Stantec

2020 CANADIAN CONSULTING ENGINEERING AWARDS

BRITISH COLUMBIA INSTITUTE OF TECHNOLOGY

CANADA WAY INFRASTRUCTURE RENEWAL PROJECT

Category A – Buildings

Created a backbone for future campus development and achieving a gold standard in sustainable design

PROJECT SUMMARY

The British Columbia Institute of Technology ("BCIT") Canada Way Infrastructure Renewal Project initially began as an upgrade to the school's electrical infrastructure, with key power receiving substations and unit substations approaching the end of their expected useful life. BCIT engaged Stantec to replace the 11 substations and related infrastructure, along with the design and construction of a new power-receiving substation.

Since the electrical upgrades required underground utility work on English Road, the project grew into an opportunity to enhance the public realm of the North Campus with integration of sustainable design elements. Utilizing an integrated design approach, Stantec and BCIT took stakeholder input from the Campus Plan to transform English Road into English Walk, a pedestrian-friendly corridor that enhance the student experience and better connects the east and west sides.

The project also integrates the infrastructure-related sustainable framework, Envision, which propelled the project to sustainably innovative heights. The framework encompasses five assessment categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate Resilience. Because of its positive social, economic, and environmental impacts to the community, the BCIT North Campus Infrastructure project earned itself an Envision Gold Certification, the first educational institution to be certified under this rigorous sustainability framework.

New Canada Way Arc Resistant line-up switchgear 12.5/25kV →

PROJECT HIGHLIGHTS

Q. 1 Innovation

Briefly introduce your project, i.e. what was done and why? Then explain how it demonstrates the innovative application of engineering principles or techniques. How is it distinguishable from similar projects of its type?

The British Columbia Institute of Technology ("BCIT") North Campus Infrastructure project initially began as an upgrade to the school's electrical infrastructure, with key unit substations and Main receiving substation approaching the end of their expected useful life. Several objectives included:

- Construct a new Canada Way power receiving substation to replace the existing aging Canada Way receiving substation
- Infrastructure improvements associated with the adjacent modernization of electrical upgrades.
- Replace all aging unit substations on the north campus serving buildings north of Goard Way road over a period of four (4) years.
- Establish a new BC Hydro connection at the corner of Carey Ave and Canada Way. The new electrical backbone infrastructure was built on the north campus, which encompassed three major electrical services:
    - High voltage (HV -12.5/25kV)
    - Low voltage (LV - below 750V) and,
    - Telecommunication / control / safety service

1st
Educational Institution
with Envision Gold Certification

The main receiving station building from which the electrical high voltage distribution currently originates for almost entire campus was equipped on the beginning of the project only with Goard Way line-up substation used mainly to feed South and partially North Campus loads. Design team has decided then to build new Canada Way substation within the same main receiving station building which was large enough to accommodate new equipment and thus become the central power point for entire campus. It should be emphasized also that all 11 unit substations are built in so called secondary selective type of configuration meaning 100% redundancy in power supply for all the loads on them thus bringing the probability of losing the electricity to the minimum. During the preliminary stages, the design team also identified a safety risk of arc-flash and proposed adding an arc-flash duct to both existing line-up and the new Canada Way project equipment line-up. The gas/arch-flash duct was added and routed to the roof of the building to redirect the energy of an arc-flash explosion away from the maintenance staff and away from pedestrian traffic outside the building. This practice is relatively new in the industry and makes the installation safer to maintenance staff in the building and less restrictive in where work can be done within the building boundaries.

