Cornell University and The City of Ithaca
Means Restriction Pre-Schematic Proposals

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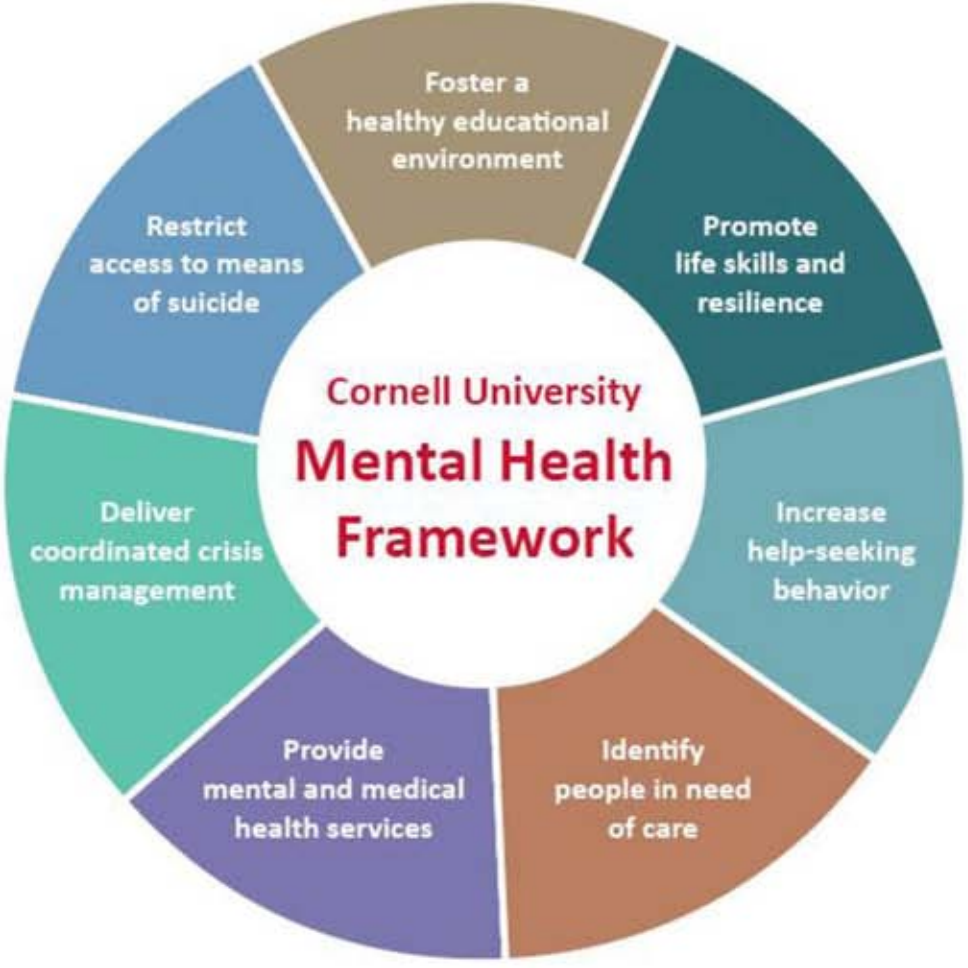
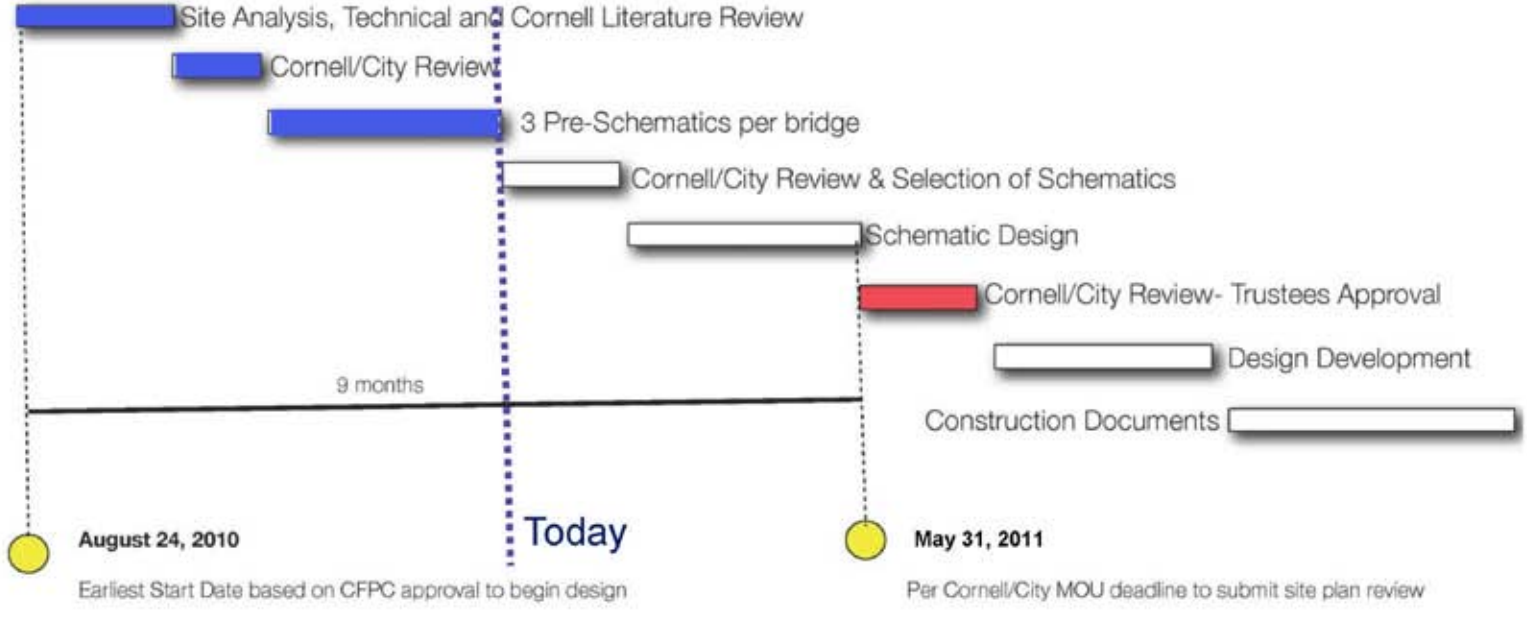
02 March 2011

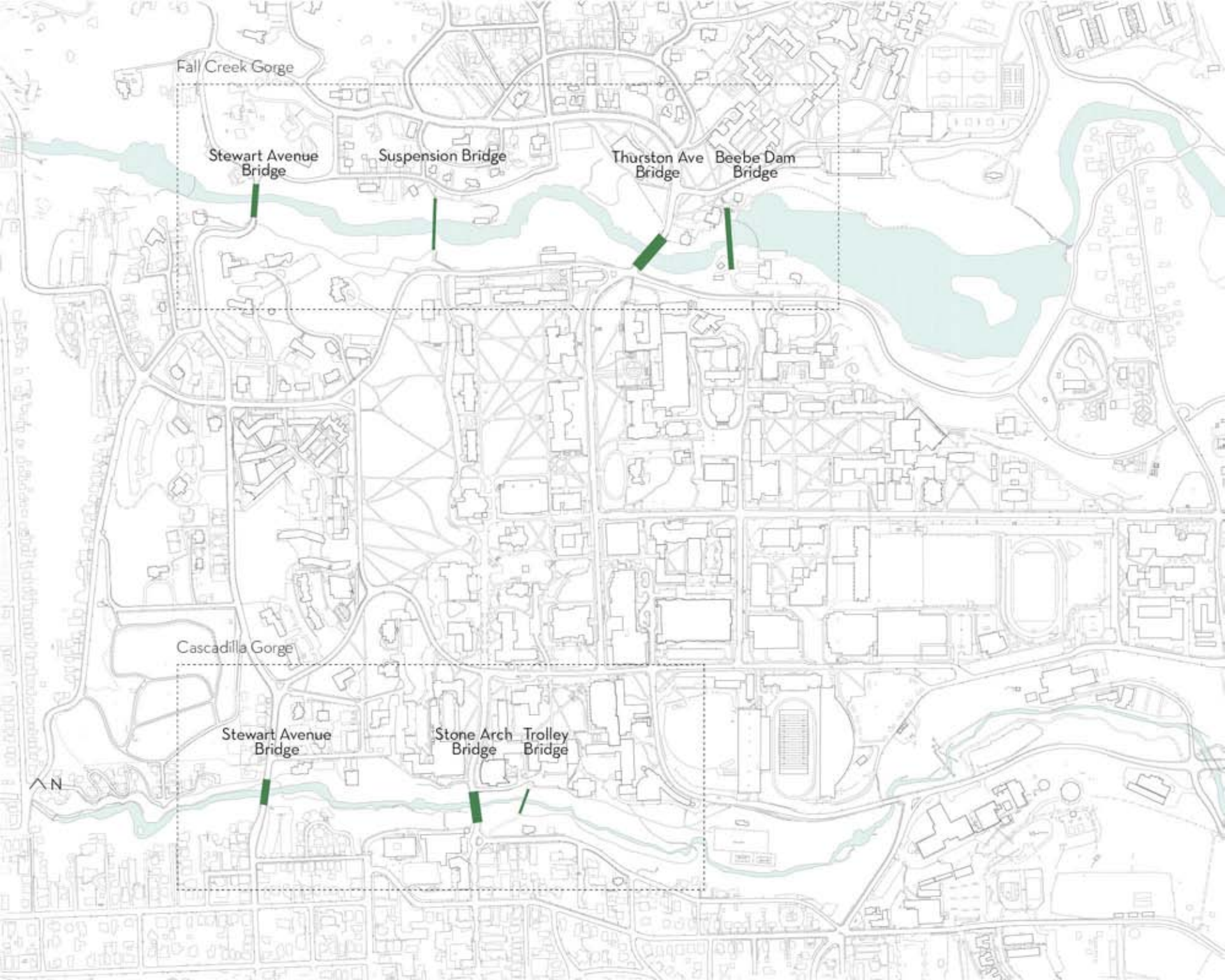

Foster a healthy educational environment
Promote life skills and resilience
Increase help-seeking behavior
Identify people in need of care
Provide mental and medical health services
Deliver coordinated crisis management
Restrict access to means of suicide
Cornell University
Mental Health Framework

