

BC CONSTRUCTION CLEANTECH

Industry Whitepaper July 2021



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Advisory

 **VANCOUVER
ECONOMIC
COMMISSION**


**CONSTRUCTION
FOUNDATION OF BC**



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DISCLAIMER

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organisations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region.

This project was conducted under the mentorship of Scius Advisory staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of Scius Advisory or the University of British Columbia.

INTRODUCTION

Stringent zero-emission and net-zero building targets established by municipal and provincial governments are currently challenging BC's construction industry. Policies like the BC Energy Step Code and the Zero Emissions Building Plan are demanding high-performance, low-carbon building products and technologies for new construction. Additionally, further efforts are being made to retrofit existing buildings to meet the energy efficiency goals and climate change drivers. To satisfy the increased demand and develop local supply chain resilience, BC needs to strengthen its capacity to produce sustainable, green building products and technologies.

The purpose of this report is to define and map the BC-based low/no carbon clean/green-tech construction ecosystem to inform industry and stakeholders on the current state of BC's cleantech construction sector. Along with the inventory of companies attached, the report presents a preliminary overview of the active companies, and their revenue and employees.

APPROACH

The analysis in the report was carried out in four phases:

Phase 1: An initial definition of construction cleantech was established based on reviews of literature and market reports. In the process, evaluation criteria were developed to facilitate and guide the review process in Phase 2. An

existing inventory of companies provided by the Vancouver Economic Commission's Green Building Market Forecast 2019 served as a baseline for the development of the database and report.

Phase 2: The inventory of companies was updated based on the established definition and criteria. Additionally, key data such as company names, description, website, service sector, product, location, contact information were updated and collected. Each entry received various rounds of review and was given a rating to retain, review, or remove from the database.

Phase 3: A desktop research method was used to explore additional companies and technologies. This included reviewing existing contact networks, featured companies in market reports and local associations' member directories.

Phase 4: The analysis phase included an estimation of industry revenue and employment. Data was sourced from Zoominfo based on its positivity review among industry professionals and referrals by personal networks. Additionally, Zoominfo had consistent instances where the report included the most recent financial data of 2021 Q2. Secondary data was taken from Dun & Bradstreet where no information was available on Zoominfo.

DEFINITION

Cleantech refers to “technologies related to clean energy products, transmission, storage or use; water treatment and management; and/or efficiency in energy or resource management and use” (KPMG, 2019). Additionally, the term is also used interchangeably with “Greentech”. While construction cleantech falls under the general cleantech umbrella, it specifically focuses on products, materials, and technologies that help meet building-related climate policy goals. Particularly, it draws focus to companies and technologies that improve building operating performance and energy efficiency; reduce GHG emissions from operations and embodied carbon; rely on renewable energy sources; and most importantly, enable building electrification.

In the known tech ecosystem, construction cleantech shares the space with construction technologies or “contech” and timber technologies - “timber tech”. Contech comprises innovative technologies that improve the construction process, manufacturing and transportation. Timber tech – an emerging sub-sector in BC - refers to the industry involved with the supply, manufacture, transportation and use of mass timber and other prefabricated wood products and companies involved with industrialized and componentized construction systems.

This report solely focuses on the construction cleantech sector. However, a contech industry whitepaper dated July 2020 can be

found on the VEC website¹. A report on BC’s timber tech sector is expected to be released by the Provincial Government in late 2021.

EVALUATION CRITERIA

In addition to meeting the established construction cleantech definition, the companies selected for inclusion in this study also needed to be commercialized product manufacturers or technology developers with demonstrable intellectual property attached to their products or services. The report does not include design consultants, advisors, and product distributors. Lastly, the companies are required to have a significant presence in the BC market with at least 3 BC-based employees.

ECOSYSTEM

Although construction cleantech, contech, and timber tech are different in their function and definition, the three tech sectors all contribute to the project lifecycle in BC. In defining the construction cleantech ecosystem, the report identifies five industries within the cleantech sector, two industries overlapping cleantech and contech, and two industries within all three technology sectors (Figure 1). Fenestration; Energy System; Building Envelope; Lighting; Green Material; Networking, Monitoring and Control; Software; Modular and Prefabrication; and Deconstruction and Reclamation represent the primary contributors of the construction cleantech sector.

