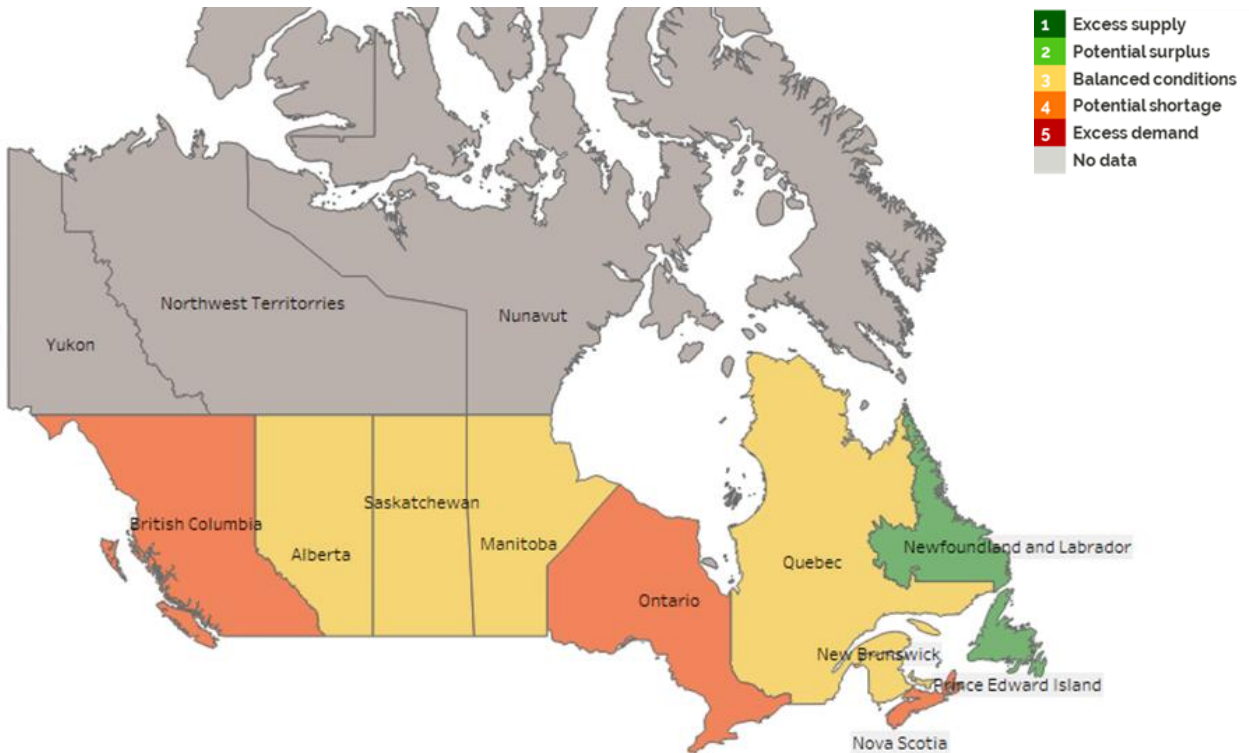
Relevant retrofit measures



Envelope

## National Labour Market Outlook 2022-2025

BuildForce Canada Canada Non-Residential Market Ranking of Construction Trades and Occupations





## Key Competencies for Green Retrofits

- Knowledge on **Passive House airtightness levels** and **air/vapor barrier systems**
- Understanding of **building envelope** and **thermal bridges**
- Knowledge on **low carbon building materials and embodied carbon**
- **Building science fundamentals** (Building-as-a-system)
- **Green building construction strategies** such as energy efficiency, indoor environmental quality
- **Soft skills** such as communication, problem solving, project coordination