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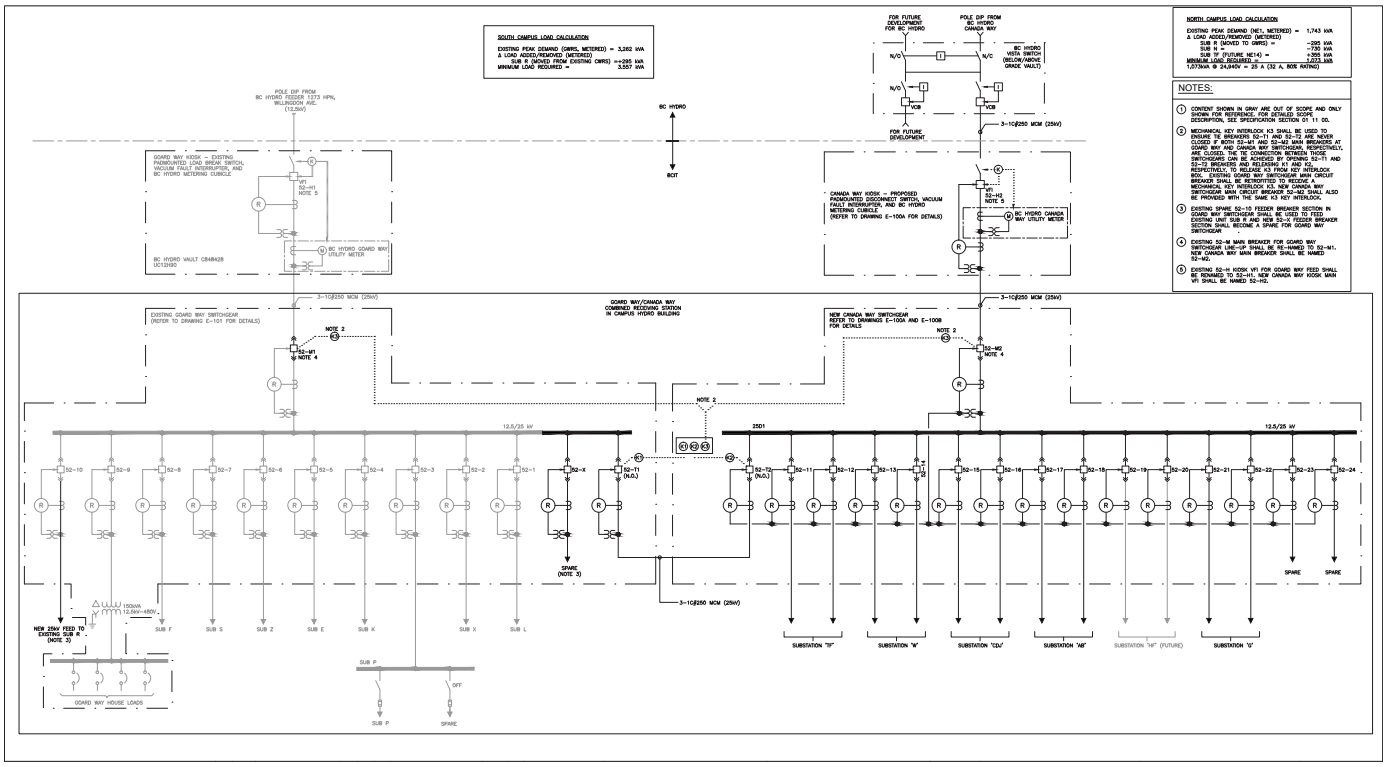
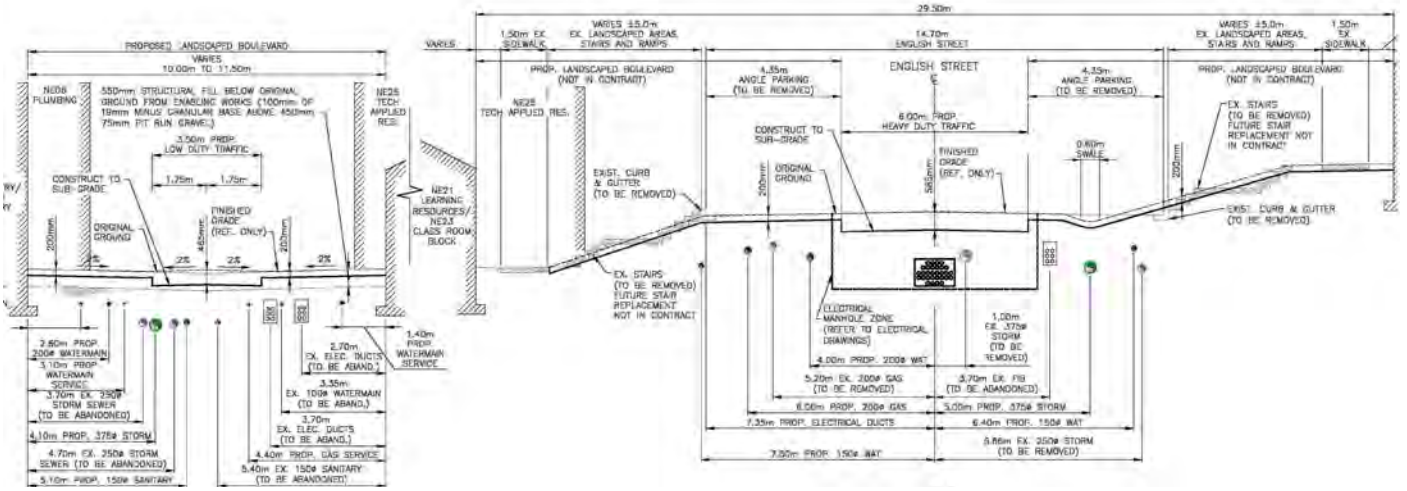