¹ <https://www.vancouvereconomic.com/research/the-contech-ecosystem-in-metro-vancouver/>

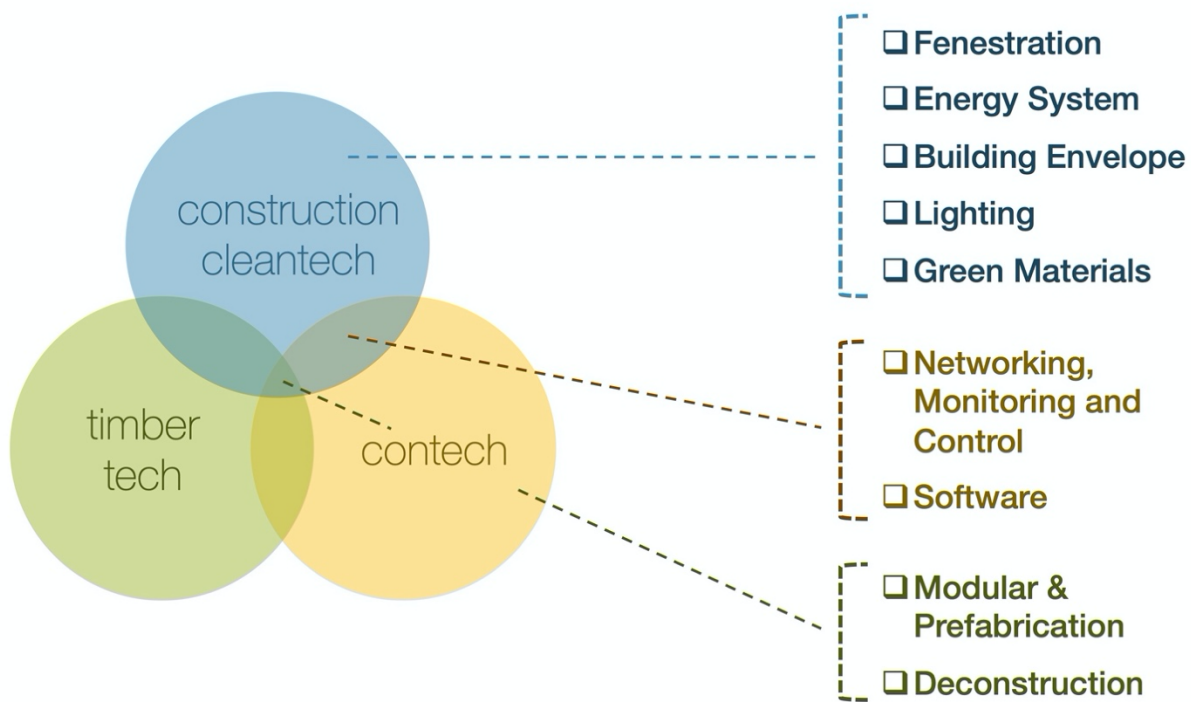


Figure 1: the Tech Ecosystem

MARKET SNAPSHOT

There are at least 115 companies in BC’s construction cleantech industry with an estimated 4,500 employees. The total revenues of BC’s cleantech companies were \$1.26 billion² (CAD) annually as of July 2021.

The Fenestration sector, accounts for over 40% of the total revenue generated while only accounting for one-third of the total employment (Figure 2 & 4). Comparably, other industries like Modular/Prefab, Networking, Monitoring and Control (NMC), and Energy Systems have a similar share in revenue and employment size.

While the Fenestration industry leads the construction cleantech sector in the highest annual revenue, the technology focused NMC and Software industries have the highest revenue per company (Figure 3).

Similarly, although Fenestration leads in total employment, the NMC and Building Envelope Industries lead the sector in employment intensity, measured by the number of employees per company (Figure 5).

