

Canadian Consulting Engineering Awards

# Calgary Cancer Centre

Phases 1-3

**Award Submission**

April 2023







**Image 1: Early rendering, 2017**

© Alberta Infrastructure



**Image 2: Completed building, 2022**

© Ross Griffiths, Arup

# On-time On-budget World class

Arup Canada Inc. was the Bridging Consultant on the Calgary Cancer Project. The client, Alberta Infrastructure, sought the on-time and on-budget delivery of a world class comprehensive cancer care facility – and the team delivered! Arup provided full multi-disciplinary consultancy services throughout the project including developing the requirements, supporting the design-build procurement, design review, compliance management, site monitoring, and contract administration. The resulting socioeconomic benefits include improving health outcomes and job creation for the citizens of Calgary, Alberta.



# Section 1: Complexity

The Calgary Cancer Project in Calgary is a 127,000m<sup>2</sup> facility with 160 inpatient unit beds, over 100 chemotherapy chairs, over 100 patient exam rooms, 15 radiation vaults, a series of highly specialized research labs, and five levels of underground parking.

This C\$1.4BN design-build project was delivered in three phases: Pre-procurement; Procurement; and Design & Construction. Substantial Completion was achieved in November 2022.

Hospitals are complex, highly serviced facilities and this project was especially so because it is a specialist centre that brings together healthcare, research and education. There were 63 separate departments, each with a stakeholder (user) group. In addition, there were up to 60 separate building systems that needed to achieve the required integration and interoperability standards. Our specialist in this field was engaged to lead this workstream as a part of our client's Project Management Office team.

Complexity also extended into the Arup team itself - our Calgary team project managed and coordinated a large, multi-disciplinary team of over 100 from Arup alone, together with many more from our 12 sub-consultants (Figure 1).

The left screenshot shows a table with columns for Room Number, Room Name, Room Type, and Room Area. Red arrows point to specific rows with annotations like 'This table has been converted to use BIM IDs' and 'This table has been converted to use BIM IDs'. The right screenshot shows a similar table with columns for Room Number, Room Name, Room Type, and Room Area, with red arrows pointing to specific rows and annotations like 'This table has been converted to use BIM IDs' and 'This table has been converted to use BIM IDs'.

Transformation of Data for BIM IDs from 'RDS-Items in Room'

Transformation of Data for information with no BIM ID from 'RDS-Room Data Draft'

The spreadsheet is titled 'SOA-SOR-RDS Review Matrix'. It has columns for Room Number, Component, Sub-Component, Room Name, Room Type, Room Area, and various review metrics like 'No BIM ID', 'PCL', 'Comments', 'SOR', and 'PCL'. Red arrows point to specific rows and columns with annotations like 'Overall RDS Status and General Comments to PCL' and 'Spreadsheet automatically compares SOR against PCL output, area for comments after each item to review'.

