

Bertram Pedestrian Overpass

Solving its complex
geometry



Outline

1. Presenters
2. Site Layout
3. Challenges
4. Solution Options
5. Construction

Bertram Pedestrian Bridge



Our Presenters

Technical Leaders within the Entuitive's Transportation team.

Notable Projects:

- Pattullo Bridge Replacement (Vancouver)
- Garner Expressway Replacement (Toronto)
- West Montrose Bridge Rehabilitation (Waterloo)
- Government Centre Power Upgrade (Edmonton)

- Peace Bridge (Calgary)
- Fish Creek Park Stress Ribbon (Calgary)
- Anthony Henday Drive Strs. 1.3 & 1.4 (Edmonton)
- Sharq Crossing (Doha)
- Dubai Creek Harbour Tower (Dubai)



Ivy Liang, M.A.Sc., P.Eng.
Structural Engineer
Vancouver

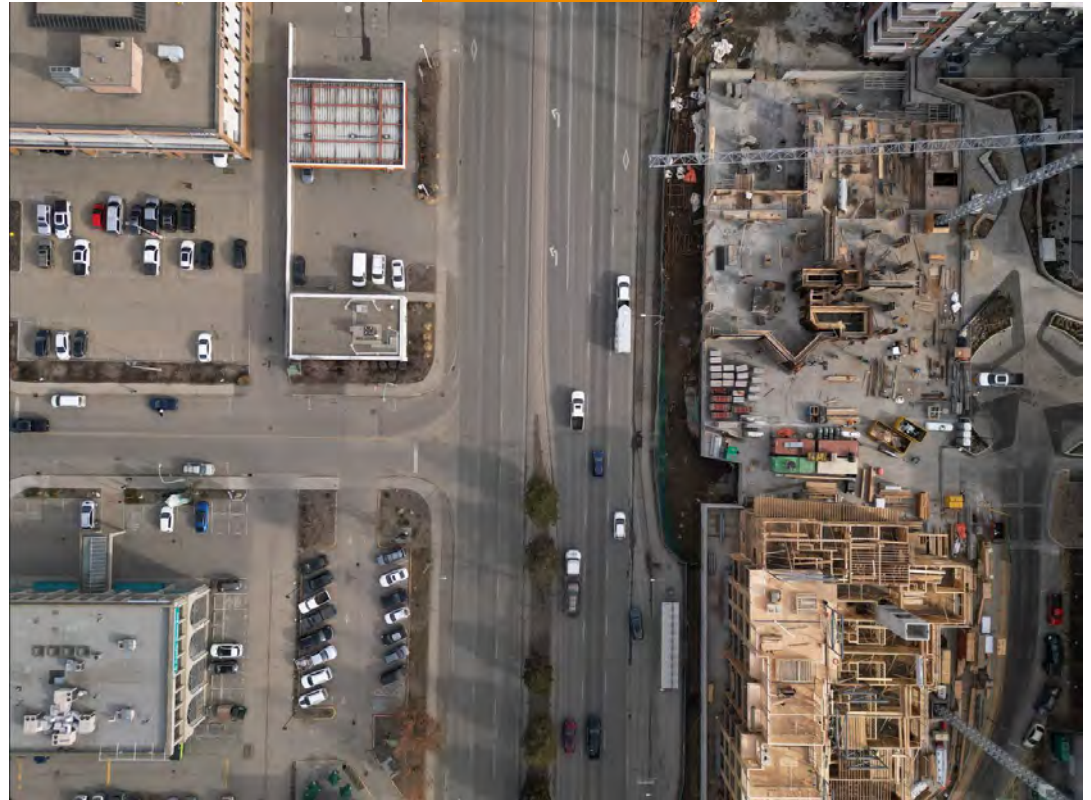


Gerd Birkle, Ph.D, P.Eng.,
Senior Associate
Calgary

Site Layout

- ✓ Located in Downtown Kelowna
- ✓ Small Construction Area (North Side)
- ✓ Landing on Condo Podium (South Side)
- ✓ Utilities Throughout the Site
- ✓ Active Highway Through the Site
- ✓ Businesses on Both Sides (North Side)
- ✓ Limited Site Access (both sides)

