



**CONSTRUCTION
INNOVATION CENTRE**
Research Driving Change

ANNUAL REPORT

2021-2022



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INTRODUCTION

WHAT IS THE CIC?

The University of Alberta's Faculty of Engineering established the Construction Innovation Centre (CIC) in May of 2019. Its mission is "to provide breakthrough research, education and training that directly benefit Canada's construction industry and lead to the sustainable and economic development of our built environment and a competitive advantage for the Canadian construction industry."

The CIC brings together more than 30 established faculty members in construction engineering, building science, masonry, steel and water by uniting under one umbrella the Hole School of Construction Engineering, Nasser School of Building Science and Engineering, Masonry Group, and Steel Centre. The CIC is supported by more than 50 partners in industry, professional associations, and funding bodies.

With the help of its partners, the CIC seeks to identify strategic directions for innovation and education and provide the united platform required to coordinate the activities and resources of the wide range of University of Alberta research groups in a manner that maximizes impact for the construction industry, Albertans, and Canada as a whole.

The CIC seeks to become an internationally recognized center for research, teaching, and training in engineering, construction, and servicing the built environment—the focal point around which academia, industry and government can come together to meet the grand challenges facing construction industries and create high-impact innovations across the construction engineering spectrum. We believe in research and innovation that drives change.



CIC Goals

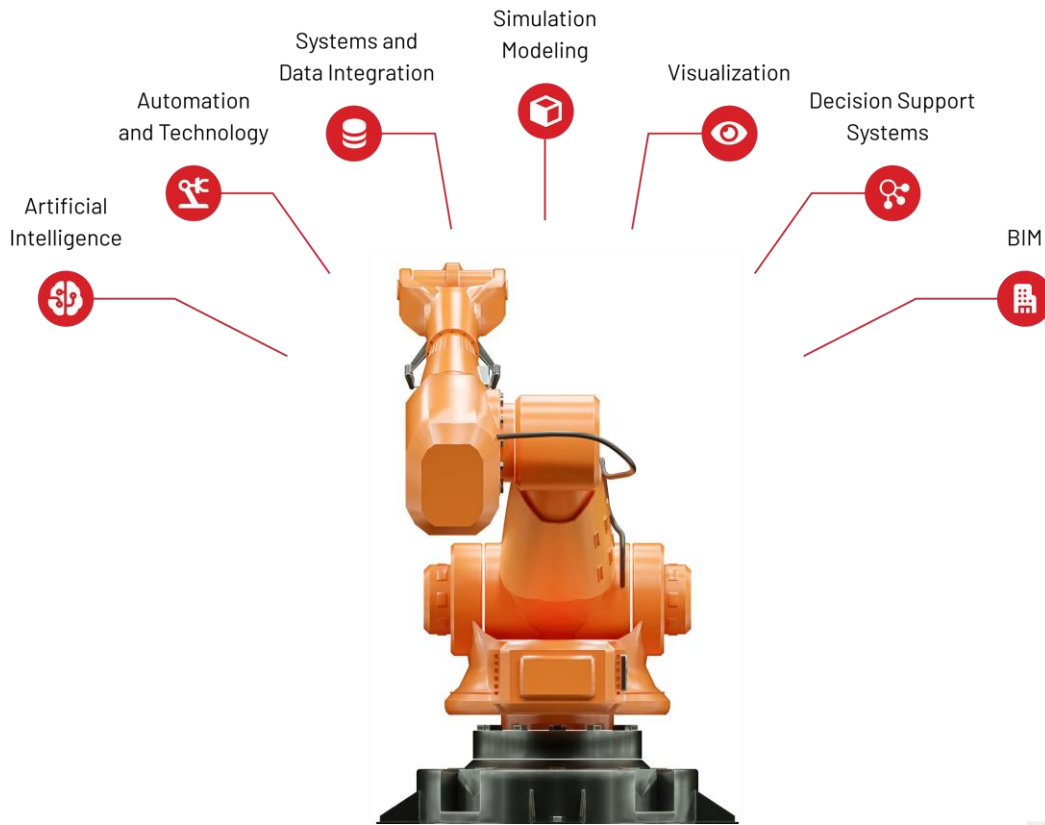
- » Accelerate and support innovation, productivity, and competitiveness in Alberta's and Canada's construction industry, including off-site industries materially impacting construction, through high-impact research projects
- » Identify industry needs and align CIC research programs to meet these needs
- » Provide a unified platform for solutions to construction industry problems through multi-disciplinary research
- » Train the next generation of construction engineers and workforce with leading-edge knowledge and skills
- » Enhance engagement with all levels of government to grow and sustain investment in Canada's construction industry