Development Changes shown in Red and Green - consistent with SOR issue for 50%

SOA-SOR-RDS Review Matrix

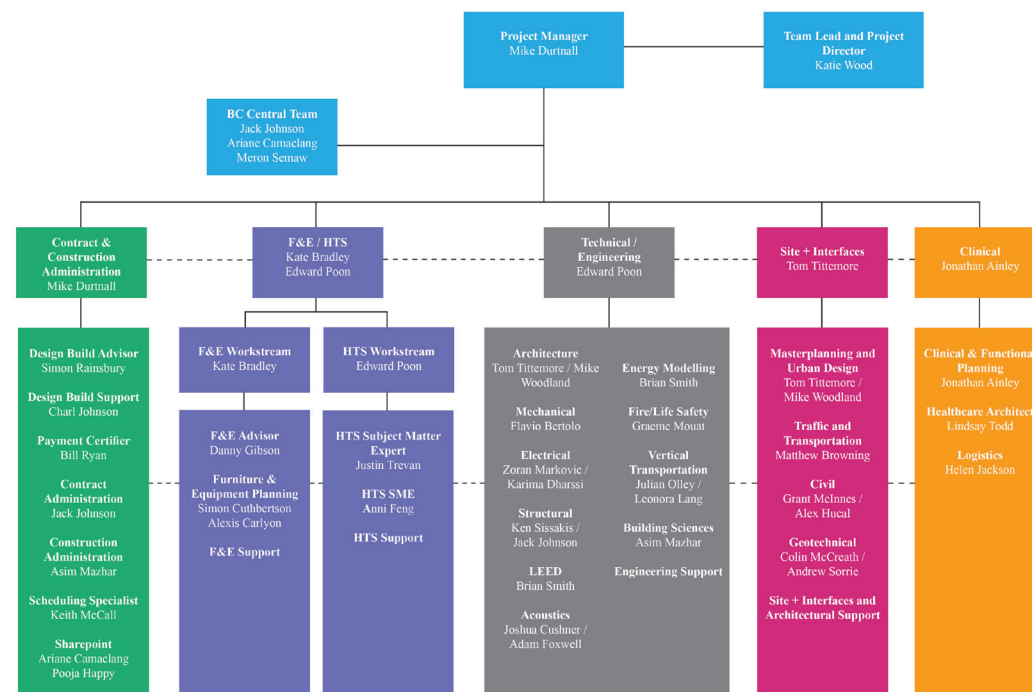


Figure 1: Organizational Chart

Figure 2: Automated Room Data Sheet Review Process

## Streamlined review process

Arup developed a 1200-page requirements document over 7 months and 5 separate iterations; there were multiple stakeholder reviews generating over 1000 comments. To manage this task, we designed a tracker document and guidance that enabled these to be recorded and to maintain a record of the rationale where comments were rejected.

This audit trail proved invaluable downstream in providing a record of the document history. This tracker approach was also used throughout the lengthy design package reviews. We continually updated the requirements document as Change Orders were issued to make it easier for package reviewers to know what the latest requirements were.

Room Data Sheets were submitted by the Design-Builder for each room outlining requirements such as medical gases, room pressurization, air change rate, electrical requirements, etc. The 15-day review period for over 5000 rooms would have taken over 9 months manually, but Arup designed an automated process (Figure 2) to extract the requirements for each room and match each attribute against the Design-Builder's BIM ID. This automated process took three days, including checking for any discrepancies to be reviewed manually.

The facility was constructed over five and a half years on an existing, extremely busy hospital campus. The need to keep the project going through the COVID-19 pandemic added an extra challenge. We successfully introduced remote site review innovations such as holding pre-review briefings with specialists unable to travel to site to confirm what they needed to see and the use of on-site resource, photography, and post-review virtual meetings with the specialist to complete the reviews.





**Image 3: Inpatient room**

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**Image 4: Research laboratory**

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## Section 2: Client's needs

As Alberta Infrastructure (AI) is accountable to the Government of Alberta for delivering the project, their primary goals were to deliver on time and on budget.

AI was strongly motivated to deliver a high-quality facility for the end client, Alberta Health Services. However, they had limited experience with the Design Build approach when the project commenced and Arup provided advice and training sessions for stakeholders on what to expect, their roles and how DB may differ from what they were familiar with.

Arup worked with AI and AHS to carefully balance performance-based and prescriptive specifications in the requirements, to enable appropriate innovation. The required quality standards were achieved through our work diligently reviewing compliance throughout design and construction, identifying any non-compliances and ensuring that they were rectified by the Design-Builder.

### Delivery on time and on budget

Our project controls and scheduling specialists undertook a schedule risk analysis of the proponents' schedule submittals at the conclusion of the procurement phase, using Acumen Fuse software to assess the likelihood of success. This was influential in AI securing approval to award the contract. We provided contract administration services throughout design and construction and, after 5.5 years, **substantial completion was achieved within one week of the target date.**

Our work supporting the change management process, including reviewing and challenging Design-Builder proposed scope and estimates, contributed significantly to the project to remaining on budget. At Substantial Completion, **costs remained within 1% of the of the original contract price.**



**Image 5: Calgary Cancer Centre under construction, June 2021**

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**Image 6: Rendering of the Calgary Cancer Centre**

© Alberta Infrastructure



**Image 7: Ross Griffiths and team**

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**Images 8 and 9: Calgary Cancer Centre - construction phase, September 2018**

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**Images 10 and 11: Calgary Cancer Centre - construction phase, July 2019**