Bridge Means Restriction
Long Term Approach

Design and Review Process



Long-term Bridge Means Restriction Study


Fall Creek Gorge
Stewart Avenue Bridge
Suspension Bridge
Thurston Ave Bridge
Beebe Dam Bridge
Cascadilla Gorge
Stewart Avenue Bridge
Stone Arch Bridge
Trolley Bridge
N

Materials

Bar System

Glass Wall

Tensile Steel Mesh

Stewart Avenue Bridge
at Cascadilla Creek Gorge

Span: 230 feet
Height Above Ground: 75 feet
Railing Height: 41"

High vehicular traffic
High pedestrian traffic
High visibility
Iconic campus bridge

Ownership: City of Ithaca

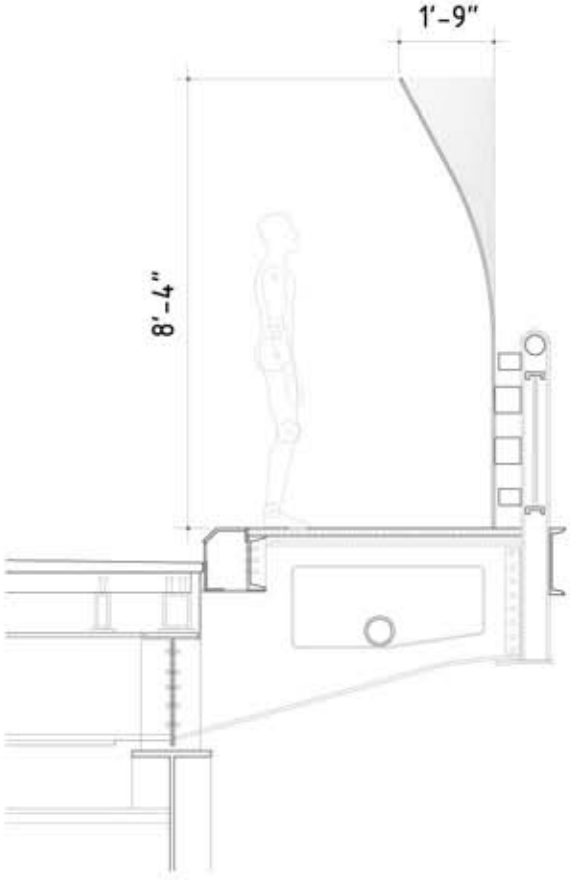
First Built as a trolley bridge in 1888, it was rebuilt in the early 1900s as a combined road/trolley bridge.

Stewart Avenue Bridge
at Cascadilla Creek Gorge

Existing

Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal A



Stewart Avenue Bridge
at Cascadilla Creek Gorge

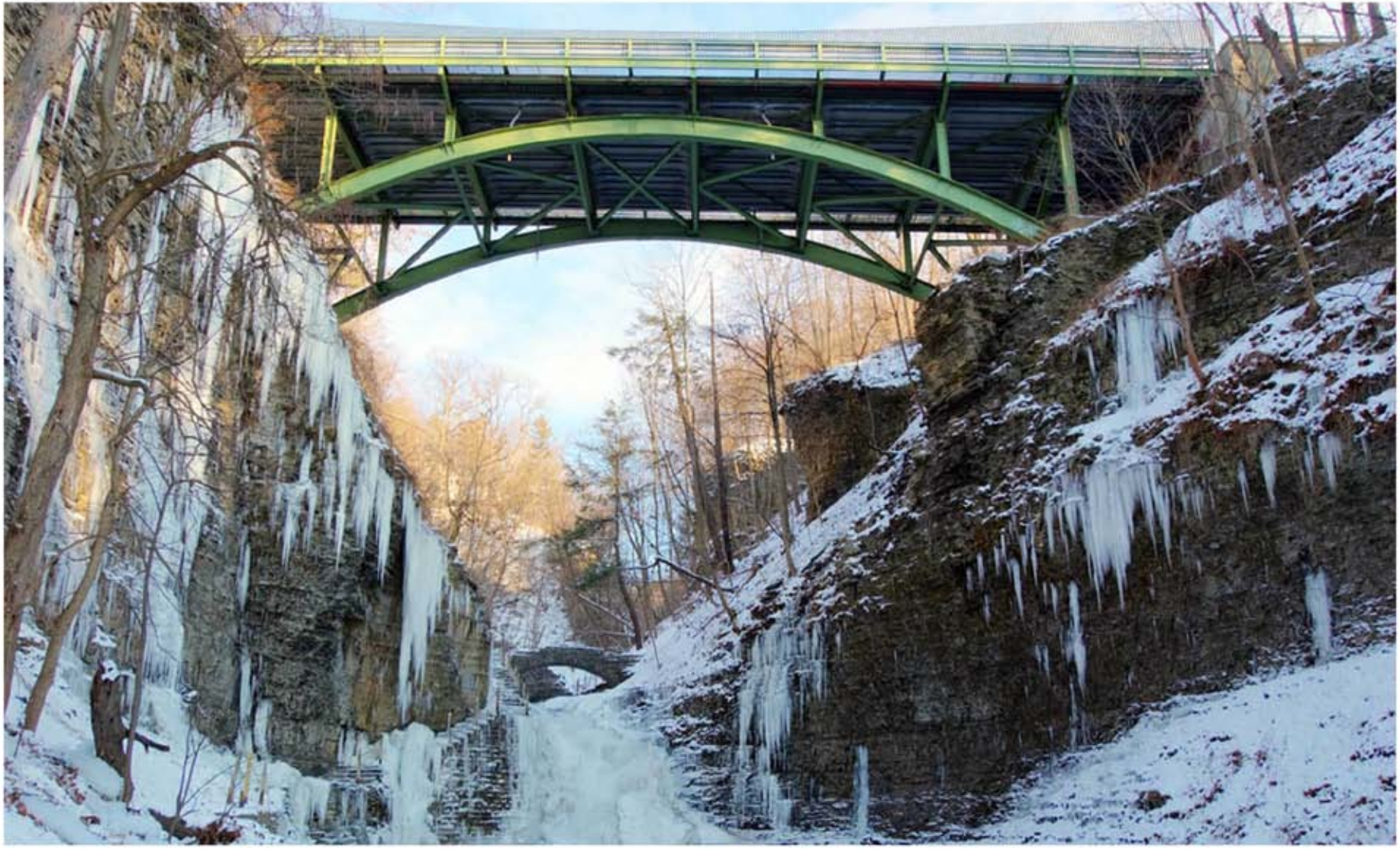
Proposal A

Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal A

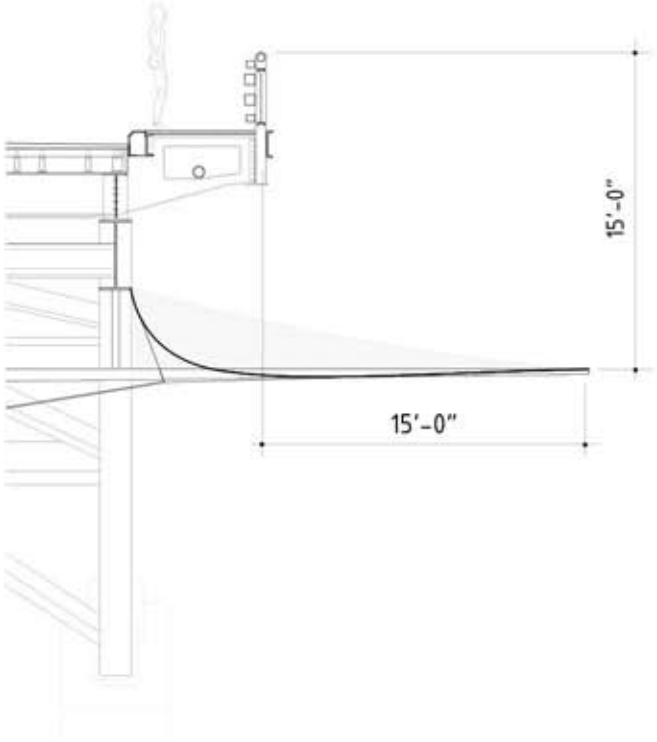
Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal A



Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal B

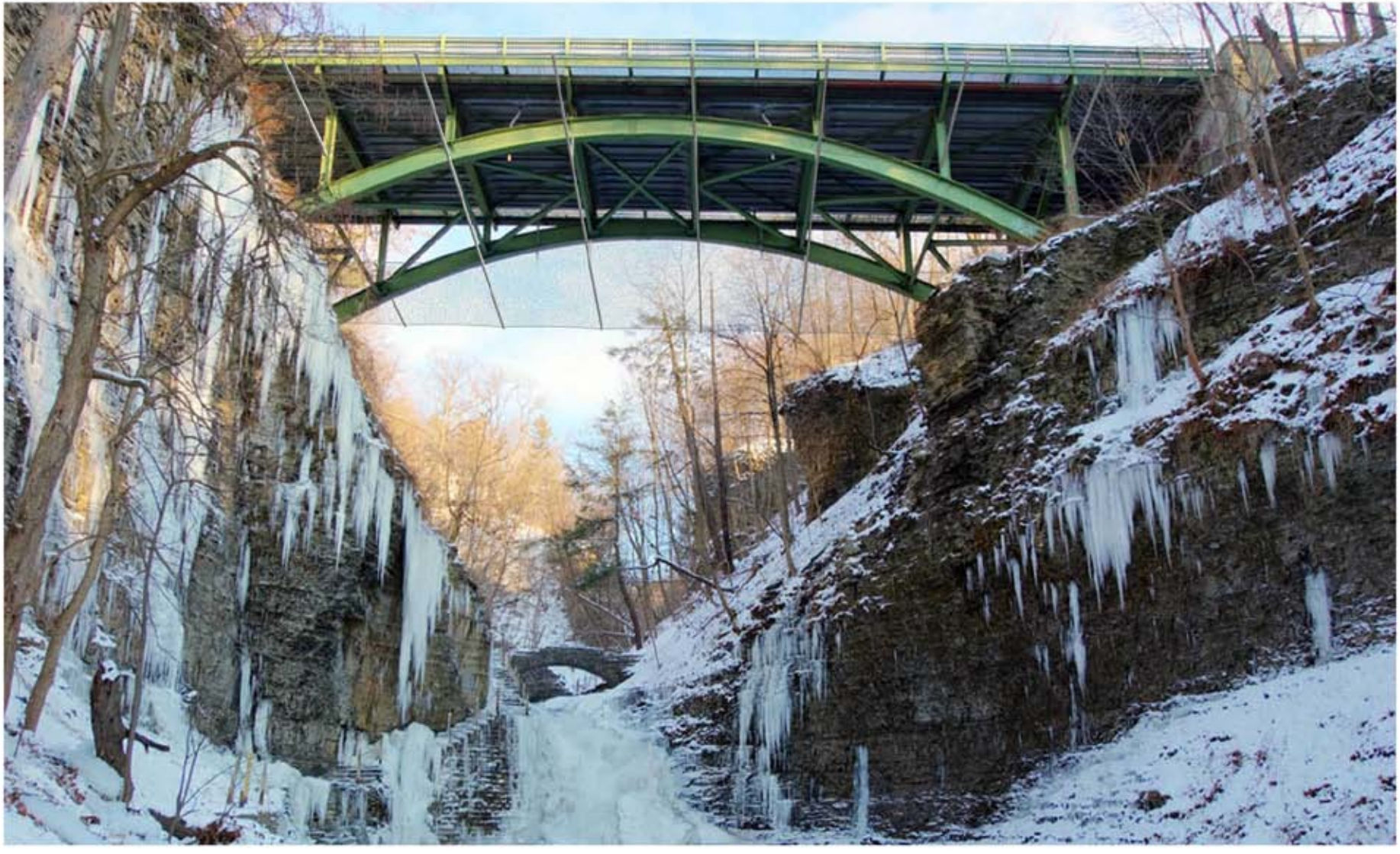


Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal B

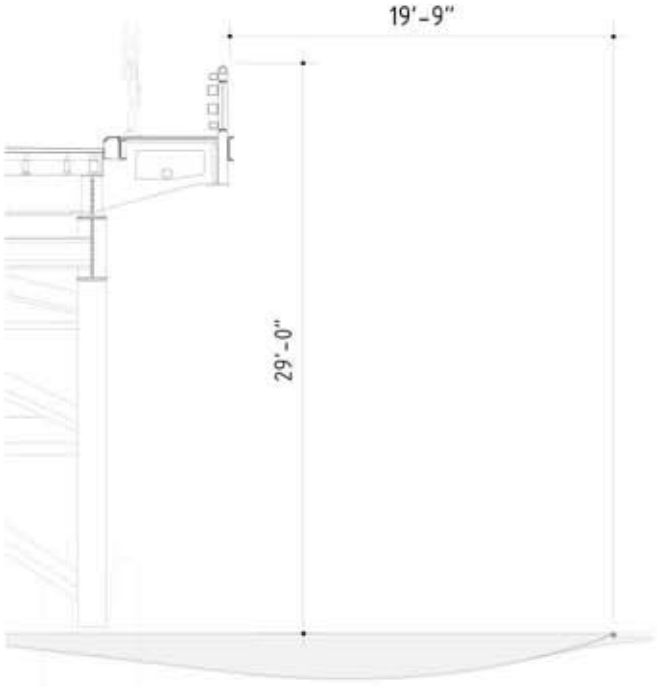
Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal B



Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal C

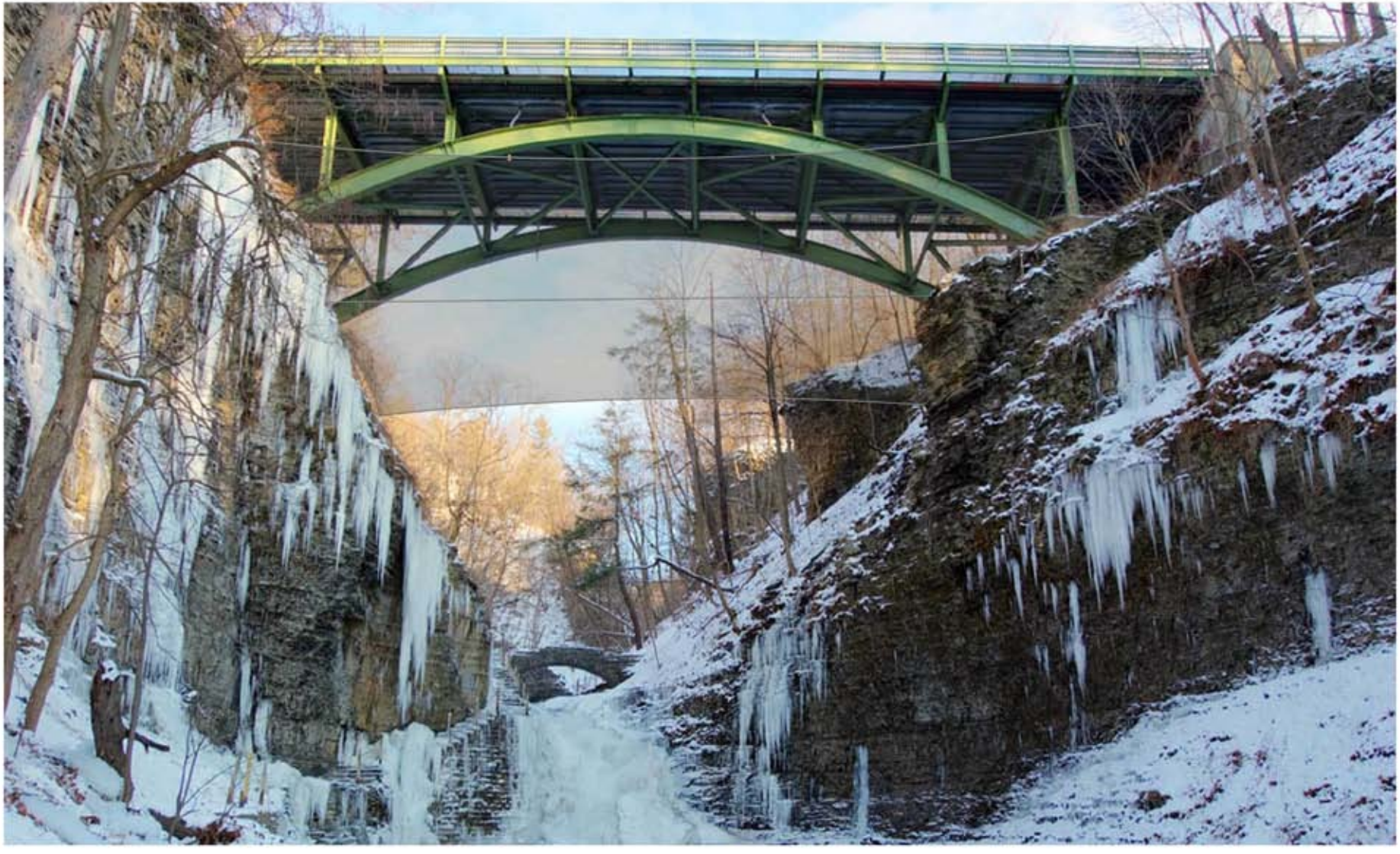


Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal C

Stewart Avenue Bridge
at Cascadilla Creek Gorge

Proposal C



Stewart Avenue Bridge
at Fall Creek Gorge

Span: 220 feet
Height Above Ground: 110 feet
Railing Height: 41"

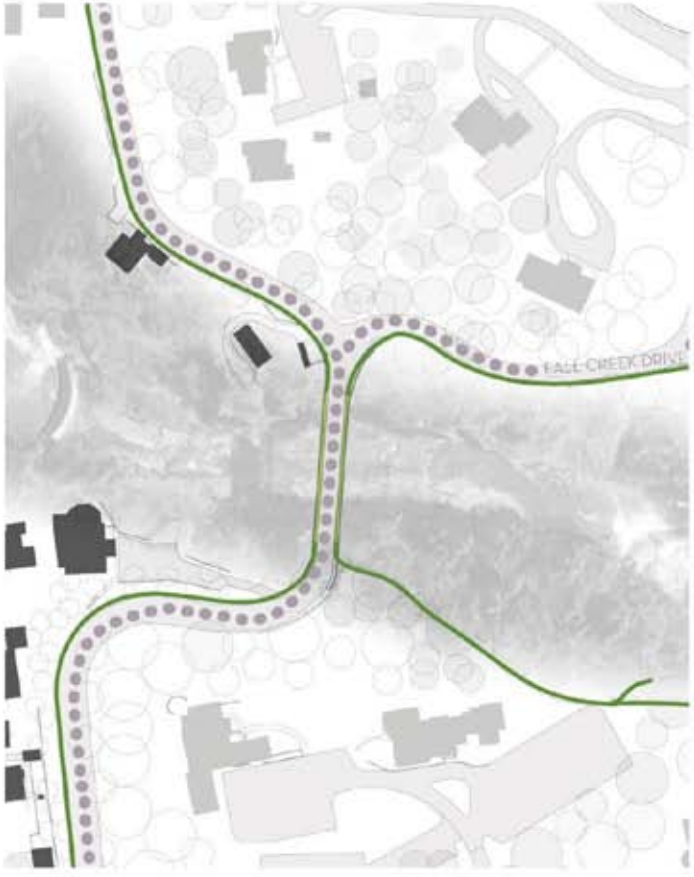
High vehicular traffic
Low pedestrian traffic
Moderate visibility
Iconic campus bridge

Ownership: City of Ithaca

First built as a trolley bridge in 1899, it was rebuilt in the early 1900s as a trolley and vehicle bridge.