Active Highway



Active Businesses

Condo Development

Design Context

- ✓ Previous Design with **Budget** Constraints
- ✓ **Existing** Piles for Bridge Piers
- ✓ Alternative Project Delivery (**PDB**)
- ✓ Tight Design Schedule (**12 weeks to GMP**)
- ✓ Accessibility requirements (**max slope 5%**)
- ✓ Roads on Level Elevations (**6 m gain**)
- ✓ MUP requirements (clear **width 4 m**)
- ✓ Poor Soil Conditions (Site **Class E**)
- ✓ One Side Landing on Parkade (**Weight**)

Level Roads



~80 m long approach

~14 m wide space

Construction Context

- ✓ Alternative Project Delivery (**PDB**)
- ✓ **Coordination** with Adjacent Businesses
- ✓ Building **Within** Another Construction Site
- ✓ **Tiny** Construction Site and Laydown Area
- ✓ Tight **Schedule** (12 months)
- ✓ Building over **Active** Highway
- ✓ Building **Downtown** Kelowna (Security)
- ✓ Building right beside **Occupied** Condos

No Space



Access to Businesses

High Visibility

Solution Development – Original Concept



Explored:

Diagonal Alignment

Straight Alignment
(shorter bridge)

Different Materials

Slopes:

5.0% on straight

2.2% on curves

2.0% on bridge

Solution Development – Further Refinement



Adjustments:

Smoothen the corner

Smaller footprint

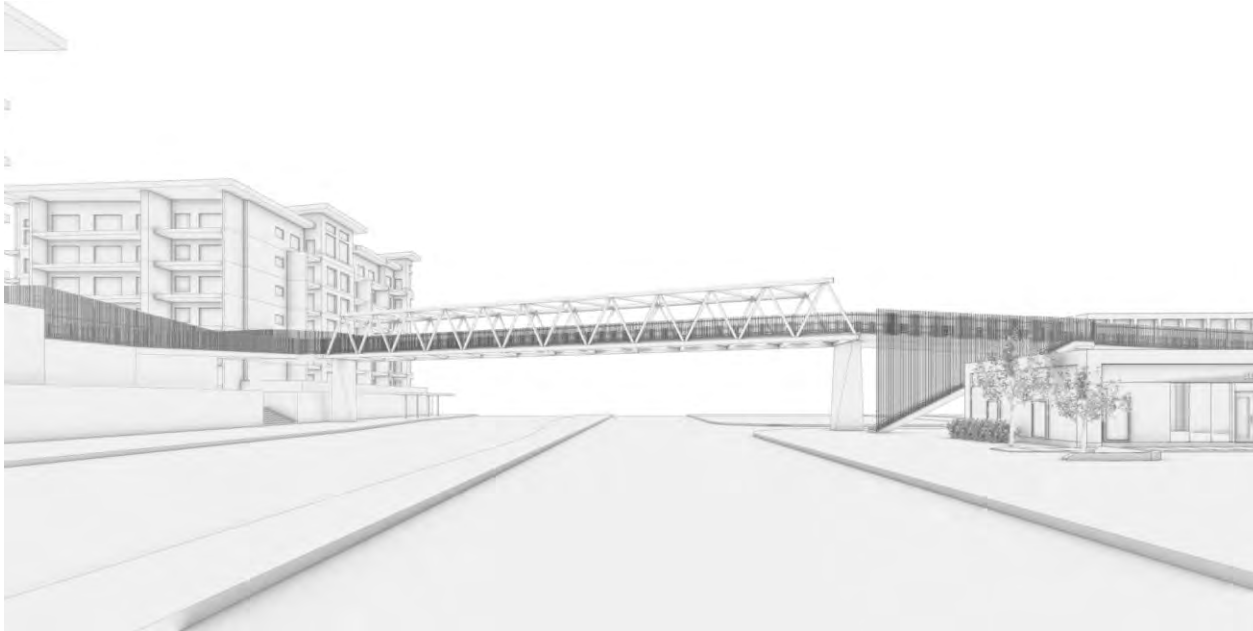
More gradual North

Angled South

Lighting

Unique railing design

Solution Development – Truss Bridge



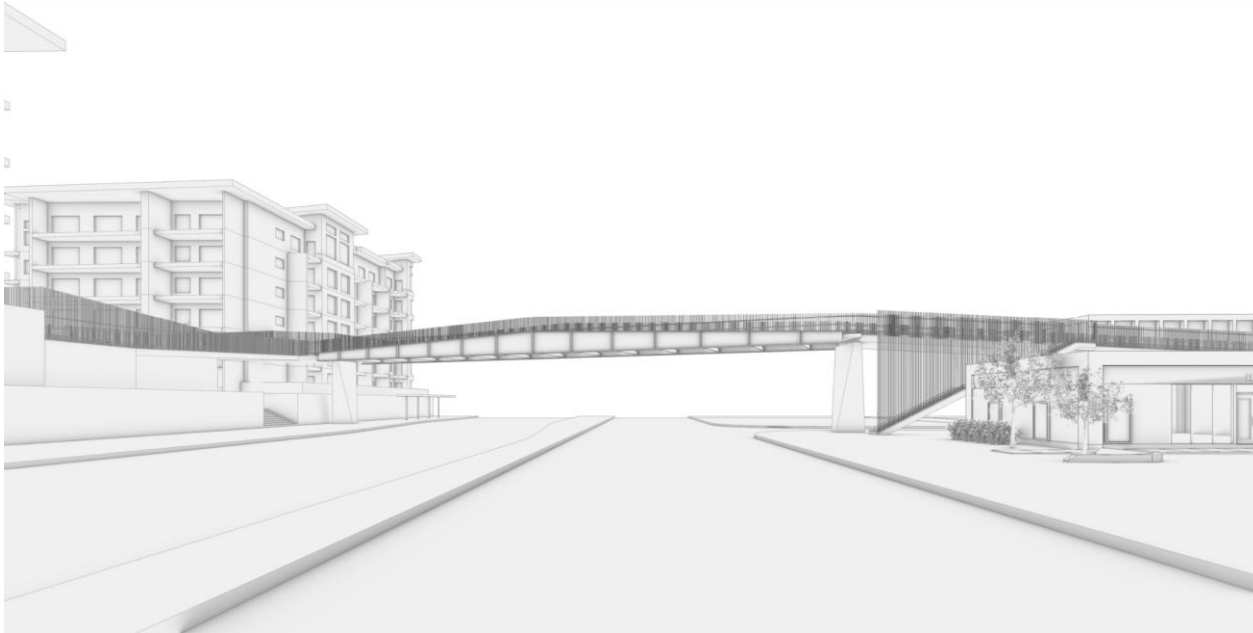
Structural System:

Single Span Space Truss

Regular Geometry (no skew)