² Source data was in USD. All monetary figures have been converted at \$1.25 USD to \$1.00 CAD (Bank of Canada July 2021 Monthly Exchange Rate)

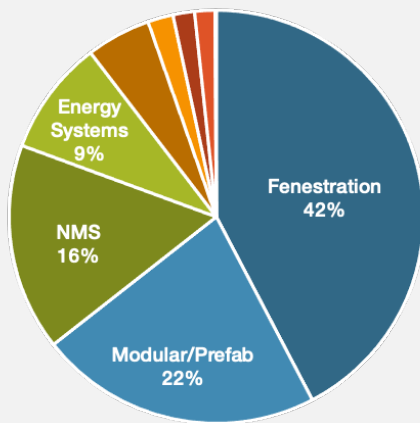


Figure 2: Revenue per Industry

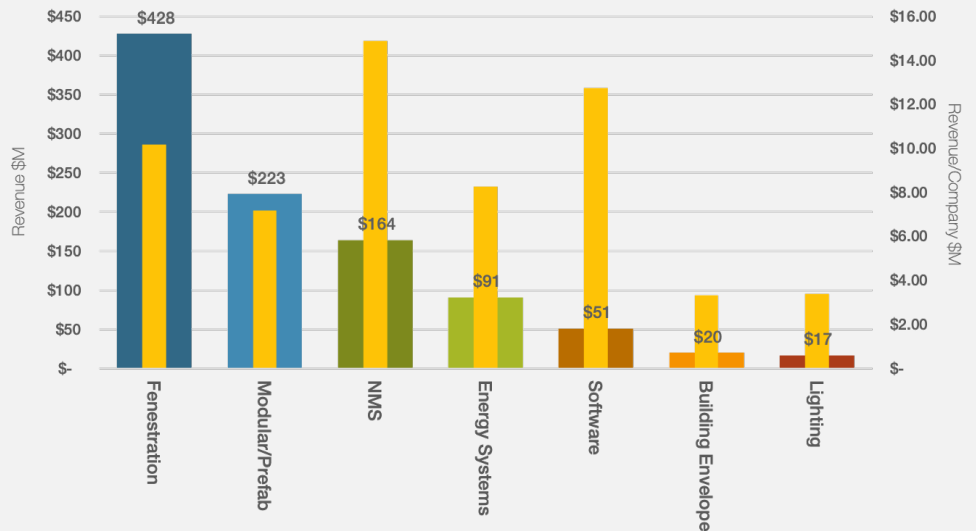


Figure 3: Revenue per Industry vs Avg Revenue/Company (Yellow)