<b>Responsible Organizations</b>	<p>Professional associations and unions that support training and development of carpenters include:</p> <p>With approximately 500,000 members, the <b>United Brotherhood of Carpenters</b> (UBC) is one of the largest building trades unions in North America.</p> <p><b>Canadian Home Builders' Association</b> (CHBA) represents the residential and commercial industry of Canada. Currently, its members belong to over 9,000 companies including home builders, renovators, land developers, trade contractors, product and material manufacturers, building product suppliers, lending institutions, insurance providers, and service professionals.</p> <p><b>College of Carpenters and Allied Trades</b> (CCAT) is a union-employer construction skills school that was founded to fulfill the recruiting and educational requirements of Carpenters Local 27 members and their employers. CCAT is a designated apprenticeship training agent and offers numerous up-grade training programs.</p>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Carpenters face an aging workforce combined with talent attraction and retention challenges.</li> <li>• Competition from new residential, commercial, and institutional building construction projects, as well as heavy industrial sectors may limit the number of workers available for retrofit projects.</li> <li>• Lack of awareness and implementation of building-as-a-systems principles and approaches.</li> <li>• Lack of mentorship and on-site training on green retrofit practices.</li> <li>• <b>It could be difficult to track the on-site ad-hoc training on envelope – this method tends to be a widely practiced method to teach the details of assembling envelopes.</b></li> </ul>
<b>Additional Notes</b>	<ul style="list-style-type: none"> <li>• Trade certification for carpenters is compulsory in QC</li> </ul>

## Examples of Learning Resources

- **Holland College** : Heritage Retrofit Carpentry Program
- **College of Carpenters and Allied Trades**: General carpenter apprenticeship; Mass Timber Course
- **Academy Canada: Faculty of Construction, Trades and Mining**: Carpenter (Pre-Employment) Diploma program.

# PROPERTY MANAGERS

NOC 0714 Facility operation and maintenance managers

Property managers organize and evaluate the operations of commercial and institutional facilities. They manage retrofit projects from the client side, including making business case for retrofits, and coordinating with other occupations involved. They are key to ensuring energy efficiency and other sustainability considerations of building operations and maintenance.

*Typical education background:*

Property managers usually require post-secondary education related to property management, real estate management, accounting, or business administration.



## Relevant retrofit measures



Electrical



Envelope



Mechanical



Renewables

## National Labour Market Outlook 2019-2028

### Canadian Occupational Projection System (COPS) Future Labour Market Condition

Design and consulting occupations	Future Labour Market Condition
Facility operation and maintenance managers	Balance

## Key Competencies for Green Retrofits

- **Building science fundamentals** (Building-as-a-system)
- **Interdisciplinary skills**, across mechanical, operational, and technological disciplines.
- **Business acumen**, for contracting and making business case for retrofits
- **Assessment of existing building**, including understanding of existing systems; auditing current energy efficiency and embodied carbon; checking prefabrication suitability.
- **Understanding the amount of building preparation required**, for demolition, services disconnect and materials remediation.
- **Digital literacy**, required to operate automated systems.
- **Soft skills** such as people management, tenant engagement, negotiation, problem solving

### Responsible Organizations

Professional associations that are provide training and development to project managers include:

**Building Owners and Managers Association (BOMA)** represents the commercial real estate sector in Canada on issues of national importance, works to build a strong communications network among its local organizations, BOMA International, and other real estate groups, and promotes professionalism among its members via education programs and effective public relations.

	<p><b>Canadian Federation of Apartment Associations (CFAA)</b> represents the owners and managers of residential rental suits in Canada. CFAA advocates for the interests of the rental housing industry to the Federal Government of Canada.</p> <p><b>Institute of Housing Management (IHM)</b> is a leading provider of property management education in Canada.</p>
<b>Considerations on Workforce Capacity &amp; Skills</b>	<ul style="list-style-type: none"> <li>• Property managers need to involve at the design phase to support the operational sequences to ensure energy efficient processes – this will require a major cultural shift as building managers and designers work in silos.</li> <li>• Property managers lack the key engagement and negotiation skills to manage issues and concerns of tenants, that come with retrofit related disruptions</li> <li>• There is no occupational standards or integrated curriculum for property managers to build the preliminary skills for high performance buildings</li> <li>• Labour force shortage as the industry faces impending labour attrition from retirement, along with significant challenges to attract and retain skilled workers,</li> </ul>

### Examples of Learning Resources

- Institute of Housing Management college program: Conestoga College, George Brown College & Humber Institute of Technology & Advanced Learning; Property Management program
- BOMI: Property Administrator Certificate
- BOMI: Property Management Financial Proficiency Certificate
- Real Estate Institute of Canada (ON): MPSAXM - Management Plan Skills Assessment
- McGill School of Continuing Studies (QC): Professional Development Certificate in Residential and Condominium Property Management