Partial Precast Deck Panels

Solution Development – Steel Through Girder



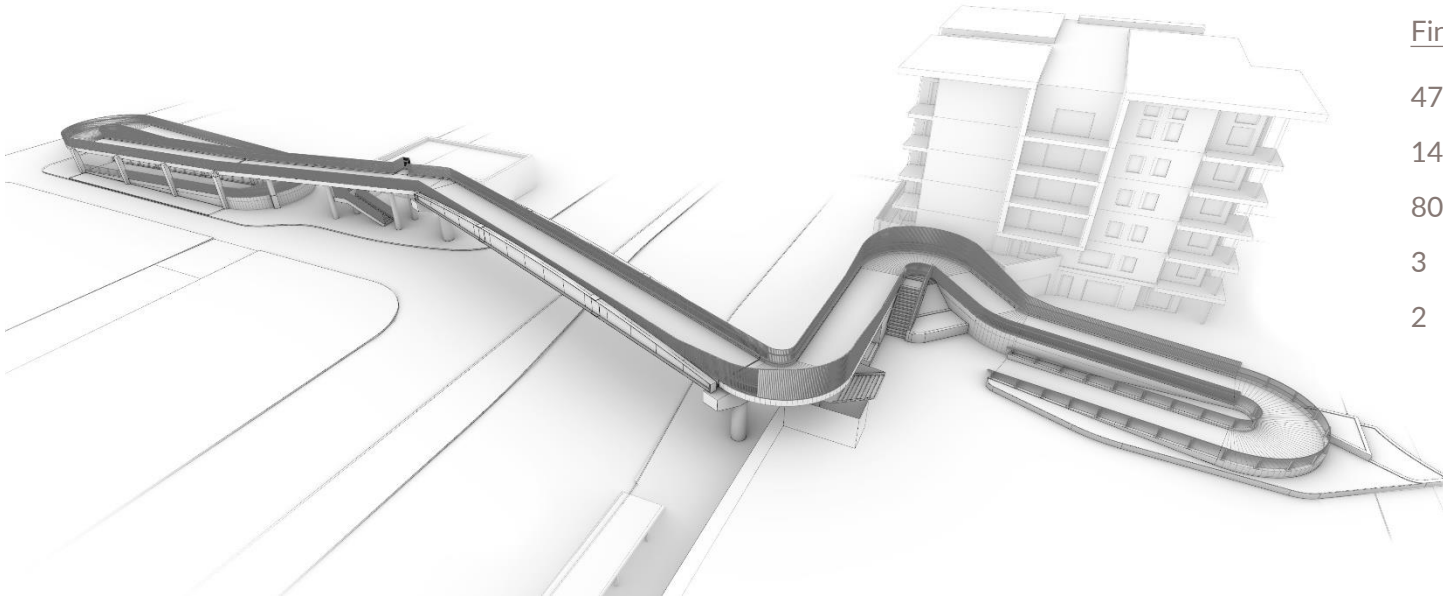
Structural System:

Single Span Steel Through Girder

No Skew

Partial Precast Deck Panels

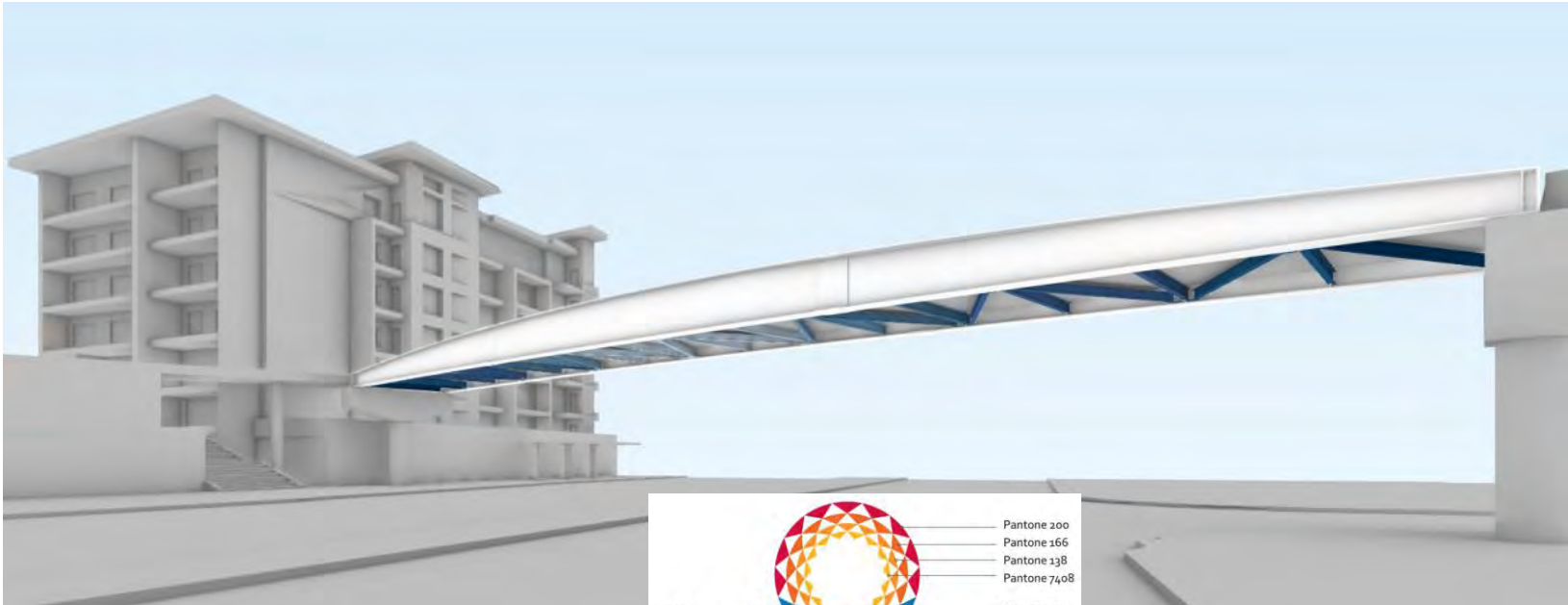
Solution – Intricate Ramp Bridge System



Final Elements:

- 47 m Main Bridge
- 140 m Ramp (South)
- 80 m Ramp (North)
- 3 Stairs
- 2 Privacy Screens