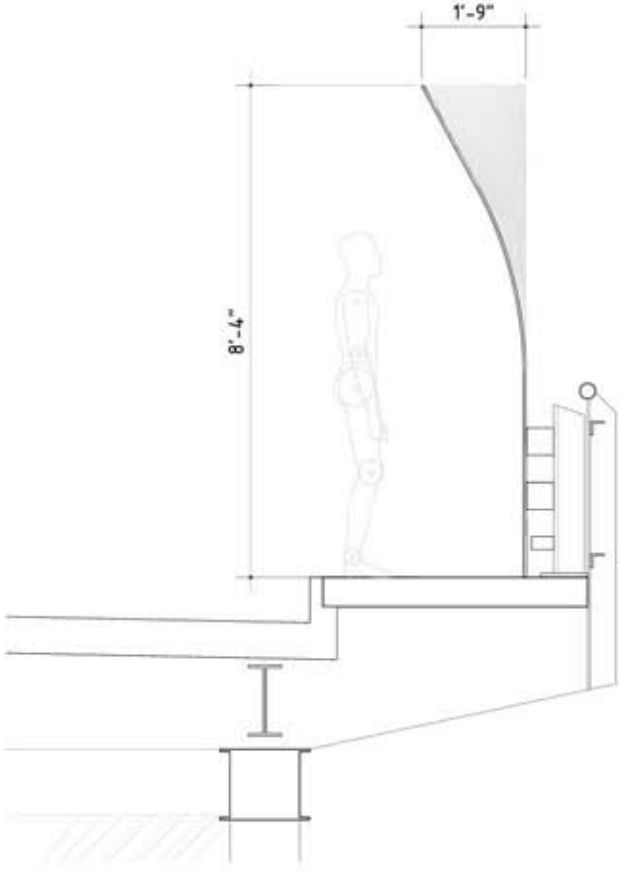
Stewart Avenue Bridge
at Fall Creek Gorge

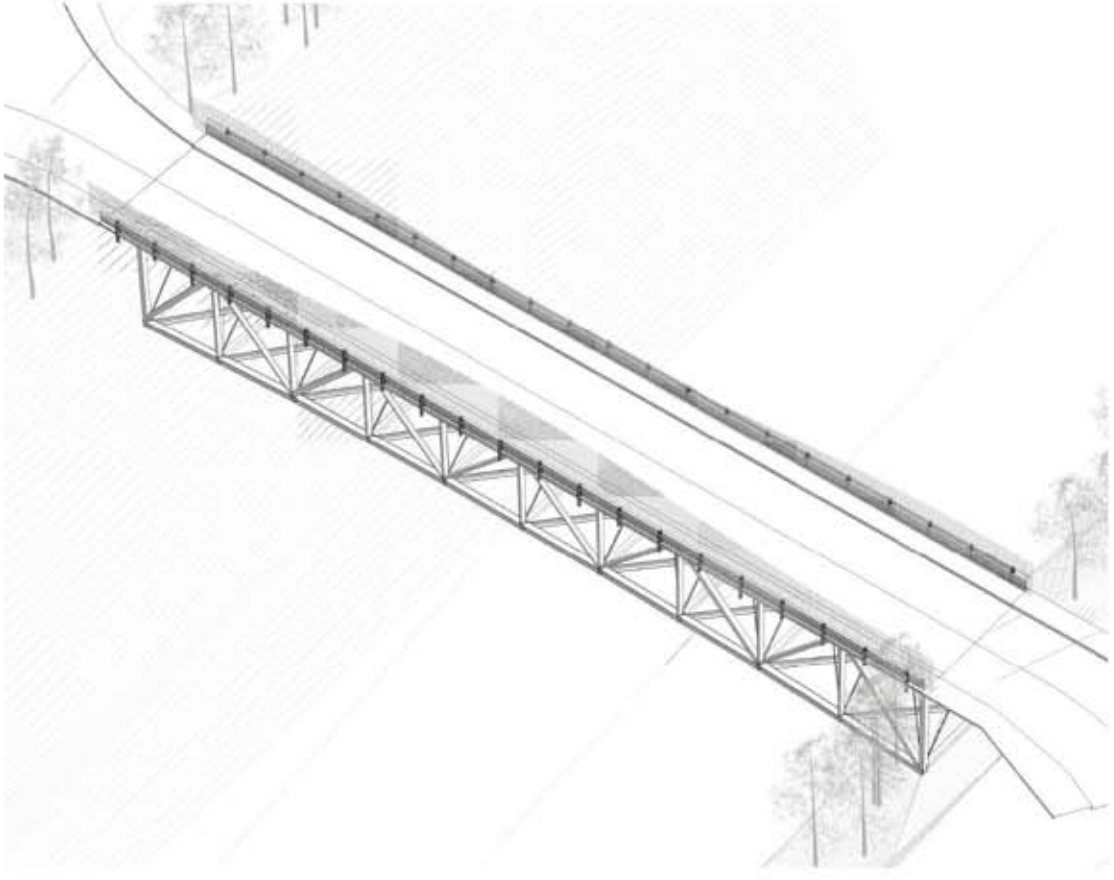
Existing



Stewart Avenue Bridge
at Fall Creek Gorge

Proposal A





Stewart Avenue Bridge
at Fall Creek Gorge

Proposal A

Stewart Avenue Bridge
at Fall Creek Gorge

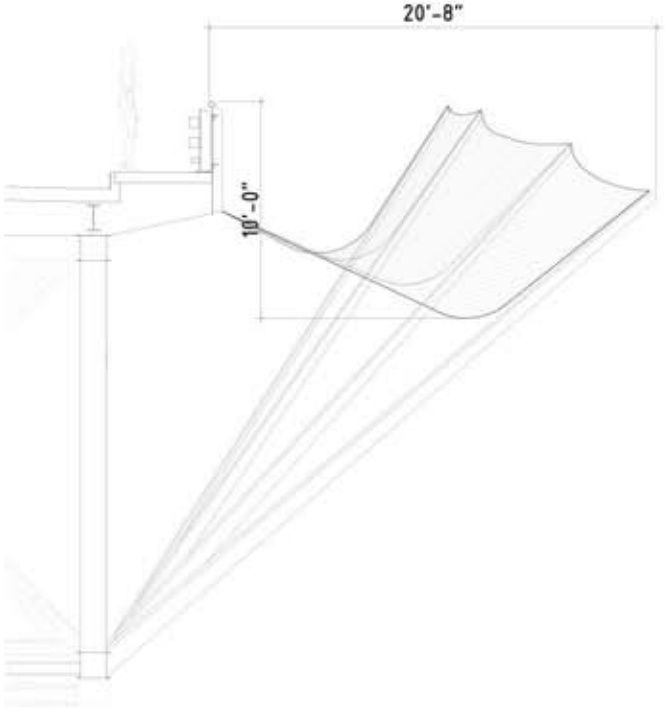
Proposal A

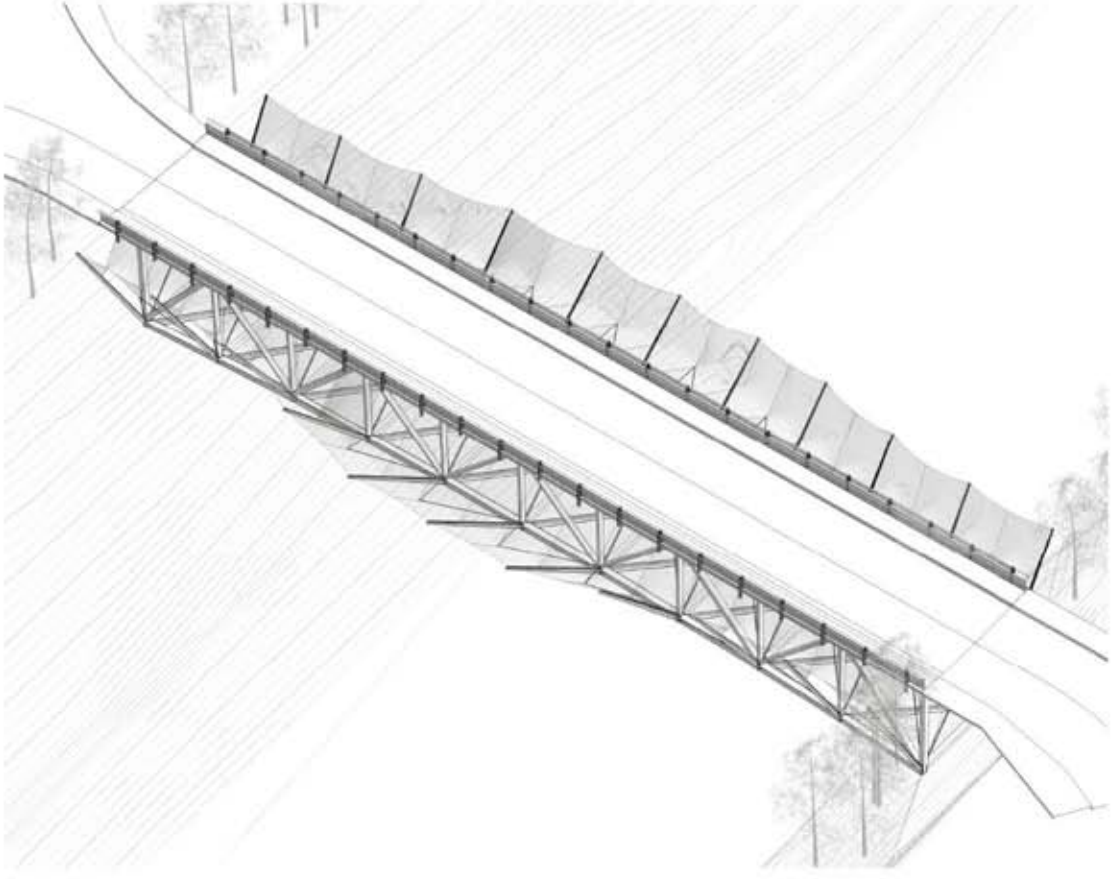
Stewart Avenue Bridge
at Fall Creek Gorge