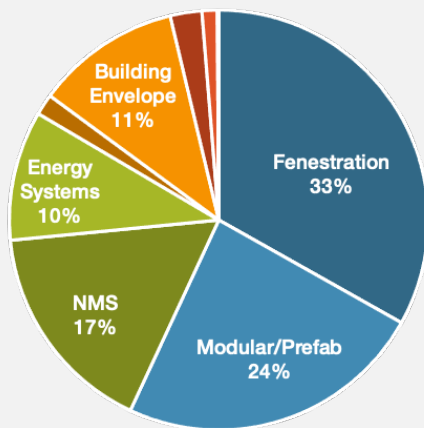


Figure 4: Workforce per Industry

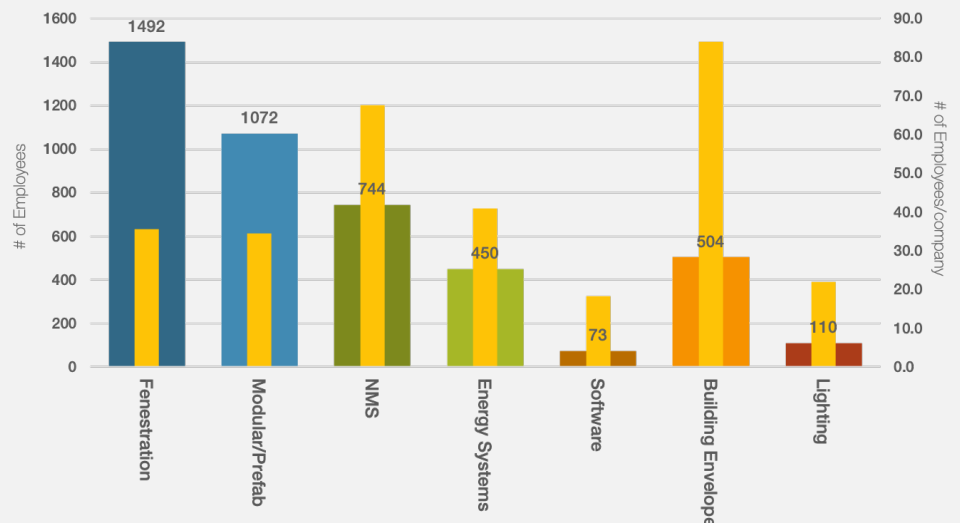


Figure 5: Workforce per Industry vs Avg Workforce/Company (Yellow)

OVERVIEW OF KEY INDUSTRIES

Fenestration is the largest construction cleantech industry by revenue and employees. As of July 2021, there are at least 42 companies in this industry making \$535 million (CAD) in annual revenue and employing approximately 1,429 employees. The fenestration sector is made up of companies that develop and/or produce energy efficient windows, glazing systems, doors and skylight products for both commercial and residential applications.

Companies with products such as automated opening/closing systems and self-tinting glass that help to improve energy performance are also included.

Energy efficient fenestration products were defined as meeting a minimum of EnergyStar or equivalent standards as verified via Natural Resources Canada Energy Efficiency

Ratings³ or other sustainability rating systems such as the Passive House certified component database⁴.

FENESTRATION HIGHLIGHT



www.starlinewindows.com

Starline Windows is one of the industry leaders in Western North America. They produce architecturally designed aluminum windows and doors and modern residential vinyl window and door products. As of July 2021, Starline has revenues of \$214 million (CAD) and employs more than 300 employees. The company is headquartered in Surrey, BC and they are the largest window manufacturer in BC.

Modularization and Prefabrication is the second-largest construction cleantech sector in BC. As of July 2021, there are at least 33 companies generating \$280 million (CAD) in annual revenue and employing approximately 1,092 employees. Companies in the Modularization and Prefabrication space produce high-performance prefabricated

³ <https://oee.nrcan.gc.ca/pml-imp/index.cfm?action=app.search-recherche&appliance=WINDOWS>

components, prefabricated building products, mass timber, steel or cementitious composite panels, closed building panels, and insulated concrete forms. Companies also offer specialized custom fabrication and/or installation services or provide factory-produced spec homes. Some companies also operate advanced manufacturing systems using high degrees of automation or digitization to increase production efficiency and reduce waste.

MODULAR & PREFAB HIGHLIGHT



www.pacific-homes.com

Pacific Homes specializes in prefabricated building systems specifically in custom home and cottage packages. Their Pacific SmartWall® panel is laboratory-tested by BCIT High-Performance Building Lab. Located in Cobble Hill, BC, Pacific Homes has an annual revenue of \$41 million (CAD) and has approximately 118 employees.

Networking, Monitoring and Control is represented by 11 BC companies making \$205 million (CAD) in revenue with 744 employees. The industry incorporates Internet of Things building hardware and software to provide smart HVAC control, air

⁴ <https://database.passivehouse.com/en/components/>

quality monitoring, lighting and window controls to increase energy efficiency and reduce operating costs. Companies included provide primary services in manufacturing, designing, and installing monitoring and control systems. Additionally, some companies also provide custom testing and commissioning services.

