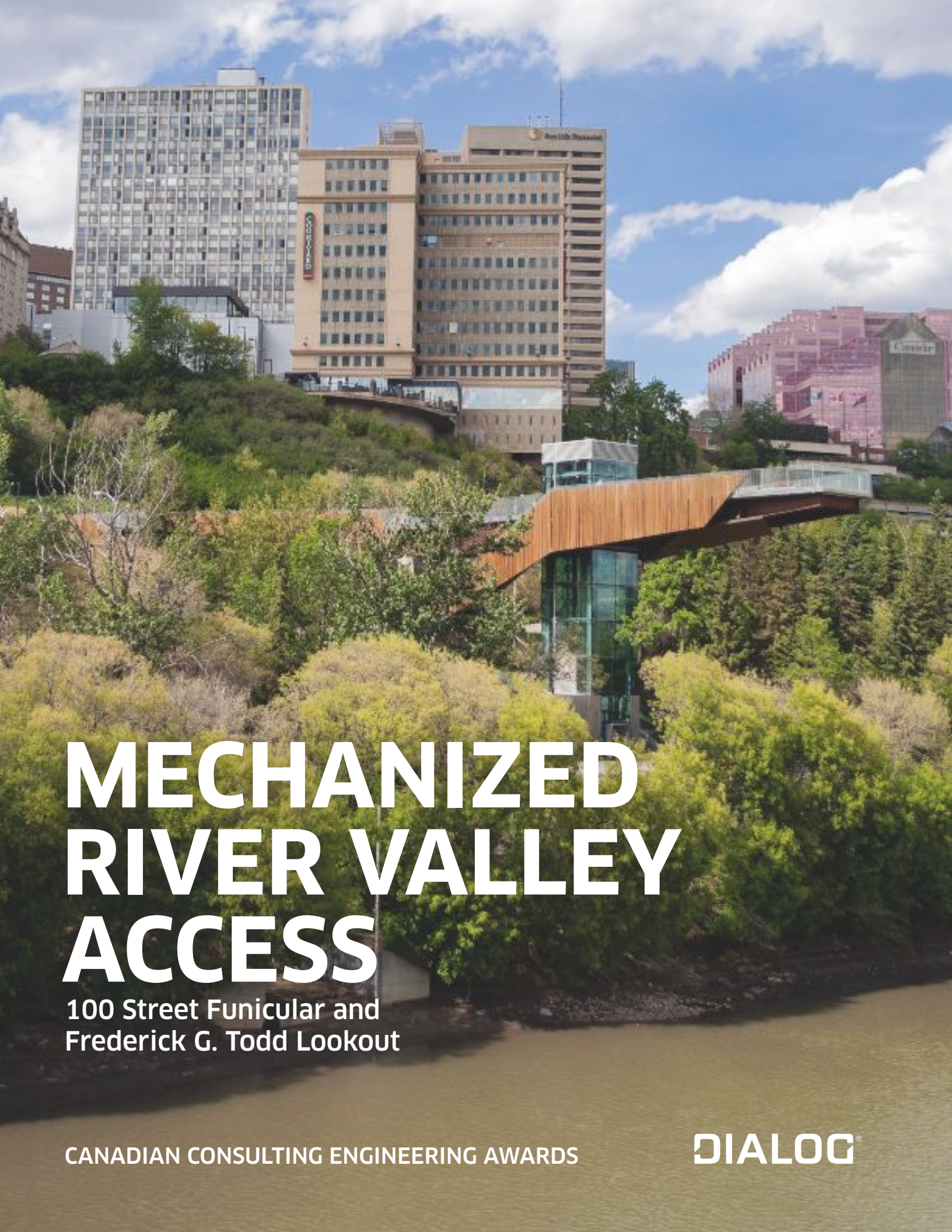


MECHANIZED RIVER VALLEY ACCESS

100 Street Funicular and Frederick G. Todd Lookout

CANADIAN CONSULTING ENGINEERING AWARDS

DIALOG®

INTRODUCTION

The North Saskatchewan River Valley is the birthplace of the City of Edmonton and the province of Alberta. The surrounding river valley that runs through the middle of Edmonton is the largest urban parkland in North America—22 times the size of New York's Central Park. The top of the river bank, which is home to Edmonton's downtown, is cut off from the river valley and trails system below by an unfortunate network of roadways, a steep slope, and an elevation change of 50 m.

The large elevation difference and steep slopes of the river valley are part of its great beauty, but also make access difficult for users with mobility challenges. The City of Edmonton had long sought to better connect the public between downtown and the North Saskatchewan River Valley. The Mechanized River Valley Access project was born to address this challenge—rich in the potential to engage every Edmontonian and visitor, regardless of mobility, in an elegant and organic narrative with the ribbon of green through the city.

DIALOG worked with the City to explore dozens of orientations and sections that allowed the project to engage with the surroundings while respecting the existing slope.

The resulting journey is comprised of a funicular (think of an elevator on an incline) with parallel stairs, a promenade and park, a pedestrian bridge, a lookout and an elevator.