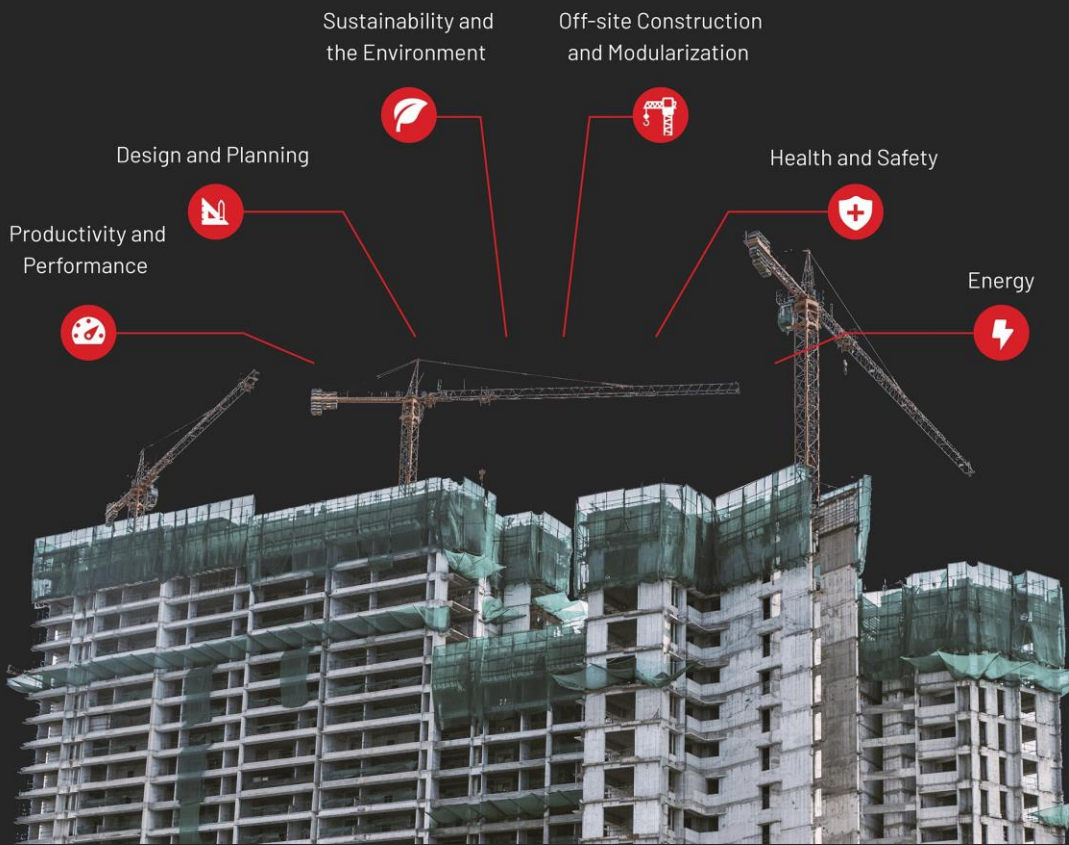
“The CIC aims to provide breakthrough research, education and training that directly benefit Canada’s construction industry and lead to the sustainable and economic development of our built environment and a competitive advantage for the Canadian construction industry.”