NMC HIGHLIGHT

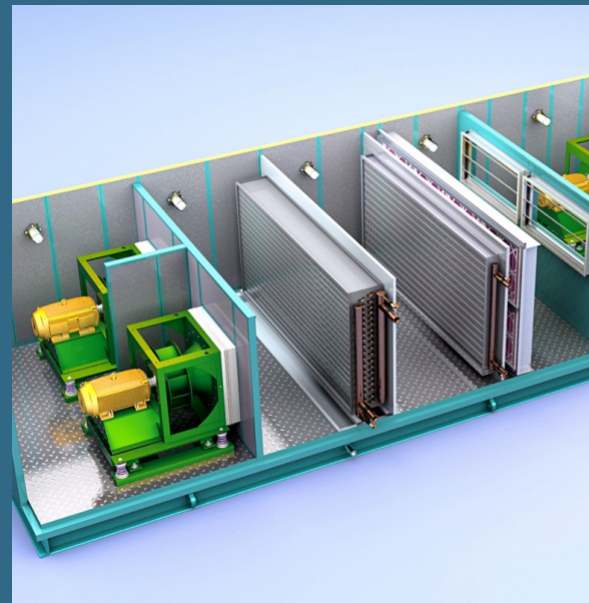


www.deltacontrols.com

Delta Controls is an industry leader in building automation systems. Their headquarters and product manufacturing plant is located in Surrey, BC. Delta Controls offers control solutions for buildings in the commercial, healthcare, hospitality, education, and leisure markets. As of July 2021, they have annual revenues of \$88 million (CAD) and have over 260 employees.

Energy Systems include companies that provide low carbon, energy efficient solutions for heating and cooling such as heat pumps, heat exchangers, custom HVAC systems and accessories, renewable energy systems and up-and-coming battery power stations. There are 11 BC companies that generate \$114 million (CAD) annually and employ 450 people. To be consistent with low emission and electrification goals, fossil-fuel based HVAC systems are excluded from the report.

ENERGY SYSTEM HIGHLIGHT

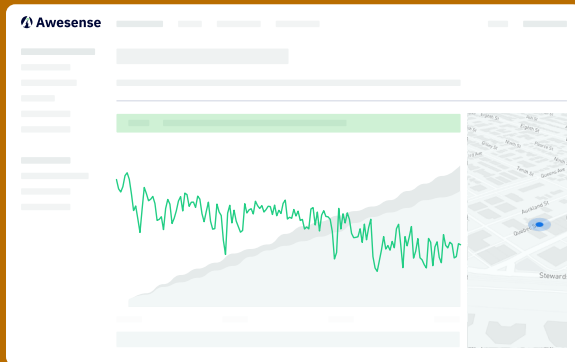


www.haakon.com

Haakon Industries is a manufacturer of custom air handling equipment located in Richmond, BC. All their air handling units are custom-made to different projects and requirements and are designed with their in-house proprietary software. Haakon serves various commercial, industrial and institutional industries with an estimated revenue of \$49 million (CAD) and 177 employees.

Software development is the newest identified sector in the construction cleantech ecosystem. As of July 2021, the sector produces \$64 million (CAD) in annual revenue with a total workforce of 83 workers spread across 5 companies. These companies primarily focus on solutions in data visualization and processes in aiding energy management and load demand prediction and distribution. The products include solutions for both private and commercial energy metering.

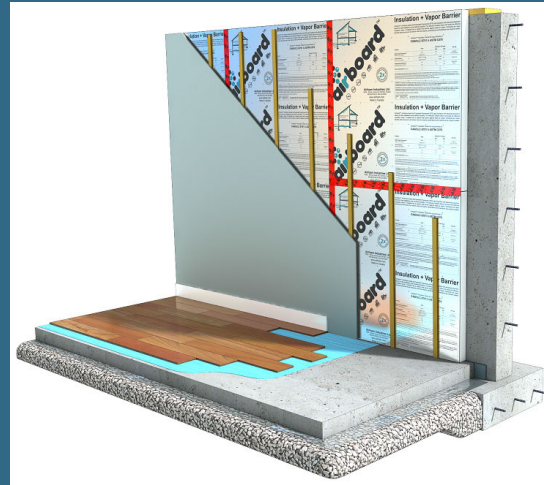
SOFTWARE HIGHLIGHT



www.awesense.com

Awesense's Digital Energy Platform empowers decarbonization and decentralization through data-driven applications and analytics. Their solution allows utilities to scale with the changing technology landscape of the energy grid. The Digital Energy Platform can integrate with existing visualization tools like Jupyter, Zeppelin, Tableau, and Power BI. Awesense is based in Vancouver, has 44 employees and generates \$58 million (CAD) annually.