Proposal A

Stewart Avenue Bridge
at Fall Creek Gorge

Proposal B





Stewart Avenue Bridge
at Fall Creek Gorge

Proposal B

Stewart Avenue Bridge
at Fall Creek Gorge

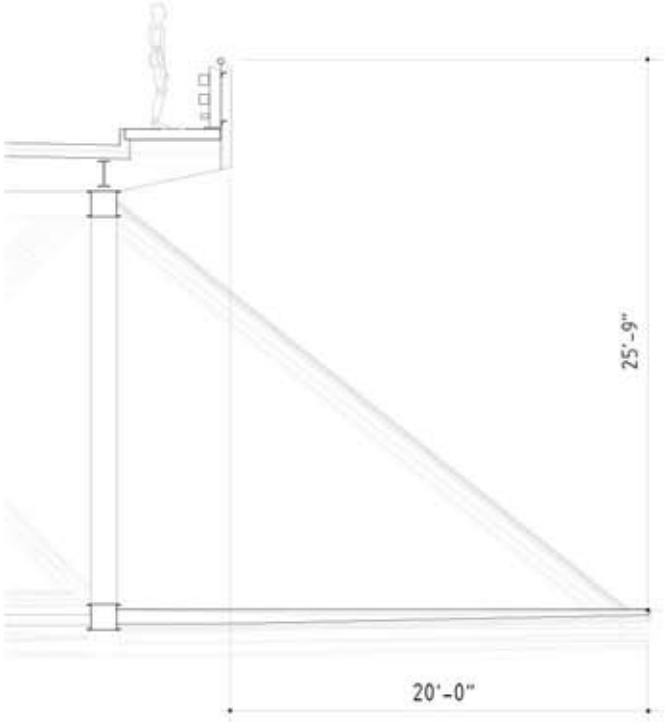
Proposal B

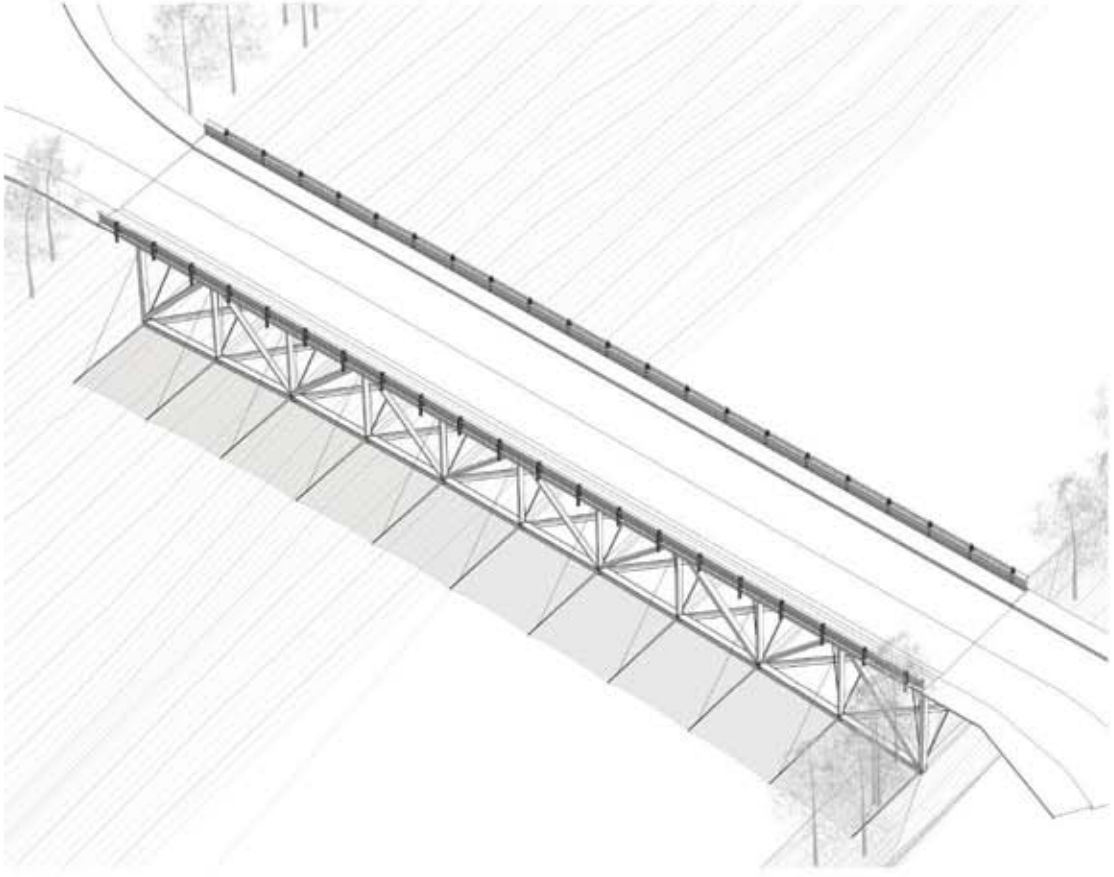
Stewart Avenue Bridge
at Fall Creek Gorge

Proposal B

Stewart Avenue Bridge
at Fall Creek Gorge

Proposal C





Stewart Avenue Bridge
at Fall Creek Gorge

Proposal C

Thurston Avenue Bridge
at Fall Creek Gorge

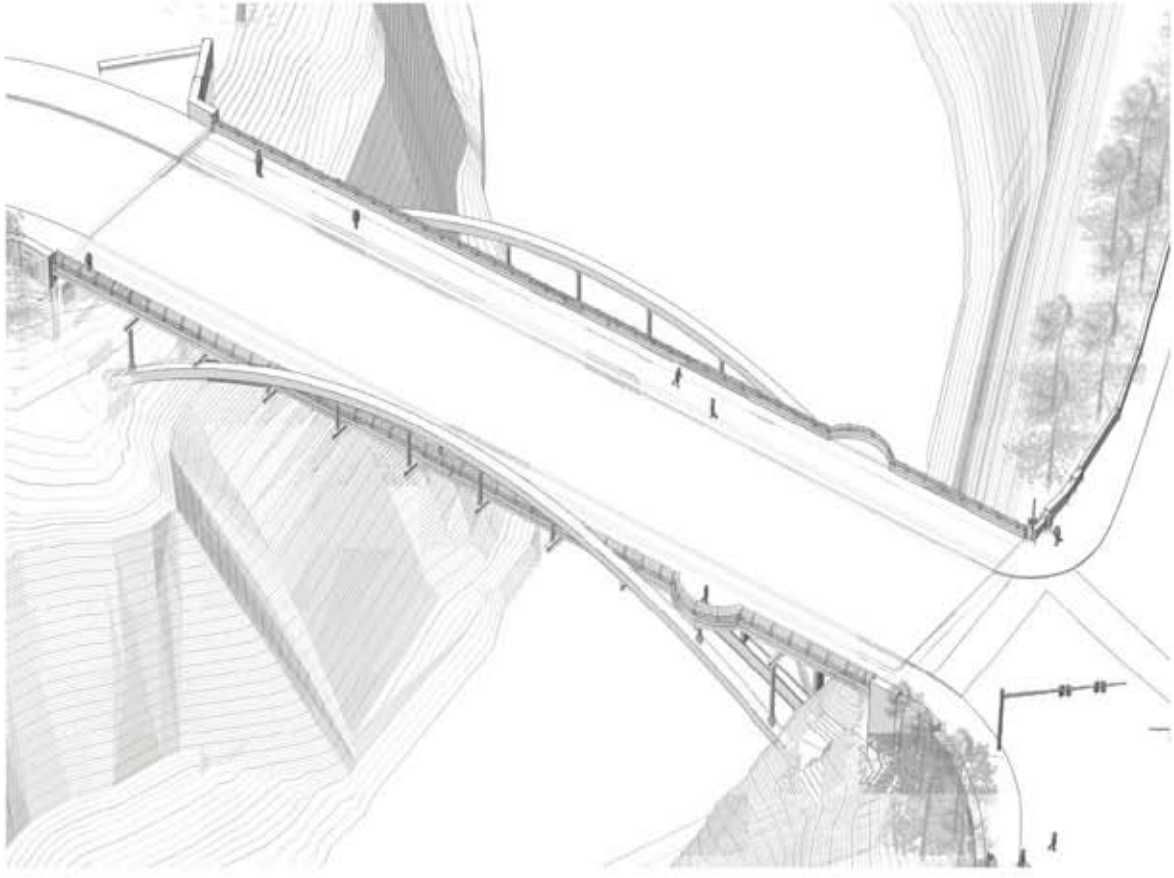
Span: 235 feet
Height Above Ground: 112 feet
Railing Height: 56"

High vehicular traffic
High pedestrian traffic
High visibility
Iconic campus bridge

Ownership: City of Ithaca
First built as a trolley bridge in 1899, rebuilt in 1960 and widened again and rebuilt in 2005.