Top Research **Methods**



Top Research **Problems**



CURRENT

CIC RESEARCH PROJECTS

Ongoing Research Projects (NSERC Approved)

Enhancing Safety Management Systems on Construction Projects: A Data-driven Approach

Evaluation of Impact of Exoskeletons on Performance and Safety of Construction Workers

Modular Wall Systems for Accelerated, Safe, and Sustainable Construction

Practical Methods for Accurate Estimation of Overall R-Values of Masonry Walls

A Robust and Low-cost Technology for Risk Mitigation of Pathogenic Infection in HVAC Systems

RESEARCH DRIVING CHANGE



Federated Platform for Construction Digital Twins

Industrialization and Decarbonization of the Construction Process

BIM-Integrated Robotics for Intelligent Mass Timber Manufacturing and Operations

AI-powered Generative Design and Manufacturing for Prefabricated Buildings

Data-Driven Decision-Making Methods for Improved Design, Fabrication, Construction and Deconstruction of Steel Structures

CIC-Approved projects (under review by NSERC)

BY THE NUMBERS

PROJECT STATS

10
**APPROVED
PROJECTS**

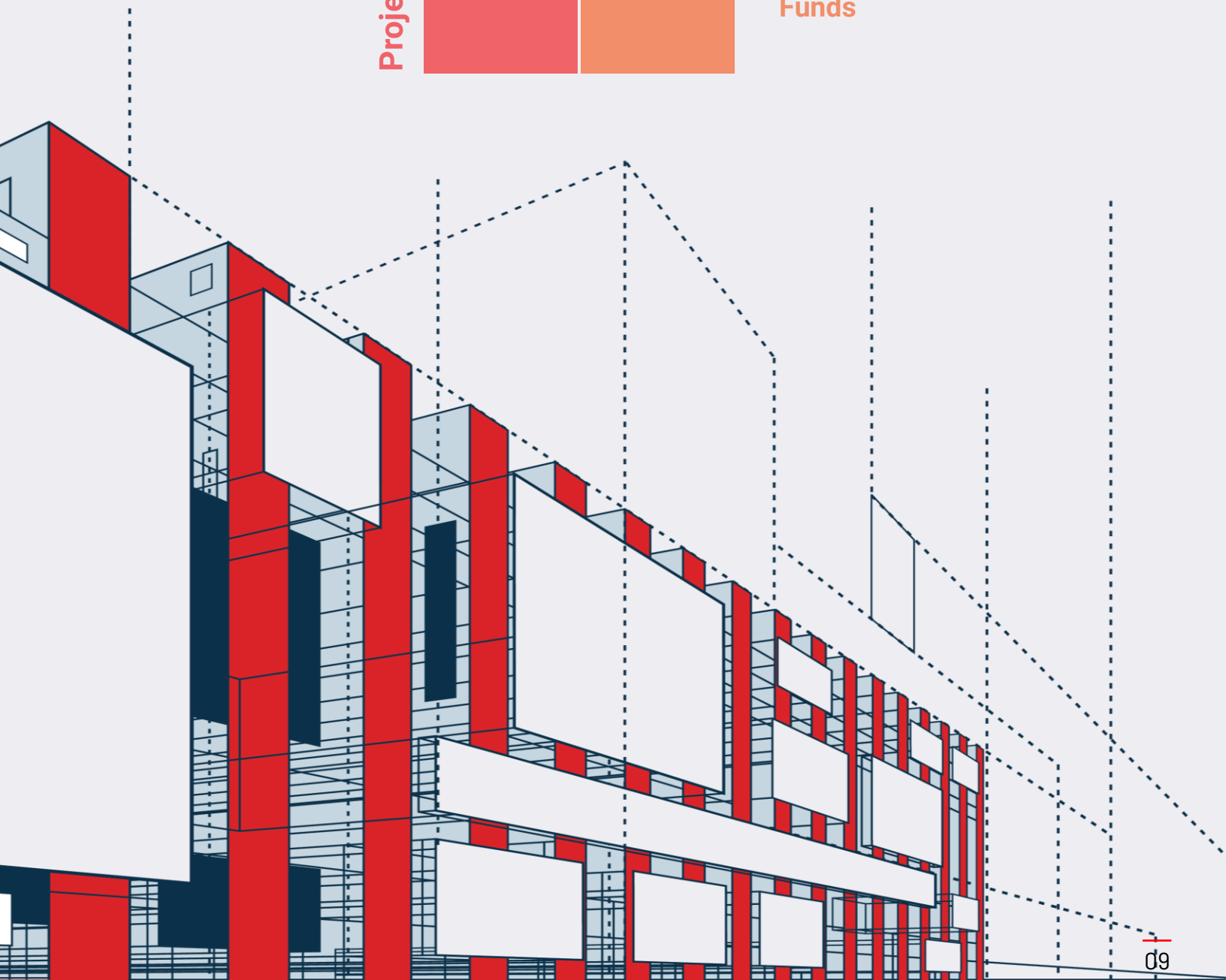
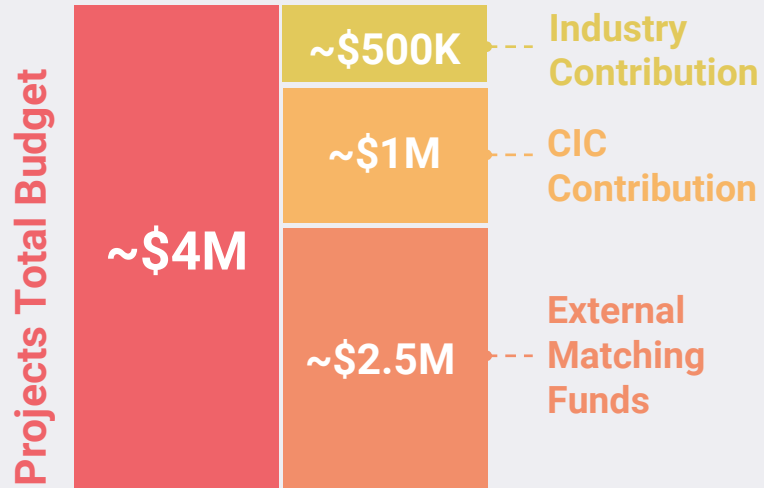
27
**ACADEMIC
RESEARCHERS**