BUILDING ENVELOPE HIGHLIGHT



www.airfoam.com

Airfoam Industries manufactures sustainable building insulation, geofoam, flotation, and other expanded polystyrene products. Airfoam's Rigid Insulation covers applications for building walls, roofs, and below-grade foundations. They are located in Surrey, BC and have approximately 36 employees, generating \$9 million (CAD) in annual revenue.

Building Envelope is represented by 6 BC companies making \$25 million (CAD) in annual revenue with approximately 504 employees. The building envelope is critical to high-performance buildings as it minimizes the effect of outside temperature on the indoor air temperature. Products like insulation, air, vapour, and moisture barriers, and other thermal break solutions work in tandem with the building's fenestration and HVAC systems.

Lighting comprises 5 companies that produce energy efficient LED products and solutions, daylight optimization systems, and fibre optic lighting. In total, there are 110 employees in the sector generating \$21 million (CAD) in revenue.

LIGHTING HIGHLIGHT



www.cooledgelighting.com

Cooledge Lighting is an innovative lighting company that produces flexible LED light sheets that deliver high-quality illumination that is seamless, adaptable and scalable when compared to traditional lighting solutions. In 2019, Cooledge was named by Cleantech Group to the 2019 Global Cleantech 100 list⁵. Their office is in Richmond, BC, producing \$9 million (CAD) in revenue annually and has a workforce of 50 employees.

UNDER-REPRESENTED INDUSTRIES

This study has found that BC's construction cleantech ecosystem is well represented by some sectors, such as Fenestration and Modularization and Prefabrication, but lacking in others – notably in the development and production of Green Materials and in Building Deconstruction.

Green Materials comprise construction products that have a low impact on the environment and/or human health such as low embodied carbon, non-toxic and/or high

recycled content. There are also products made from natural materials such as wool, hemp and straw, that also fit the definition.

There is only one identified Green Material company in BC. Dinoflex specializes in cost-effective rubber flooring, surfaces, tiles and custom products and solutions for architects, designers, and builders. Their products have high recycled rubber content reused from waste tires. The repurposed materials are healthy (they are non-toxic and/or do not off-gas) and qualify for LEED credits. Dinoflex manufactures in Salmon Arm with 50 employees and \$9 million (CAD) in annual revenue.

Building Deconstruction comprises processes and technologies to disassemble and reclaim building materials at the end of a building's life. Unbuilders is the only identified Deconstruction company in BC. Their work includes demolition by hand and salvaging old-growth lumber, windows, doors, cabinets, fixtures and appliances. The company holds the City of Vancouver's highest recorded salvage and recycle rate of 99% for single-family homes. Unbuilders have projects around the Metro Vancouver area and their office is in Vancouver. As of July 2021, they have \$1 million (CAD) in annual revenue and 5 employees.

⁵ <https://www.cooledgelighting.com/company>

NEXT STEPS

This study provides a snapshot of BC's emerging construction cleantech sector. The companies included have an important role to play in helping BC achieve its climate goals while growing the green economy. BC's construction industry is a major economic driver, generating 8% of the province's GDP. At the same time, buildings are responsible for emitting 8.3MtCO₂e (2018) – 12% of BC's total GHG emissions.

The next step is to engage with the companies included to understand the challenges and opportunities for growth. The sector is also evolving quickly and regular updates to the list of construction cleantech companies will be important to identify market entrants, track growth and follow market trends.