Thurston Avenue Bridge
at Fall Creek Gorge

Existing

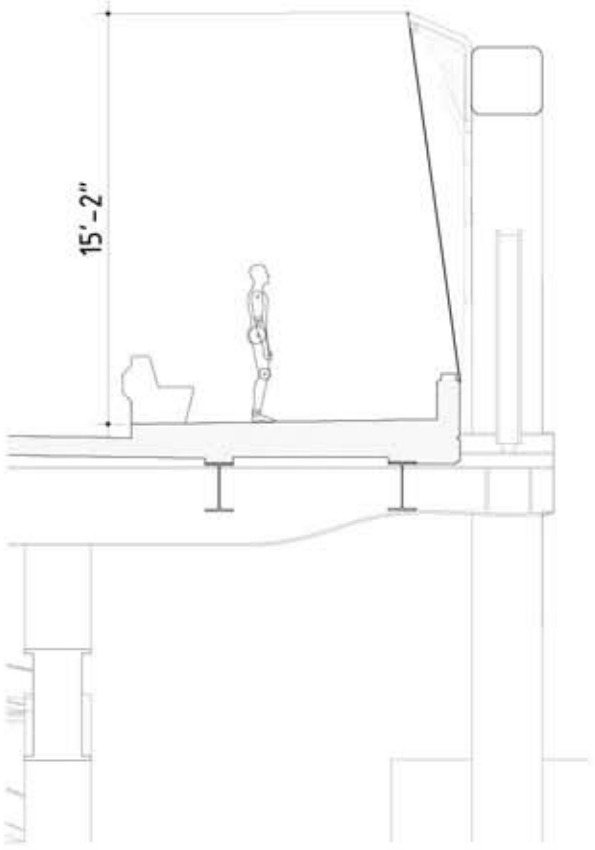


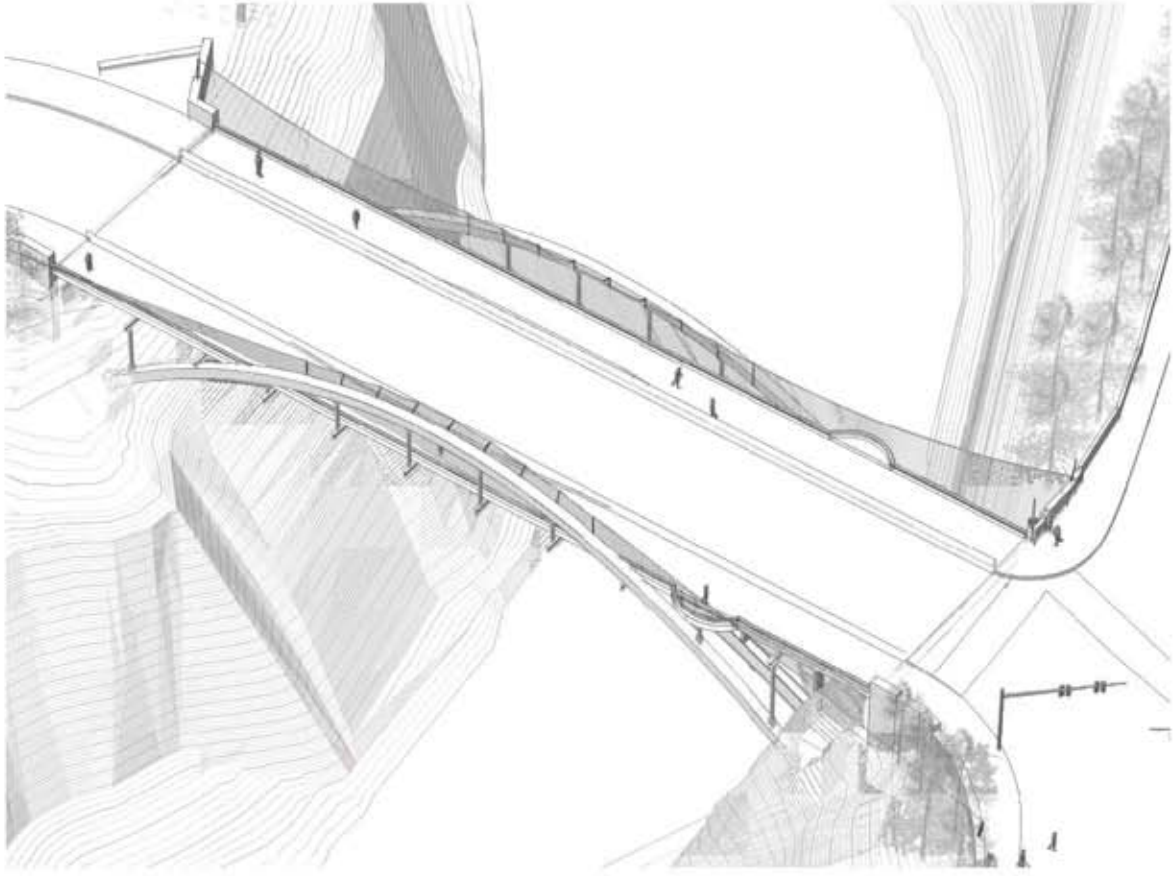
N

East Avenue

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal A





Thurston Avenue Bridge
at Fall Creek Gorge

Proposal A

Thurston Avenue Bridge
at Fall Creek Gorge

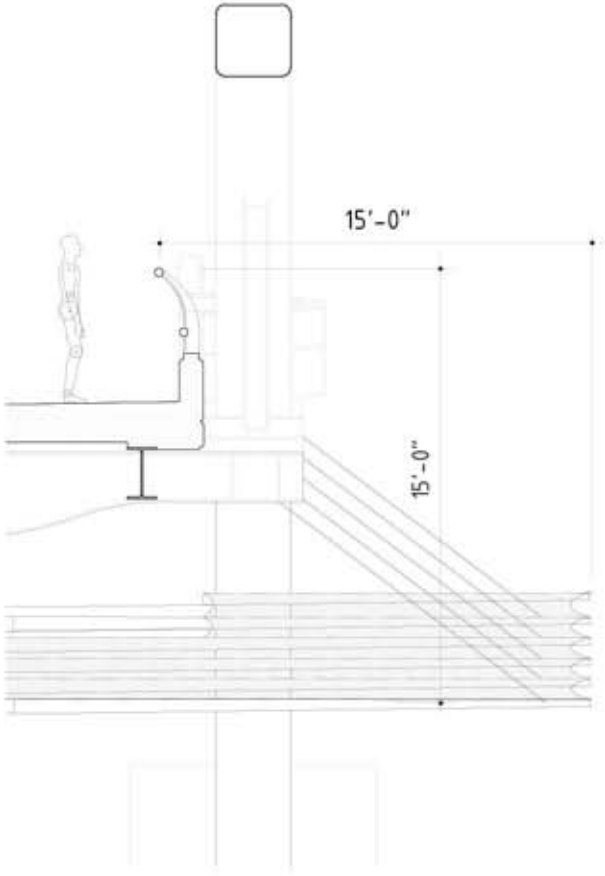
Proposal A

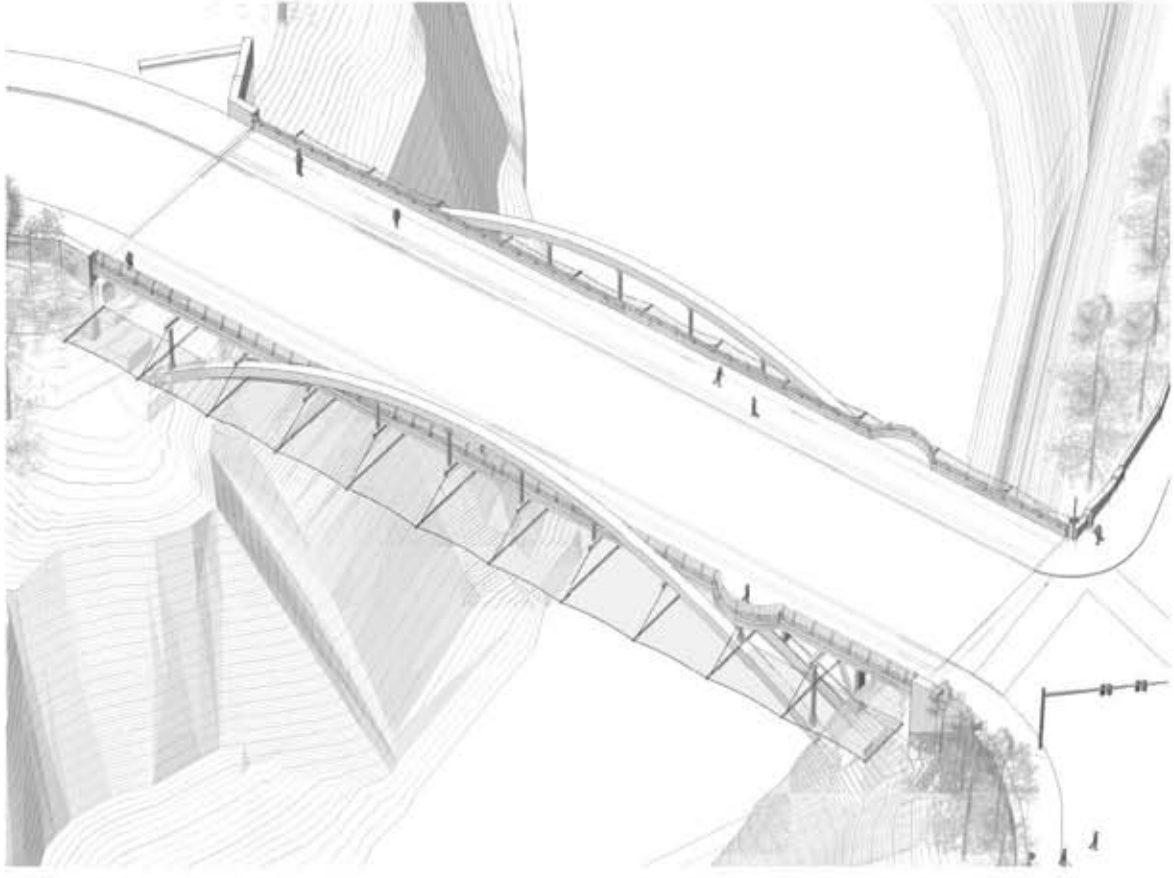
Thurston Avenue Bridge
at Fall Creek Gorge