47
**INDUSTRY
PARTNERS**



BY THE NUMBERS

PROJECT STATS



EVENTS

CIC WORKSHOPS

AI in Construction Researcher Meet-and-Greet

November 2021

The CIC and AI4Society Signature Area joined forces to promote and develop research initiatives that relate to the area of “Artificial Intelligence for the Construction Industry”. Researchers met on November 9th, 2021 to explore research overlaps and form partnerships.

The AI4Society and CIC jointly provide support for such partnerships, including facilitating introductions between researchers and industry partners, grant development support, and seed funding.

AI in Construction Academia & Industry Meet-and-Greet

December 2021

The CIC and AI4Society Signature Area hosted a follow-up event to further promote the adoption of AI in the Construction industry on December 7th, 2021 to facilitate more connections between researchers and industry professionals to discuss the most prominent needs, opportunities, and challenges in implementing AI in construction.

The event aimed to foster partnerships between researchers and industry partners and allow new teams to access funding and support provided by the CIC and AI4Society for research initiatives related to AI in construction.





Robotics in Construction Seminar

April 2022

The CIC and Centre for Innovation in Construction and Infrastructure Engineering and Management (CICIEM) brought research and industry experts together to discuss the applications, opportunities and challenges presented by robotics in construction. The seminar included two presentations: “Main Applications of Robotics in Construction” led by Dr. Osama Moselhi and Dr. Amin Hammad from Concordia University; and “Improving Construction through Robotics - Use Cases & Lessons Learned” led by Ramin Attar, Co-Founder and CEO of Promise Robotics, Dr. Nenand Gucunski, professor and Chair of Department at Rutgers University, and Sina Karimi, R&D specialist at Pomerleau; followed by a panel discussion about the opportunities and challenges of robotics in construction from an industrial perspective.