In response to the climate emergency, BC has established the Energy Step Code⁶ which sets a clear policy roadmap to net zero energy buildings by 2032. The BC Electrification Roadmap⁷ offers a path towards low carbon buildings, infrastructure and transportation. Awareness campaigns and capacity building programs will be needed to help owners, investors and those working in the industry to engage with the technologies, products and materials being developed by the construction cleantech companies.

With an increased focus on addressing climate change, government agencies and industry leaders can adjust the tone and

messaging of their communications to drive the uptake of clean and green construction. In addition, the governments can show leadership in establishing preferred purchasing for green and cleantech products and services. Ultimately, bridging the knowledge gap between the mainstream world of construction and the dynamic and rapidly evolving construction cleantech sector.

⁶ <https://energystepcode.ca/>

⁷ <https://www.zebx.org/launching-bcs-building-electrification-road-map/>

APPENDIX

FENESTRATION	
3E Glass Ltd	http://3eglass.com/
A-1 Window Manufacturing Ltd	https://a1windows.ca/
Berdick Manufacturing Pacific Ltd	https://www.berdickwindows.com/
Boardwalk Woodworking Ltd	http://boardwalkwoodwork.com
Bowen Window & Door Ltd	http://windowvancouver.com/
Builders Door & Window Supply	https://www.buildersdoorandwindow.ca/
Canadian Aluminum Windows (2004) Ltd	http://www.canadianwindows.info/
Cascadia Windows Ltd	https://www.cascadiawindows.com/
Centra Windows Inc	https://www.centrawindows.com/
Century Glass	http://www.centuryglass.ca/
Columbia Manufacturing Co. Ltd	http://www.columbiaskylights.com/
Csky Windows Ltd	http://www.cskywindows.ca/
DYG Windows Ltd	http://www.dygwindows.com/
Dynamic Architectural Windows & Doors Inc	https://www.dynamicwindows.com/
Enerstar Windows Ltd	https://enerstarwindows.com/
EuroLine Windows Inc	https://euroline-windows.com/
Fenstur Windows and Doors	https://www.fensturwindows.com/
HighQ Windows Inc	https://www.highqdev.ca/
Home Fortune Enterprises Ltd	http://homefortune.ca/
Innotech Windows & Doors Inc	https://www.innotech-windows.com/
MJ Windows Ltd	https://www.mjwindows.ca/
Modern Aluminum and Vinyl Products Ltd	https://modern.ca/
Morrison Windows Ltd	http://morrisonwindows.ca/
Oasis Windows Ltd	http://oasiswindows.com/
RetroTeck Window Mfg. Ltd	https://www.retroteckwindow.ca/
Starline Windows	https://www.starlinewindows.com/
Stilewood International Door and Window	http://stilewood.com/
Sunlight Windows MFG Ltd	http://windowdoorvancouver.com/
Super Windows Ltd	No website
Thermoproof Manufacturing Ltd	https://www.thermoproof.ca/

Tyee Manufacturing Inc	https://www.tyeewindows.com/
Unison Windows & Doors Inc	https://unisonwindows.com/
Van Isle Windows Ltd	https://www.vanislewindows.com/
VanAir Design Inc	https://www.vanairdesign.com/
Vario Glass Inc	https://varioglass.ca/
View Inc	https://view.com/
Vintage Woodworks Inc	https://vintagewoodworks.ca/
Vinylco Windows Ltd	https://vinylcowindows.com/
Vinyltek Windows	https://www.vinyltek.com/
West Coast Windows Ltd	https://www.westcoastwindows.ca/
Westeck Windows Manufacturing Ltd	https://www.westeckwindows.com/
Windowland Construction Inc. DBA	http://windowland.bc.ca/