Proposal A

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal B





Thurston Avenue Bridge
at Fall Creek Gorge

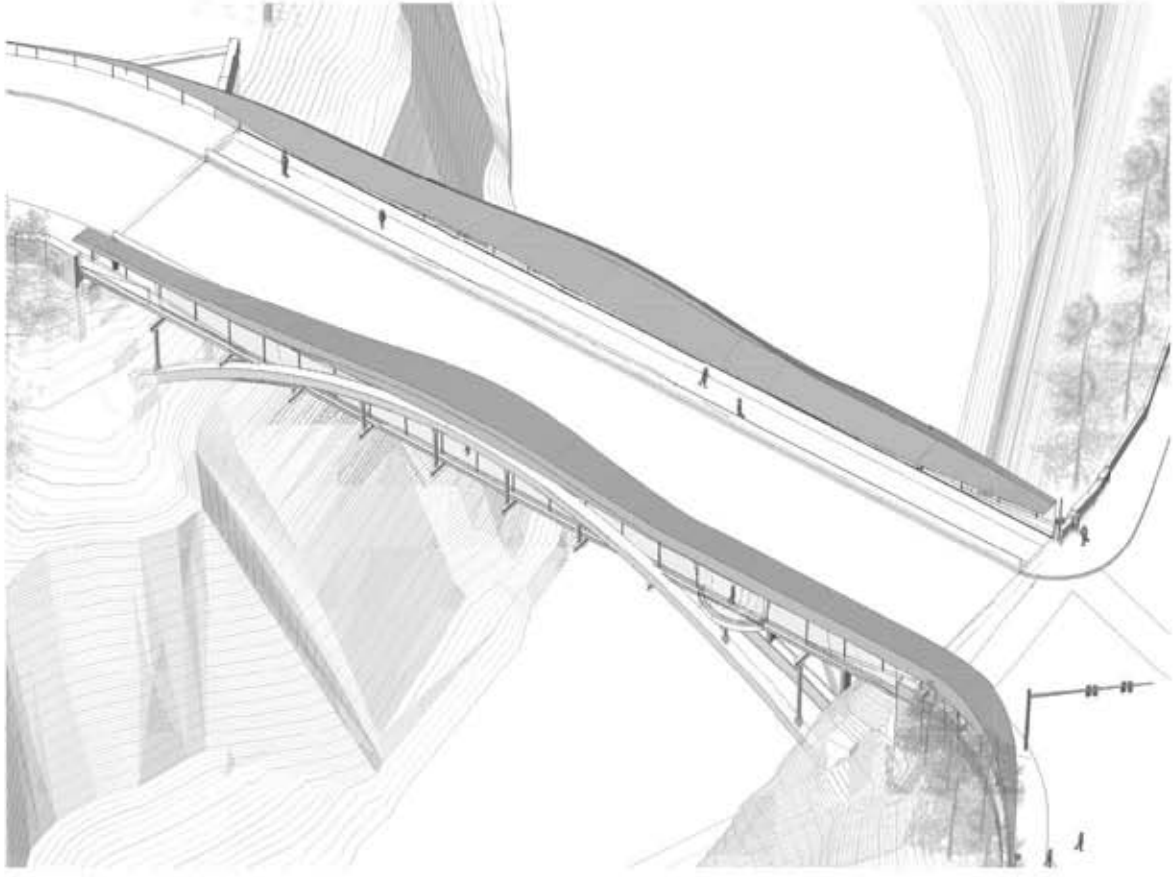
Proposal B

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal B

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal C



Thurston Avenue Bridge
at Fall Creek Gorge

Proposal C

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal C

Thurston Avenue Bridge
at Fall Creek Gorge

Proposal C

Stone Arch Bridge
at Cascadilla Creek Gorge

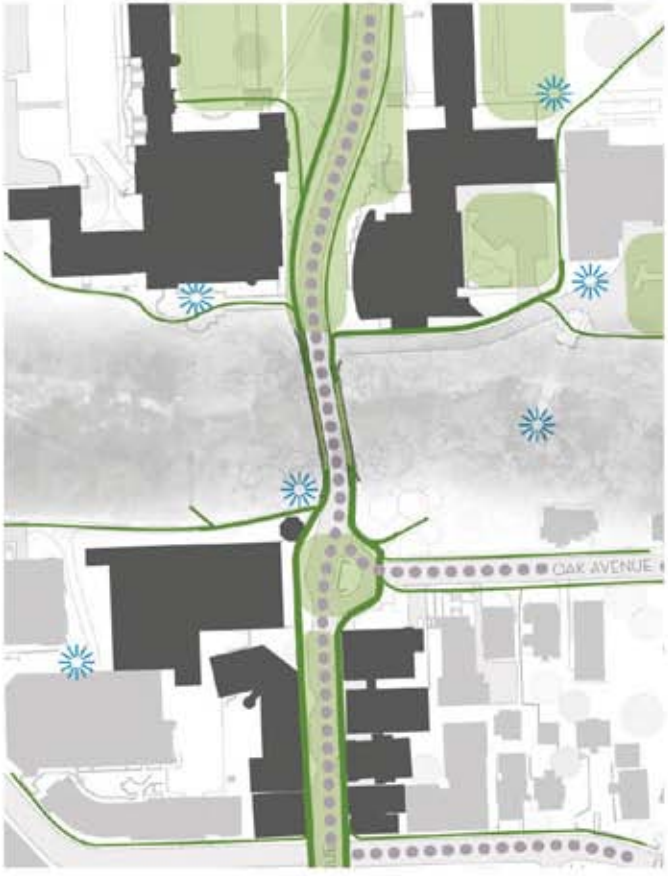
Span: 63 feet
Height Above Ground: 92 feet
Railing Height: 43"

High vehicular traffic
High pedestrian traffic
High visibility
Iconic campus bridge

Ownership: Cornell University
First built around 1869, replaced in 1897 by a stone bridge--last major repairs were made in 1987 and in 2001.

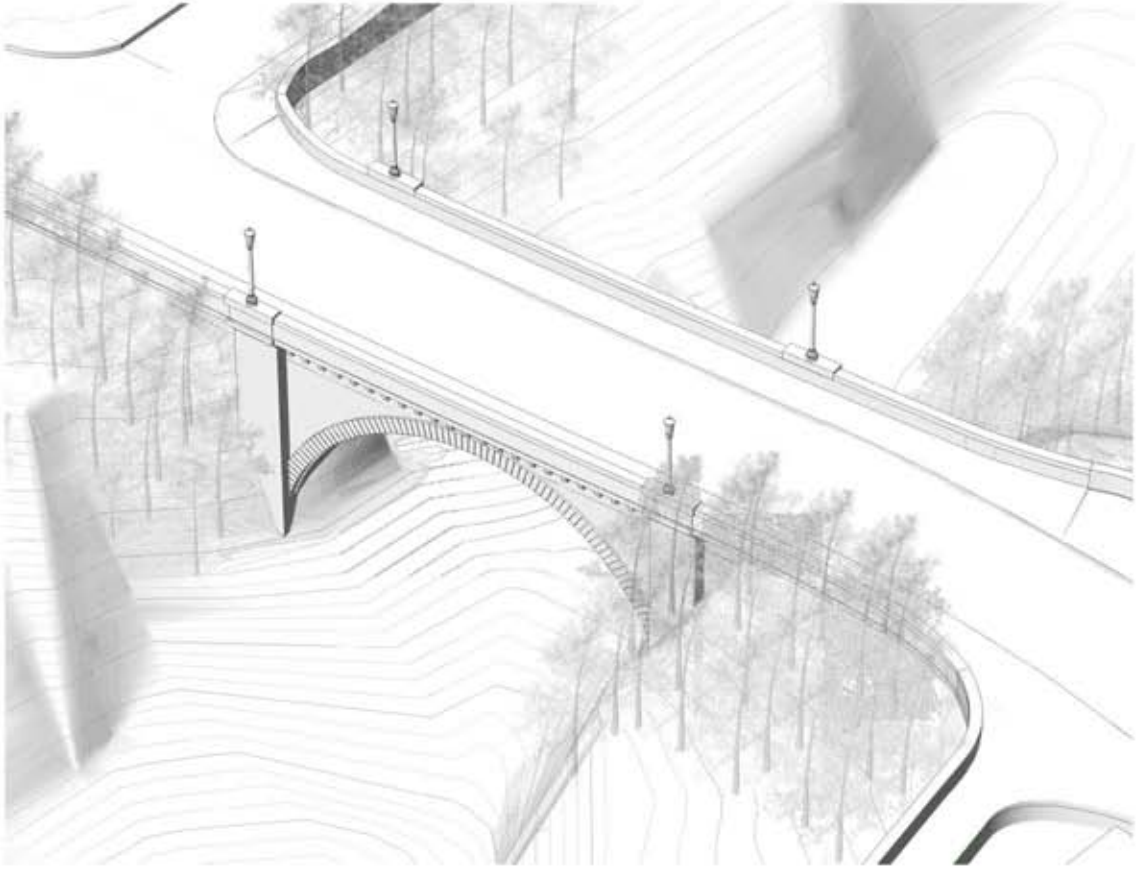
Stone Arch Bridge
at Cascadilla Creek Gorge