Solution – Colour Scheme



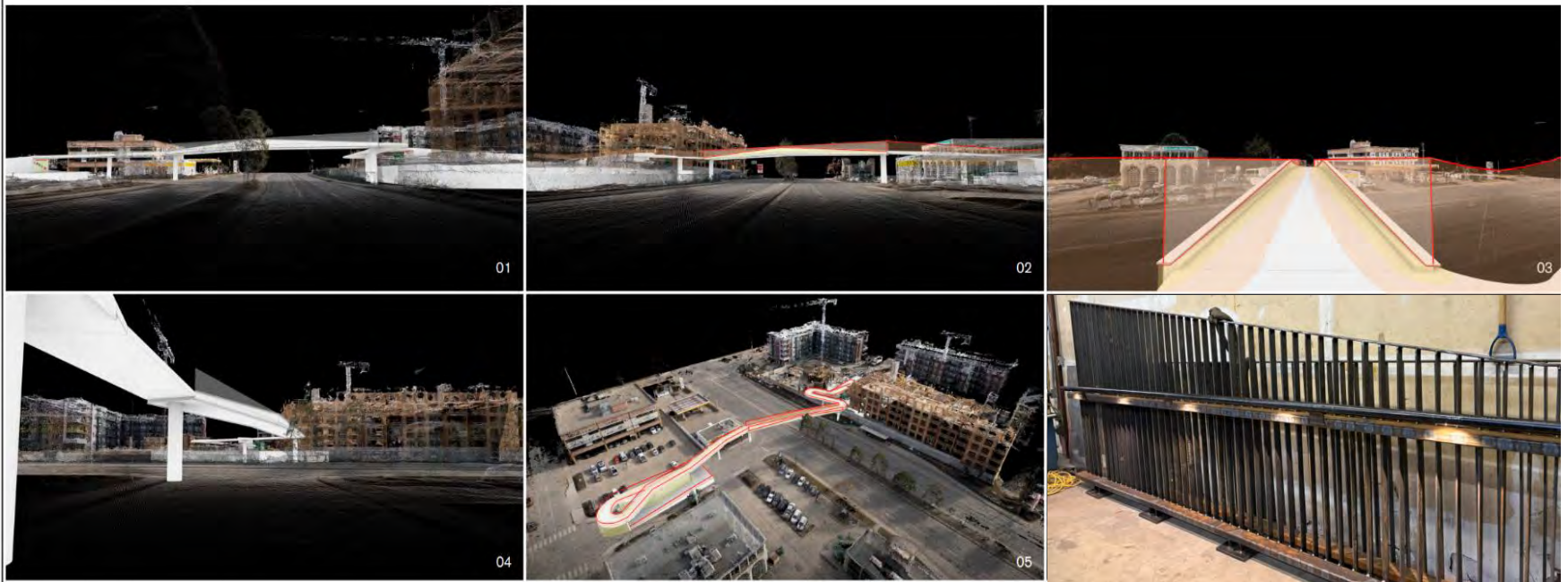


Pantone 200
Pantone 166
Pantone 138
Pantone 7408

Pantone 390
Pantone 284
Pantone 285
Pantone Black

City of
Kelowna

Solution – Lighting Scheme



Solution – Bridge Seismic Classification (CSA S6-19)

Major Road Bridge

Bridge crosses a major MOTI road

Multi-Span Bridge

Main span and approaches count

Irregular Bridge

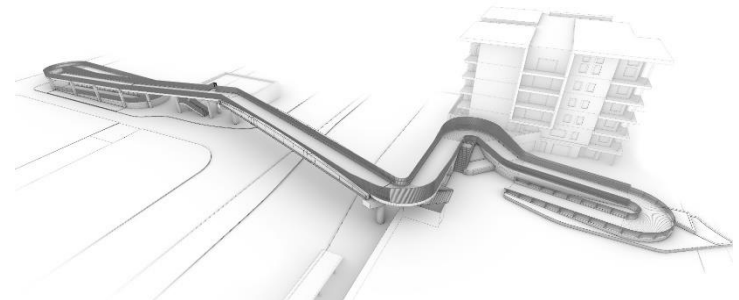
Approaches are irregular

Seismic Design Requirements (Cat 2)

Elastic Dynamic Analysis

Inelastic Static Push-Over Analysis

Performance Base Design



Solution – Cost Savings



Pad Footings

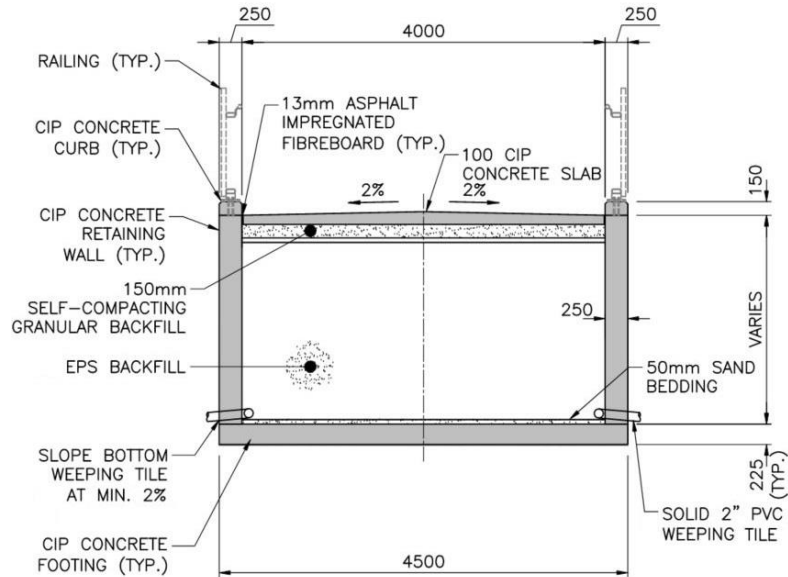
Soil Improvement

Black Steel



MMX Steel

Construction – Building on top of Parkade



Planning

Execution



Construction – Building on top of an Active Highway



Planning

Execution



A wide-angle photograph of a modern, curved pedestrian bridge with a metal railing. The bridge is set against a backdrop of a tall, white, abstract sculpture that resembles a stylized figure or a tower. To the left, a tall, modern building with a grid-like facade is visible. The bridge is situated on a hillside with greenery. In the foreground, a road with yellow lane markings leads towards the bridge. A few people are walking on the bridge, and a car is visible on the road. The sky is overcast.

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