SOUTH CAMPUS LOAD CALCULATION
NORTH CAMPUS LOAD CALCULATION
NOTES:
GOARD WAY/CANADA WAY COMBINED RECEIVING STATION IN CAMPUS HYDRO BUILDING
EXISTING GOARD WAY SWITCHGEAR (REFER TO DRAWING E-101 FOR DETAILS)
NEW CANADA WAY SWITCHGEAR REFER TO DRAWINGS E-100A AND E-100B FOR DETAILS
3-1C/250 MCM (25kV)
12.5/25 kV
SUBSTATION "P"
SUBSTATION "W"
SUBSTATION "CDJ"
SUBSTATION "AB"
SUBSTATION "H" (FUTURE)
SUBSTATION "O"
SPARE
GOARD WAY HOUSE LOADS


PROPOSED LANDSCAPED BOULEVARD
VARIES
10.00m TO 11.50m
550mm STRUCTURAL FILL BELOW ORIGINAL GROUND FROM ENABLING WORKS (100mm OF 19mm MINUS GRANULAR BASE ABOVE 450mm 75mm PIT RUN GRAVEL)
3.50m PROP. LOW DUTY TRAFFIC
CONSTRUCT TO SUB-GRADE
ORIGINAL GROUND
FINISHED GRADE (REF. ONLY)
NE26 PLUMBING
NE25 TECH APPLIED RES.
NE21 LEARNING RESOURCES/ NE33 CLASS ROOM BLOCK
2.60m PROP. 200ø WATERMAIN
3.10m PROP. WATERMAIN SERVICE
3.70m EX. 250ø STORM SEWER (TO BE ABANDONED)
4.10m PROP. 375ø STORM
4.70m EX. 250ø STORM SEWER (TO BE ABANDONED)
5.10m PROP. 150ø SANITARY
2.70m EX. ELEC. DUCTS (TO BE ABAND.)
1.40m PROP. WATERMAIN SERVICE
3.35m EX. 100ø WATERMAIN (TO BE ABAND.)
3.70m EX. ELEC. DUCTS (TO BE ABAND.)
4.40m PROP. GAS SERVICE
5.40m EX. 150ø SANITARY (TO BE ABANDONED)
29.50m
VARIES
1.50m EX. SIDEWALK
VARIES ±5.0m EX. LANDSCAPED AREAS, STAIRS AND RAMPS
PROP. LANDSCAPED BOULEVARD (NOT IN CONTRACT)
14.70m
ENGLISH STREET
4.35m ANGLE PARKING (TO BE REMOVED)
6.00m PROP. HEAVY DUTY TRAFFIC
0.60m SWALE
EXIST. CURB & GUTTER (TO BE REMOVED)
EX. STAIRS (TO BE REMOVED) FUTURE STAIR REPLACEMENT NOT IN CONTRACT
ELECTRICAL MANHOLE ZONE (REFER TO ELECTRICAL DRAWINGS)
1.00m EX. 375ø STORM (TO BE REMOVED)
4.00m PROP. 200ø WAT
5.20m EX. 200ø GAS (TO BE REMOVED)
5.00m PROP. 200ø GAS
3.70m EX. FIB (TO BE ABANDONED)
5.00m PROP. 375ø STORM
7.35m PROP. ELECTRICAL DUCTS
6.40m PROP. 150ø WAT
7.50m PROP. 150ø WAT
8.66m EX. 250ø STORM (TO BE REMOVED)

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New Canada Way receiving substation - Power Single Line Diagram

Coordinated Civil and Electrical Infrastructure Details at North Campus

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Typical substation enclosed within fence enclosure

Q. 2 Complexity

Explain any extraordinary problems and conditions that were overcome.

This project's level of complexity was high as it involved an underground distribution of high voltage duct banks coordinated with existing and new stormwater, water and sanitary lines and existing gas lines and future daylighted Guishon creek. In addition, the project included the provision of five new unit substations on the north campus. The new substations had to be dual 12.5/25kV rated and each had its own design for grounding, fencing and landscaping to blend in with the surrounding areas as best as possible. The most challenging part was replacement of failing indoor unit substation at the welding trade building with the new on the run, e.g. while trades building was operational. New mobile unit substation was used as a temporary power source in this successful operation without consequences for the trades teaching schedule.