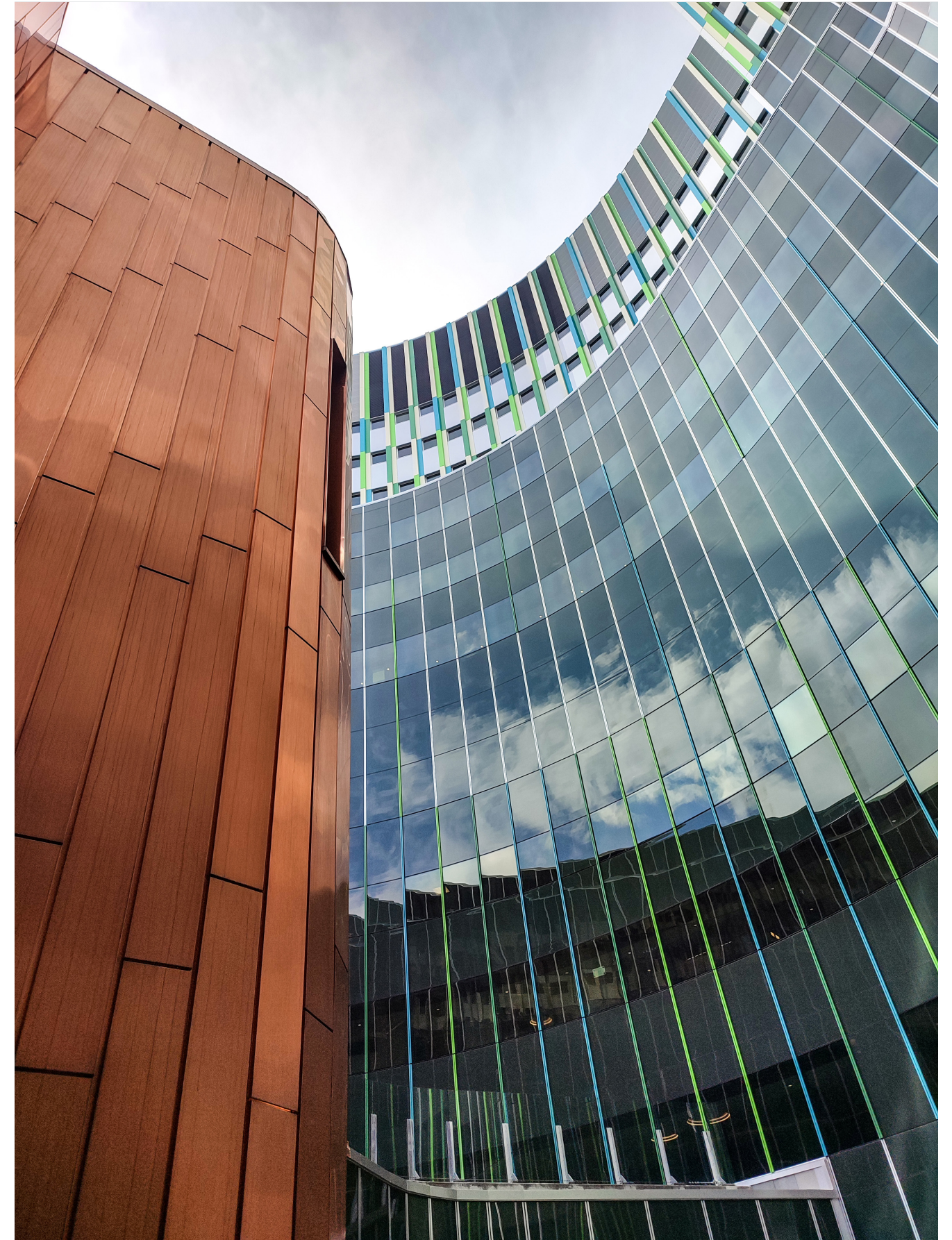
© Mike Durtnall, Arup





**Image 12: Courtyard at the Cancer Centre - "The Heart", December 2019**

© Mike Durnall, Arup



**Image 13: Courtyard at the Cancer Centre "The Heart", May 2022**

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## Section 3: Environmental benefits

In our role as Bridging Consultant, we were responsible for specifying the requirements, assisting with the procurement and checking compliance through design and construction.

During Phase 1, we ensured a holistic approach was taken to writing the project sustainability requirements. Specific contractual requirements were included in dedicated LEED, Energy Usage and Sustainability sections of the requirements document. Additional requirements were also included throughout other sections such as the mechanical, electrical, architecture, acoustic and furniture and equipment.