CIC Tech. Initiatives - Wearable Robots (Exoskeletons)

July 2022

The CIC presented on the emerging technology of exoskeletons, introducing attendees to the CIC’s research initiatives, what exoskeletons are and why they should be adopted, and the research that is taking place to understand their utility in industrial applications. The discussion was hosted by Dr. Irina Garces, a postdoctoral fellow at the UofA, and Gail Powley, the president of Technology Alberta, and the discussion was led by Drs. Yasser Mohamed, Hossein Rouhani, and Ali Golabchi from the University of Alberta and Sarah Krell, a specialist occupational health nurse with EPCOR.

EVENTS

CIC Forum 2022

This year the CIC Forum was held in conjunction with the 30th annual conference of the International Group for Lean Construction (IGLC) and the Modular and Offsite Construction (MOC) Summit. The Forum highlighted construction engineering and management research initiatives undertaken by academics and the construction industry, and attendees had the opportunity to participate in events and sessions hosted by all three groups.

The multi-conference hosted presentations on current best practices and challenges from local and international projects from the Canadian and international construction community as well as industry site visits.



Together with



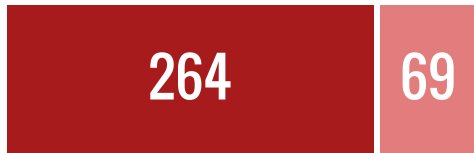
July 27-29



EVENTS

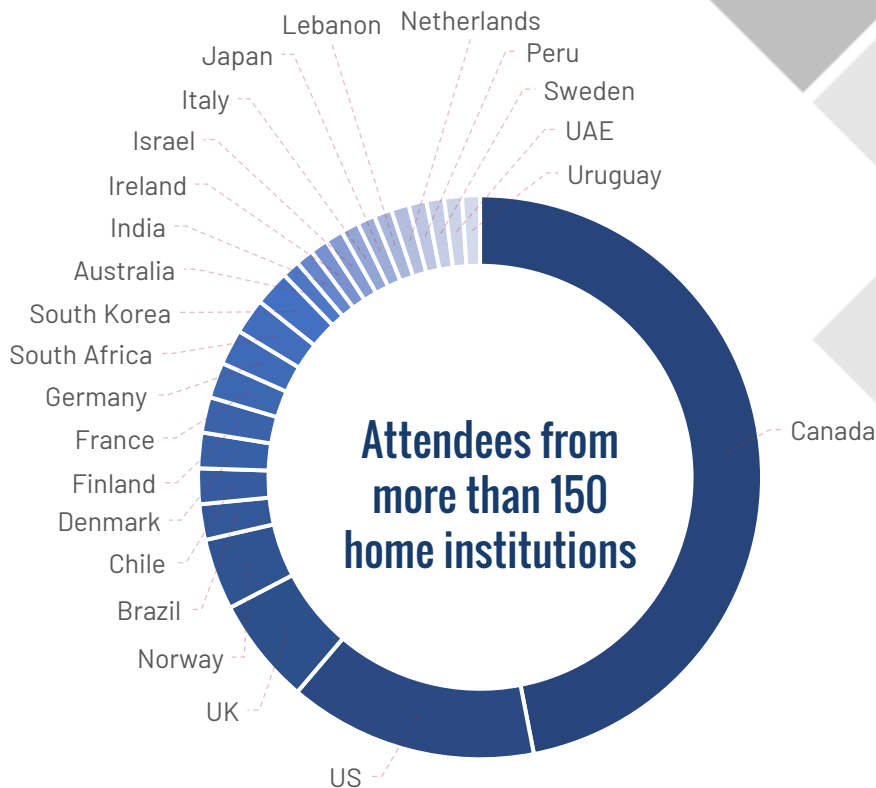
CIC Forum 2022

333 Total Attendees



**In-person
Attendance**

**Virtual
Attendance**



49%

of attendees were industry professionals

51%

of attendees were from academia



CONSTRUCTION 2050

CIC Student Competition

The CIC hosted a competition from May to July 2022 that asked students to consider what the construction industry might look like in 2050. They were asked to consider advanced technologies, Construction 4.0 concepts, digitalization, IoT, robotics, and other innovative approaches to be used as jumping off points to propose novel ideas or extensions of existing solutions by addressing social, environmental, and economic concerns to improve the productivity, safety, design, sustainability, construction methods, and materials used by the construction industry. Teams of 2 to 5 students were encouraged to form interdisciplinary groups with diverse backgrounds, knowledge, and skill sets to address this challenge. As part of the competition, the top 6 submissions were presented to senior industry leaders at the CIC Forum and the first, second, and third prize winners (as well as the top three honorable mention projects) have been featured on the CIC's website.