The project established redundancy in power supply to the entire BCIT campus. With existing Goard Way power line up (12.5kV) and our new Canada Way 12.5/25kV line up campus received two main independent power supplies that are able to support each other. Further, Stantec upgraded and finalized SCADA monitoring system for the entire campus. This system now allows monitoring and timely intervention in the case of malfunctioning of major electrical distribution system components and allowed for centralized gathering of metering data.

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Typical substation enclosed

3 Social and/or Economic Benefits

Explain the social and economic benefits to society provided by your project. Be specific and provide qualitative and quantitative information.

Since the electrical upgrade required underground utility work and civil engineering design on English Street, BCIT and Stantec decided to transform the roadway into a pedestrian-friendly corridor, turning it into English Walk. The walkway consisted of added landscape features to enhance and beautify the public realm and improve stormwater retention. Added seating areas, cycling paths, and care share parking were also included as part of BCIT's Campus Plan's stakeholder input. In addition, the rejuvenated and future proofed North Campus will facilitate campus growth and continue to improve the student experience at a rapidly growing institution.

The upgrades to the electrical infrastructure directly impact the BCIT community by providing a more robust system delivering power and communications to the campus. These new underground distribution systems and new unit substations will help minimizing the power outages. In addition, the conversion English Street to a pedestrian thoroughfare, appropriately renamed English Way means making the campus safer to get around and more enjoyable. Further with provision for the future daylighted Guishon Creek which will allow a natural flow of the fishing stream across the campus.

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Added plants to improve stormwater retention during heavy rainfall

Enhancing the student environement with implementing future daylighted of Guishon Creek which will allow a natural flow of the fishing stream across the campus.

Q. 4 Environmental Benefits

Explain how your project addresses environmental/ sustainability issues.

Sustainability is at the heart of this project, with the Envision framework rigorously applied to the project from start to finish. The five distinct categories that form the basis of Envision assess how the infrastructure upgrades impact: 1) Quality of Life; 2) Leadership; 3) Resource Allocation; 4) the Natural World; and 5) Climate and Resilience. These key elements ensure that the project has a positive contribution to the social, economic, and environmental aspects of a community.

Climate change effects to the Burnaby area were taken into considerations during the design of the upgrades in order to create resilience for increase in precipitation and warming temperatures. Key design features include the use of light-coloured pavers to increase the solar reflectance index and keep surfaces cool, and making room for more green space to accommodate cooler campus microclimates and increase ambient air temperatures.

In addition, the electrical upgrades have created an opportunity for microgrids to offset energy usage and incorporate alternative renewable sources such as onsite biomass, solar (already exists), and wind power. These microgrids well help balance the amount of power generated to how much is demanded, which can offset blackouts, and, in the long run, allow the campus to be more resilient and self-sufficient in the event of power failure.

The North Campus Infrastructure Upgrade has been Envision Gold Certified, making BCIT the first educational institution in Canada to be validated and certified using the Envision framework.

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Envision certified. BCIT is the first post-secondary facility in North America to be Envision Gold certified for an infrastructure project

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Enhancement of public realm through more social spaces, a key goal in the Campus Plan

Q. 5 Meeting Client's Needs

Explain the client's main project goals and how you met them.

The British Columbia Institute of Technology (BCIT) North Campus Infrastructure project initially began as an upgrade to the school's electrical infrastructure, with with key power receiving substation and unit susbstations and Canada Way receiving substation approaching the end of their expected useful life.

While the project was led by the electrical design, in addition to the electrical consultant the team (power, protection, communication, site acquisition and monitoring data), was also comprised of a civil consultant, landscape architect, architect, arborist, mechanical consultant, communications consultant, cost consultant, construction manager and BCIT's owner's representative. Add to this list the BCIT stakeholders and authorities having jurisdiction, City of Burnaby, and BC Hydro, and you have a varied group of individuals and organizations, each requiring and providing information throughout the project that have impacts on other disciplines. It was in this regard that solid project management was vital to the success of this project.

As the direct result of using an integrated design team approach, the team found efficiencies in later phases to not only expediate the schedule but help reduce costs. The original budget was $52M but the final construction costs were $47.9M. The project was completed approximately one year ahead of schedule.