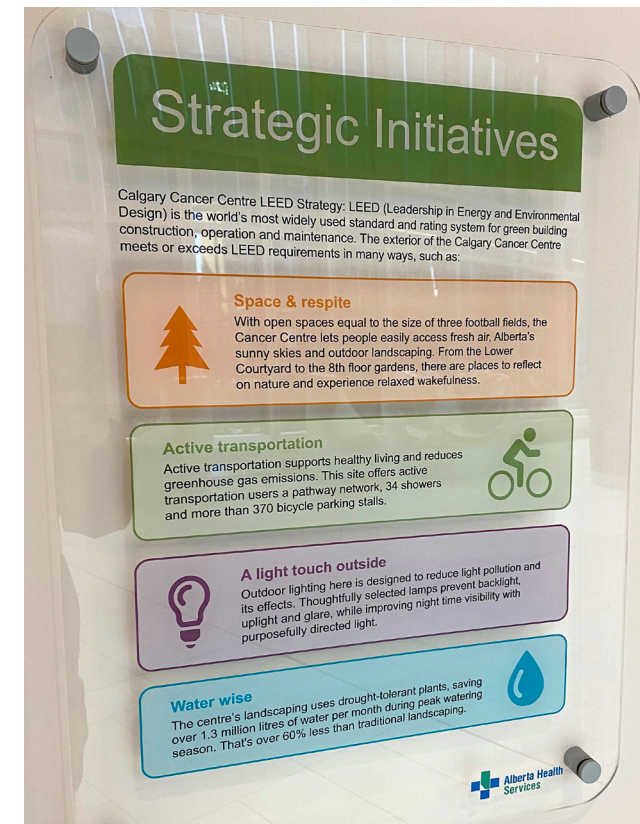
The discipline specific requirements led to industry leading design and installations such as the use of high efficiency condensing boilers (Image 16) which minimize the facility's energy usage whilst maintaining the ability to fire on natural gas or diesel to ensure resilience.

Overarching principals also drove the inclusion of views and access to green spaces, including an accessible green roof space on level 9.

In 2006, the Government of Alberta committed to a minimum of LEED Silver certification ratings for all projects funded and supported by the Government. The dedicated LEED section of the requirements document encouraged the Design-Builder to exceed these minimum requirements by setting a voluntary stretch target of LEED Gold Certification.



**Image 14: Space and respite**  
Green roof seen through a Level 8 laboratory window  
© Ross Griffiths, Arup



**Image 15: Calgary Cancer Centre LEED strategy**  
© Ross Griffiths, Arup



**Image 16: High efficiency dual fuel condensing boilers**  
© Ross Griffiths, Arup

### Exceeding expectations

The integrated sustainability requirements set out throughout the requirements document drove the minimization of energy usage by the building. The Design-Builder was required to consider the whole-life costs over an expected minimum 50-year service life, including the cost of design and construction, ongoing operations, maintenance, repairs and lifecycle replacement.

The requirements document also laid out detailed energy modelling requirements to ensure realistic energy usage predictions and the easy comparison of options during the various design phases.

The project is on track to achieve LEED Gold Certification and is an exemplar Government project, and will be the first hospital project in Alberta to achieve this certification level.





**Image 17: Healing space**  
 Providing patient-centred care  
 © Ross Griffiths, Arup

## Section 4: Innovation



**Image 19: Fully Automatic Guided Vehicle System (AGVs)**  
 © Ross Griffiths, Arup



**Image 18: Care station**  
 Meeting the projects requirements  
 © Ross Griffiths, Arup

In Phase 1, Arup supported the inclusion of innovations in the RFP document, including a Fully Automatic Guided Vehicle System (AGVS) and incorporation of future trends in technology. The successful proponent proposed dynamic glass and, as noted above, targeting LEED Gold (going beyond the Government of Alberta mandate of LEED Sliver) and these, together with AGVs were accepted as part of Phase 2 and incorporated into the requirements.

By their nature, innovations will always be something of a leap of faith for a client and owner. In Phase 3, as these were innovations proposed by the Design-Builder they had no dedicated section in the Statement of Requirements (SOR) document, they simply became part of the contractual designs as described by the Design-Builder. Their descriptions did not equate to a fully defined set of requirements, we therefore assisted the client and owner in understanding how the SOR sections as written (Architectural, Structural, Mechanical, Electrical, Hospital Technology Systems) applied to these innovations. As design and construction progressed, our engineers then undertook compliance checking of the innovations with the SOR and the reviewed design packages, ensuring that the as-constructed and commissioned systems met the Design-Builder's contractual obligations and the owner's expectations.





**Image 20: Donor Wall - acknowledging those who donated to the project**

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## Section 5: Social and Economic Benefits

As a major healthcare project for the province, the Calgary Cancer Project will contribute great social and economic benefits to the people of Calgary. It will replace the Tom Baker Cancer Centre that was constructed in 1980, had its last major renovation in 2000 and reached capacity in 2003.

The new cancer centre will deliver a leading health care facility and academic research hub for the provision of cancer services in southern Alberta. The facility will increase cancer care capacity in Calgary by consolidating and expanding upon existing services in the Calgary zone to support integrated and comprehensive cancer care.

The facility will support the development of a multidisciplinary and integrated programming philosophy that will improve patient outcomes and increase cancer survival rates.