Judges



Rod Wales
VP, Operations
Ledcor



Kyle Konsorada
VP, Strategic Innovation
Keller Construction



Travis Zubick
Assistant Manager
PCL



Sponsors

CIC STUDENT COMPETITION

Construction 2050

IDEAS FOR FUTURE



COLLABORATIONS

CIC Partnerships



The **Off-site Construction Research Centre (OCRC)** at the University of New Brunswick seeks to transform the construction industry by optimizing alternate solutions to conventional, ‘stick-built’, on-site construction. The OCRC challenges current Design for Manufacturing and Assembly (DfMA) off-site practices to leap ahead and deliver even better performance and a superior end product with a high degree of aesthetic finish.



The **Centre for Innovation in Construction and Infrastructure Engineering and Management** is Concordia University’s flagship for innovation in construction automation and civil infrastructure engineering and management. The centre promotes and initiates innovative research and knowledge-based solutions for improving quality, productivity, safety and competitiveness of the Canadian construction industry through automation and robotics.



The **AI4Society** is one of the five Signature Areas of Research and Teaching of the UofA. Its focus is on Artificial Intelligence, its applications, and its transformative role in society. The AI4Society seeks to stimulate and support interdisciplinary research and teaching initiatives in the field of AI research in Canada by providing continuing institutional leadership through the development and coordination of innovative programs.



The **Canadian Centre for Welding and Joining (CCWJ)** was established in the Faculty of Engineering at the UofA. Research done in the CCWJ focuses on productivity, weldability, automation and performance. The Centre addresses issues of introducing new processes, procedures, materials, and technologies, researching difficult-to-weld materials and examining non-destructive testing, corrosion, and fracture issues.

CIC Members



PCL
CONSTRUCTION

PCL Construction



Ledcor



Landmark Group



CARRY STEEL

Carry Steel



Masonry Contractors
Association of Alberta

Masonry Contractors
Association of Alberta



Engineered Air



Christen
Developments



Supreme Steel



Capital Power



Graham



NATIONAL ACADEMY
OF CONSTRUCTION

National Academy
of Construction



SCORPIO
MASONRY

Scorpio Masonry



Construction Owners
Assoc. of Alberta



Progressive Contractors
Assoc. of Canada



ECAA
Electrical Contractors
Association of Alberta

Electrical Contractors
Assoc. of Alberta



Christian Labour
Assoc. of Canada

CIC Advisory Board and Team

Members of the CIC's **Executive Management Committee (EMC)** and **Scientific Advisory Committee (SAC)** work with the CIC team to guide CIC's research projects and operations and monitor progress.



Travis Chorney

Senior VP
PCL



Jim Kanerva

General Manager
Carry Steel



Reza Nasser

CEO
Landmark Group



Simaan AbouRizk

Dean and Professor
University of Alberta



Quentin Huillery

Chief Operating Officer
Ledcor



Jamie Feuffel

Operations Manager
PCL



Chris Ambrozic

President
Scorpio Masonry



Steve Owens

Vice President, Construction
Capital Power



Brad Heintz

Senior Manager
Capital Power



Rod Wales

Vice President
Ledcor



Ania Ulrich

Department Chair
University of Alberta



Ben Gillam

Division Manager
Scorpio Masonry



Anastasia Elias

Associate Dean
University of Alberta



Haitao Yu

Lead, R&D
Landmark Group



Yasser Mohamed

Director
Construction Innovation Centre



Ali Golabchi

Research & Innovation Scientist
Construction Innovation Centre



Amanda Peters

Strategic Support Coordinator
Construction Innovation Centre



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OF ALBERTA**