Not only a major infrastructure and accessibility project, this project is defined by its emphasis on placemaking and improvement of the public realm. It is both an entrance to and a focal point in Edmonton's river valley.

THE JOURNEY

The Mechanized River Valley Access project connects downtown Edmonton to the North Saskatchewan River and the network of valley trails. More than just a funicular, the experience from the downtown top of bank to the valley bottom is enjoyed through five key elements.

PROMONTORY

At the top of the bank, a promontory acts as an extension of 100 Street and provides panoramic views of the valley. This urban plaza integrates passive and active zones for those waiting for the funicular or taking in the view. Steps connect visitors to the edge of the overlook with plenty of space for programming special events, stretching after running stairs, or watching the sun set. The promontory is the connecting place for downtown, the funicular, and the urban stairs.

The upper funicular landing consists of a canopy supported on below-grade concrete machine and electrical rooms, which contain the drive equipment for the funicular and electrical components for the upper portion of the site. Below, the structure is founded on concrete piles, which act to resist horizontal forces from the funicular and help to limit geotechnical instability in the area.

The canopy is framed with galvanized steel with glass and wood cladding. The architecturally exposed structural steel (AESS) carries the galvanized materiality and aesthetic, and provides a lightweight structure with weather protection for the funicular cabin. The concrete promontory slab is reinforced with low carbon/chromium rebar, and contains concrete with low chloride penetrability; these will serve to increase the lifespan of the structure. Galvanized steel railings provide weather protection, and reduce maintenance. This corrosion protection scheme carries throughout the project.

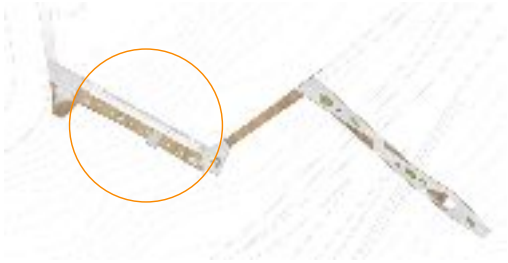
FUNICULAR AND URBAN STAIR

Funicular track: 66.0 m long along a 23.5 degree grade from horizontal

Funicular top speed: 2 metres per second

A funicular is an inclined elevator that runs between the promontory and a promenade mid-way along the valley slope. This allows people in wheelchairs, cyclists, parents with strollers, and people of all abilities to traverse the steep slope easily (and free of charge). The funicular traverses the slope on elevated steel rails and beams, providing dynamic views overlooking the picturesque valley.

Parallel to the funicular is a broad urban staircase. The stairs hover above the natural grade of the valley slope where indigenous plantings assist with the mitigation of soil erosion. The stair treads are made of Kebony, which is a softwood with a proprietary environmentally-friendly treatment that provides long-term duration resistance to rot, as well as improved dimensional stability and abrasion resistance. Integrated into the wooden treads are hollow precast concrete benches, which break up the stairs visually and provide places to rest, play, and enjoy the river views.



The stairs are supported on galvanized steel stringers. These light weight components simplified erection and assembly. Construction access was limited with lift points only at the top and bottom of the stairs because of the steep slope. The stair stringers have varying geometrical and loading requirements to accommodate the architectural aesthetic and varying urban stair geometry.

The structure on the slope is supported on steel screw piles, which allowed installation using smaller, lighter-weight equipment, thereby reducing the size of benches cut into the steep slope.

PROMENADE

The steps and the funicular land on a pedestrian promenade that takes advantage of an existing bench on the valley slope above the road network. A Kebony wood boardwalk takes pedestrians along the middle of the river bank over to a pedestrian bridge, and is adjacent to a wide lawn park area. The boardwalk foundations are steel screw piles.

Playful, eye-catching public art was incorporated into the benches. The art entitled Turbulent by Jill Anholt is a reflection of the river's active current and was selected as part of a national public art competition. The steel waves support people sitting and playing on them, while maintaining a slim, graceful form. Precast concrete benches support the art, provide additional seating, and continue the visual theme of the precast benches from the urban stairs.

PEDESTRIAN BRIDGE AND LOOKOUT

Pedestrian bridge: 50.0 m main span, 19.4 m span, 19.0 m cantilever

Length of lookout cantilever: 19 m

Height of lookout above river bank: 19 m

The spacious pedestrian bridge provides safe passage over Grierson Hill Road. People rise above traffic on a gently sloped bridge with benches and rest areas for wheelchairs along the way. The galvanized steel railings are prominent here, with architectural Kebony cladding incorporated into the railings.

The bridge is supported by only two girders consisting of notch-tough, weathering steel. This configuration allows the primary load carrying members to pass around the elevator shaft, providing an accessible connection to the river valley trails, but has less redundancy than the typical configuration with four or more girders. The design team addressed this redundancy challenge by raising the clearance to be higher than nearby bridges and exceeding typical clearance requirements. Steel bracing was used to laterally support the compression flanges, and to stabilize the girders during erection until the precast concrete deck was made continuous. The steel girders are supported on a concrete pier and steel-framed elevator shaft.