MODULAR & PREFABRICATION

Adaptive Homes	http://www.adaptive-homes.ca/
Advantage ICF	www.advantageicf.com
AE Concrete Products Inc	http://www.aeconcrete.com/
B.C. Passive House	https://www.bcpassivehouse.com/
BCollective Homes Inc	https://bcollective.ca/
Brisco Manufacturing	http://briscoman.com/
Built Prefab Corp	https://builtprefab.com/
Calmura Natural Wall Inc.	https://calmura.com/
Centura Building Systems Ltd	https://www.centurabuilding.com/
Chaparral Industries	https://www.chaparralbuilt.com/
Collective Carpentry	https://collectivecarpentry.com/
Factor Building Panels	https://www.factorbuildingpanels.ca/
Footprint Sustainable Housing Corp	https://www.homesbyfootprint.ca/
Freeport Industries	https://freeportindustries.ca/
Intelligent City Inc	https://intelligent-city.com/
Kalesnikoff	https://kalesnikoff.com/
Kinsol Timber Systems	https://kinsoltimber.com/
Mitsui Home Canada Inc	https://www.mitsuihome.ca/
Moduline Homes	http://modulinepenticton.com/

MSE Precast	https://mseprecast.com
Nexii Building Solutions	https://www.nexii.com/
NRB Modular Solutions	https://nrbmodular.com/
Pacific Homes	https://pacific-homes.com/
Paradigm Building Solutions Ltd	https://paradigmpanels.com/
Quad-Lock Building Systems	https://www.quadlock.com
Seagate Mass Timber Inc	https://seagatestructures.com/
Spearhead Timberworks Inc	https://www.spearhead.ca/
SRI Homes	http://srihomes.com/
Stack Modular	https://www.stackmodular.com/
StructureCraft Builders Inc	https://structurecraft.com/
StructurLam Mass Timber Corp	https://www.structurlam.com/
Tamlin International Homes	https://tamlintimberframehomes.com/
Zirnhelt Timber Frames	http://ztframes.com/

NETWORKING, MONITORING AND CONTROL

Delta Controls Inc	https://deltacontrols.com/
Echoflex Solutions Inc	https://www.echoflexsolutions.com/
Energex Inc	https://www.energexinc.com/
EnerPro Energy Management	https://enerprosystems.com/
Optigo Networks Inc	https://optigo.net/
Quadlogic Meters Canada Inc	https://qmeters.com/
Reliable Controls Corp	https://www.reliablecontrols.com/
Sensible Building Science	https://sensiblebuildingscience.com/
SMT Research Ltd	https://www.smtresearch.ca/
Tantalus Systems Corp	https://www.tantalus.com/
TZOA (Clad Innovations Ltd)	https://tzoa.com/

ENERGY SYSTEM

CORE Energy Recovery Solutions	https://core.life/en/
Eneready Products Ltd	https://enereadyproducts.com/
Fenix Energy Canada Inc	https://fenixenergy.com/
Geotility Geothermal Installation Corp	https://www.geotility.com/

Haakon Industries Canada Ltd	https://haakon.com/
Olympic International	https://www.olympicinternational.com/
Oxygen8 Solutions Inc	https://oxygen8.ca/
Portable Electric	https://portable-electric.com/
SHARC Energy Systems Inc	https://www.sharcenergy.com/
Smartforme	http://www.smartforme.ca/
Terratek Energy Solutions	http://www.terratek.ca/

SOFTWARE

Awesense Inc	https://www.awesense.com/
BuiltSpace	https://www.builtspace.com/
Open Technologies	https://opentech.eco/
Rainforest Automation Inc	https://www.rainforestautomation.com/
Uplight Inc	https://uplight.com/

BUILDING ENVELOPE

Airfoam Industries Ltd	https://www.airfoam.com/
Beaver Plastics Ltd (Chilliwack)	https://beaverplastics.com/
Hal Industries Inc	https://www.halind.com/
Monoglass Inc	https://monoglass.com/
Rockwool International	https://www.rockwool.com/north-america/
U-kon System	https://www.u-kon.com/

LIGHTING

BL Innovative Lighting	https://bllighting.com/
Cooledge Lighting Inc	https://www.cooledgelighting.com/
Green Image Tech (Marvee Enterprises Ltd)	http://www.greenimagetech.com/
Nano-lit Technologies Ltd	https://www.nano-lit.com/
Radiance Energy Corp	https://www.radiance.energy/