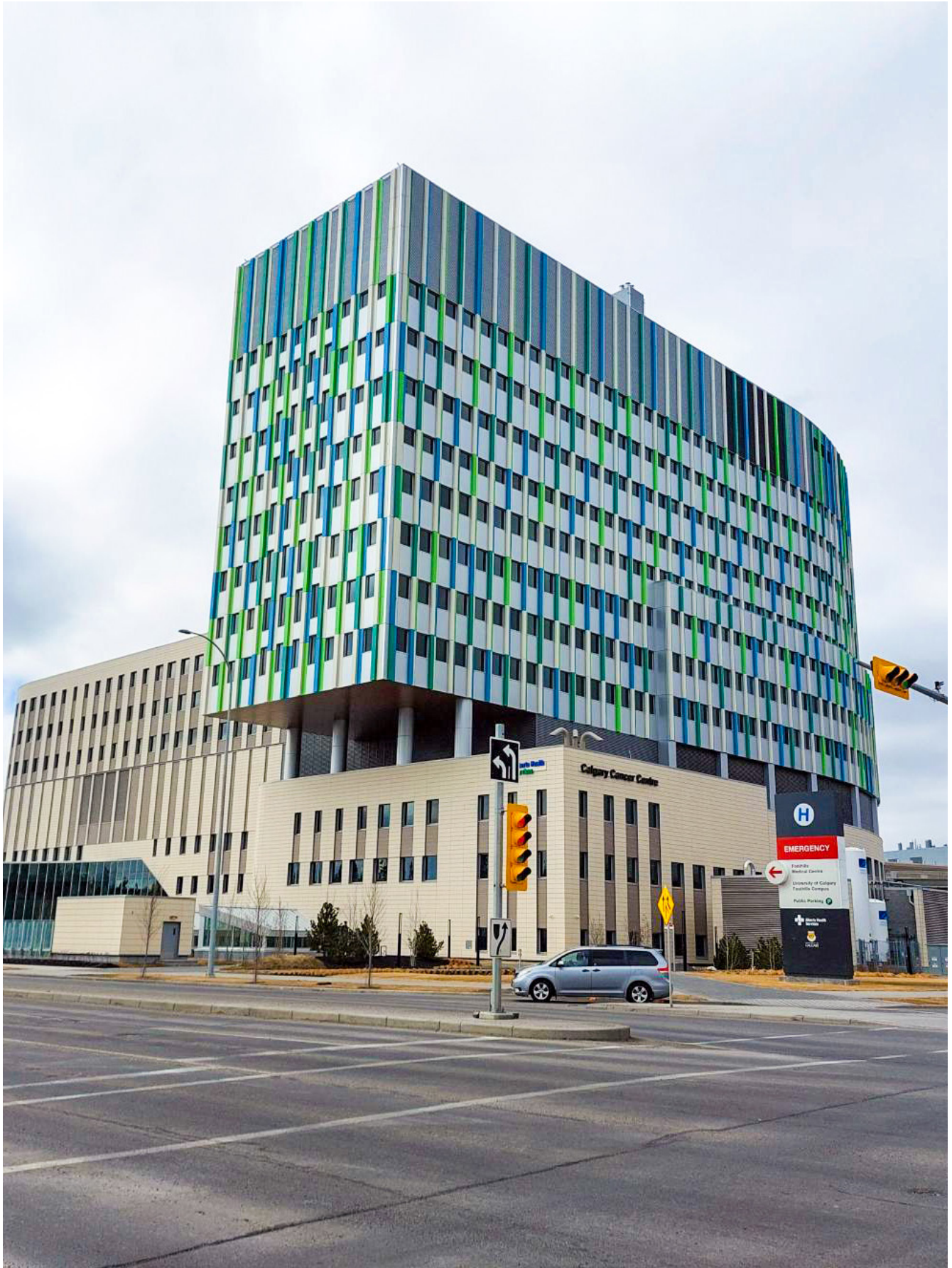
The project vision includes the following guiding principles:

- Ensuring a focus on the entire patient journey and on family involvement;
- Being an exceptional place with abundant natural light;
- Being recognized as a place where science is connected to best practices in care.

In addition, the project will provide significant economic benefit. It is one of the largest job creators in Alberta and a key part of Alberta's Recovery Plan to build and create jobs.

**More than 8,770 construction and construction-related jobs in the Calgary region were created during Phase 3. Once fully open, the new facility will create many healthcare and support services jobs for Calgary and will attract the best and brightest minds in modern cancer care and research.**





**Image 21: Calgary Cancer Centre, April 2023**

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