The concrete bridge deck consists of precast structural segments that are approximately 3 m long; they were grouted together and to the girders (using shear connectors and grout pockets) to provide structural continuity. Normally the deck concrete would be cast in place. Working with the CM, we found that the construction schedule would push deck construction into the winter. By using precast concrete deck segments and innovative handrail support details, we were able to install the handrails along the bridge and the top of the elevator shaft during the winter, thereby reducing the overall schedule. A cast-in-place cementitious topping was installed in the summer, along with the remaining Kebony platforms and precast concrete benches.

The south end of the bridge cantilevers out past the elevator shaft to a 19 m high lookout over the river's edge. Frederick G. Todd, an early twentieth century landscape architect, is the namesake of the lookout, an immersive, panoramic vantage point in the river valley he helped protect.

ELEVATOR AND TRAILS

Total stairs if walking from the river valley trail to the promontory: 250

Total travel time if taking funicular and elevator is about 5-6 minutes, depending on wait times

To complete the journey, an elevator and stair connect to the river valley trails below. The elevator is another essential component in creating barrier-free access to the river valley. The galvanized steel elevator shaft framing supports the bridge laterally and vertically. The bridge is supported on the shaft without bearings, causing the elevator shaft to move longitudinally with temperature changes. The steel framing also supports a glass enclosure for a visually lighter elevator shaft, and maintains river valley views through the glass elevator door along the journey.

Steel framed stairs from the lookout to Grierson Hill Road and concrete stairs from there to the river valley trails provide an active connection for those out for a jog, and provide a route through the corridor after the regular park hours, when the funicular and elevator are closed.

The lower plaza is another gathering space along the way that features bike parking, benches, and other distinct views of nature.

In only five minutes—or longer, if you linger along the way—one goes from the vibrant urban core to nature and the river valley. The project does more than simply meet the City of Edmonton's goal of providing universal accessibility to the river valley. It provides an intuitive, graceful experience that residents and visitors can enjoy throughout all seasons.

ELECTRICAL AND LIGHTING

The structure is designed to fit seamlessly into the river valley, without taking away from the natural environment. This introduced an interesting challenge for the lighting designers: how to safely illuminate multiple pedestrian surfaces, elevation changes, and elevator thresholds, while respecting the natural environment by reducing glare and up-light—all while complementing and integrating with the architectural design.

Luminaires have a correlated colour temperature of 3000K, introducing a warm and welcoming illumination. This warmth accents the natural wood elements of the structure. Special lensed, linear LED fixtures are integrated into the guardrail posts to provide vertical and horizontal lighting on the pedestrian walkway. This integration hides the light fixtures in the daytime while maximizing walking space on the path. 0-10V dimming control systems and luminaires are used to provide optimized illumination of the stairs and thresholds.

On-site commissioning of the control system balanced the lighting visual performance from the top of the platform to the base of the lookout. Performing this wholistic, on-site commissioning resulted in a cohesive lighting design that joins the serene river valley to the lively downtown core.

CONSTRUCTION

Shortly after the detailed design phase was awarded, Graham Infrastructure LP was engaged to provide construction management (CM) services, including costing and constructability consultation. This also allowed us to engage a funicular manufacturer very early in the project, which we knew from research during preliminary design could have a long lead time, and allowed the funicular design to occur simultaneously with the rest of the project.

The design included a diverse set of work scopes that required the CM to manage a wide array of subcontractors and trades, including earthworks, concrete pile and screw piles, bridge and building steel fabricators, structural concrete with architectural finishing requirements, precast structural and architectural concrete, funicular and elevator systems, electrical and data installers, carpentry, and security systems, and landscaping.

Many stakeholders were consulted and engaged throughout design and construction, including internal city groups such as the Edmonton Design Committee, River Valley Operations, Facility and Maintenance Services, and the Accessibility Committee. External organizations and businesses were also consulted, including the River Valley Alliance, the Fairmont Hotel MacDonald, and the Shaw Conference Centre.

The inherent geotechnical risk of working on this steep slope required consideration of slope stability issues early in the design process, and regular monitoring of slope stability throughout construction. The project was aligned to avoid areas with higher geotechnical risk, and the design incorporated elements such as concrete piles that could help mitigate geotechnical concerns.

THE RESULT

Mechanized River Valley Access is a unique project that all involved are especially proud of. Since the elements of the journey are so distinct in function, having consistent design details is important for continuity. This could only be achieved through collaboration between the City of Edmonton, DIALOG's integrated design team, and Graham Infrastructure LP and their partners.

The project was completed in December 2017, which was within the City's schedule goals and the project funding timelines. The completed construction cost was less than the $21 M funding that was available for the project.

The collaboration between designers, constructors, the City, and various stakeholders allowed us to overcome construction challenges and made the project stand out. The attention to detail throughout and close collaboration resulted in an enjoyable experience for all Edmontonians between downtown and our incredible river valley.

https://www.instagram.com/p/BcoTuO2APAc/?taken-by=zacharyweeks

PROJECT TEAM

Owner
City of Edmonton

Structural, Electrical, and Mechanical Engineering, Architecture, Landscape Architecture
DIALOG

Geotechnical Engineering
Thurber Engineering

Civil Engineering
Hatch

Construction Manager
Graham Infrastructure LP