Existing



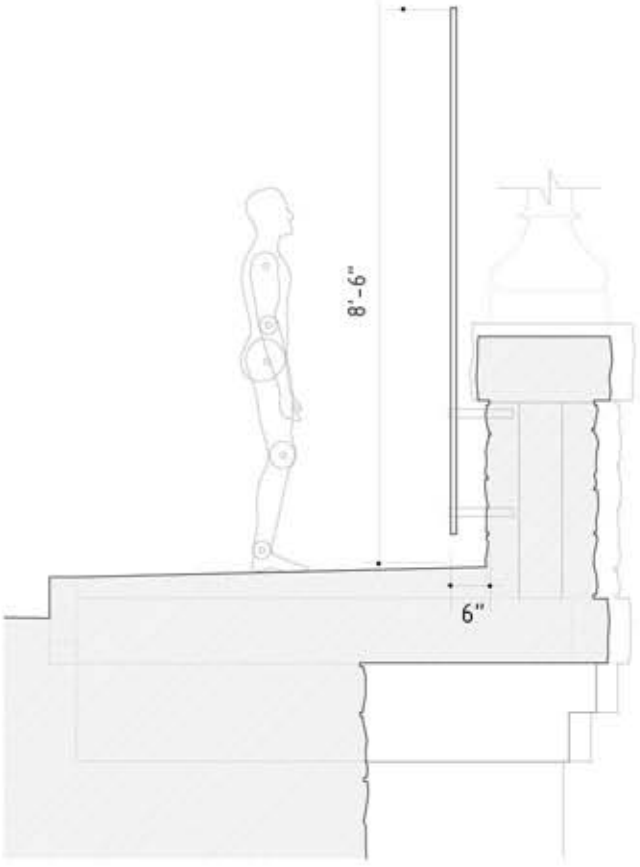
N

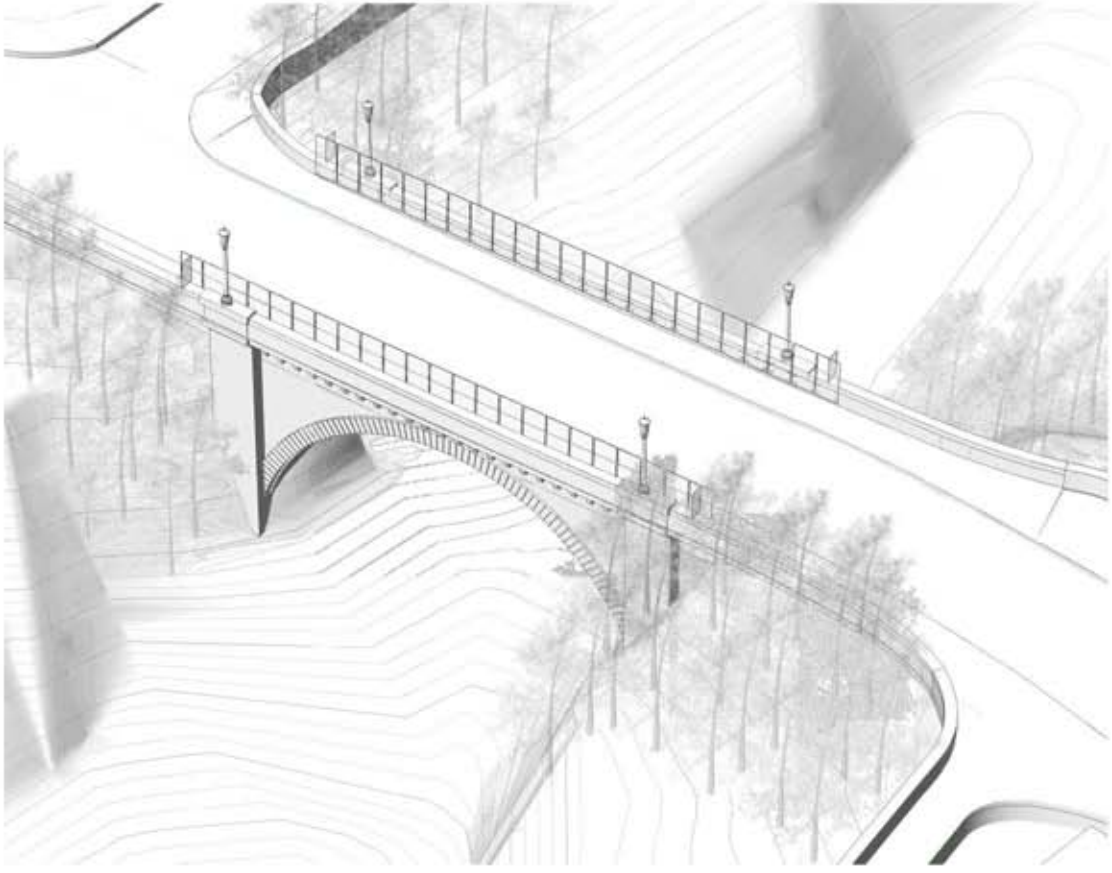
College Avenue



Stone Arch Bridge
at Cascadilla Creek Gorge

Proposal A





Stone Arch Bridge
at Cascadilla Creek Gorge

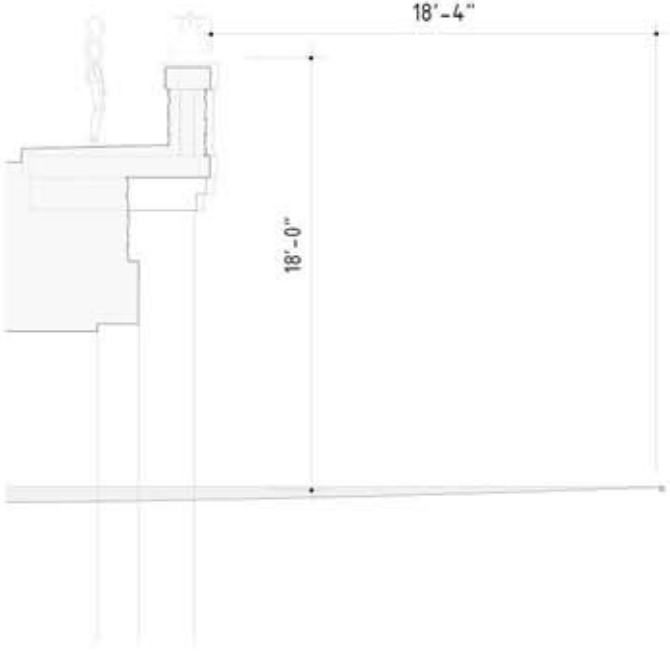
Proposal A

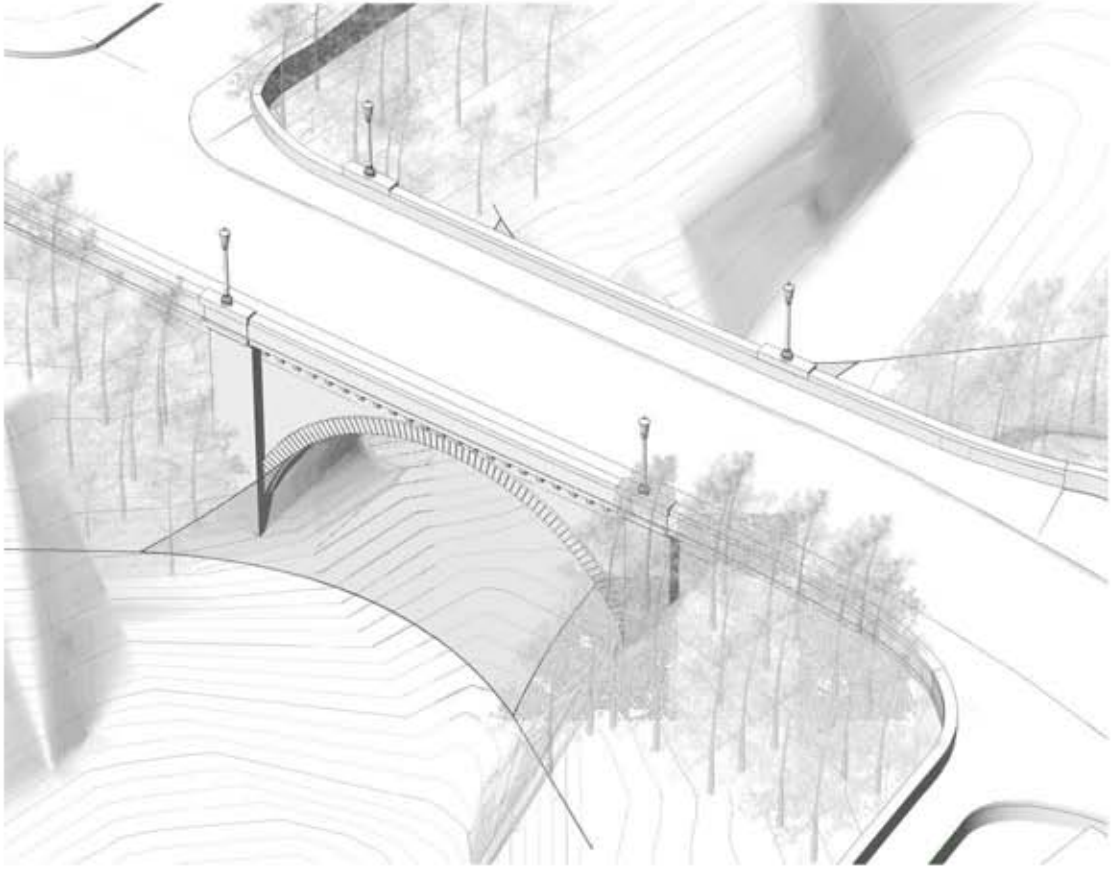
Stone Arch Bridge
at Cascadilla Creek Gorge

Proposal A

Stone Arch Bridge
at Cascadilla Creek Gorge

Proposal B





Stone Arch Bridge
at Cascadilla Creek Gorge

Proposal B

Trolley Bridge
at Cascadilla Creek Gorge

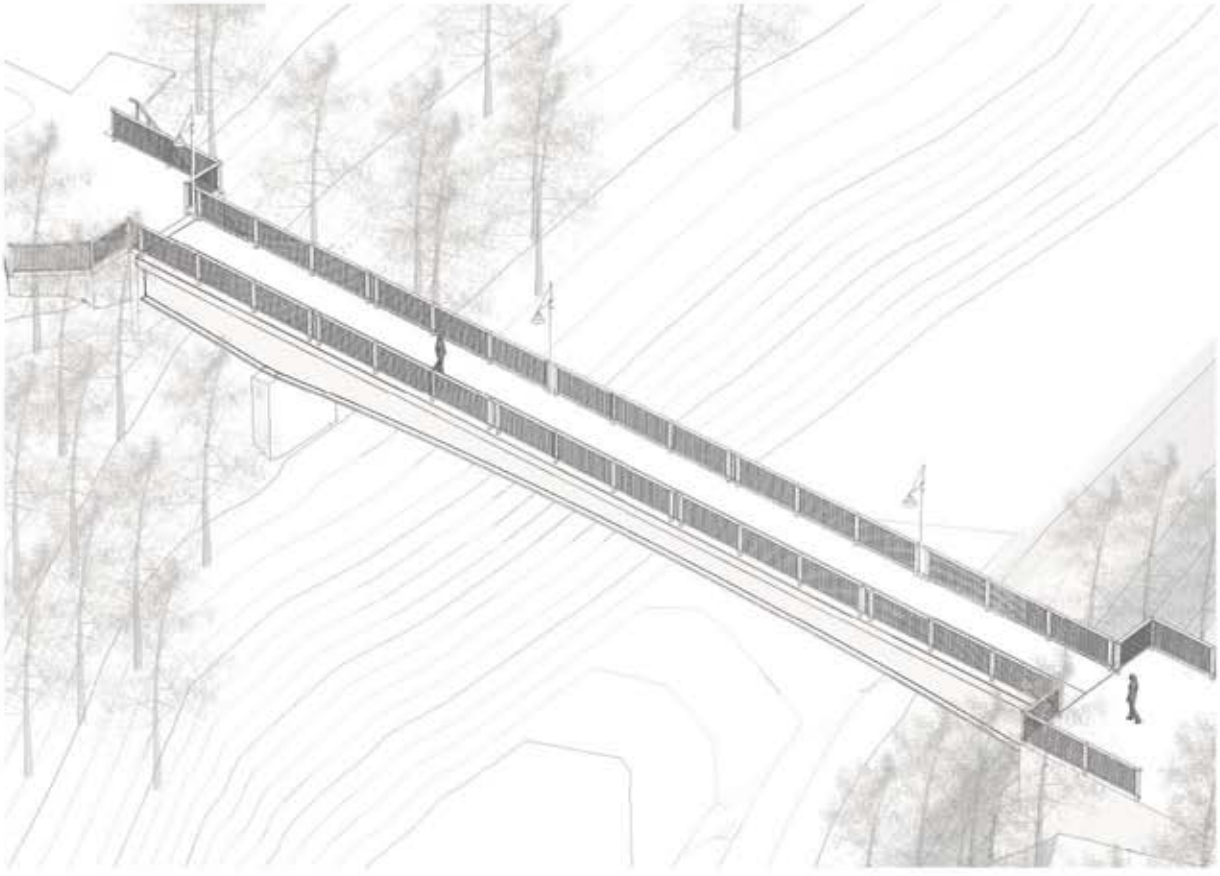
Span: 129 feet
Height Above Ground: 54 feet
Railing Height: 52"

High pedestrian-only traffic
Low visibility
Not an iconic campus bridge

Ownership: Cornell University
First built around 1900 to accomodate the trolley line., it was converted to a footbridge in the 1940s and totally reconstructed in 2006.

Trolley Bridge
at Cascadilla Creek Gorge

Existing

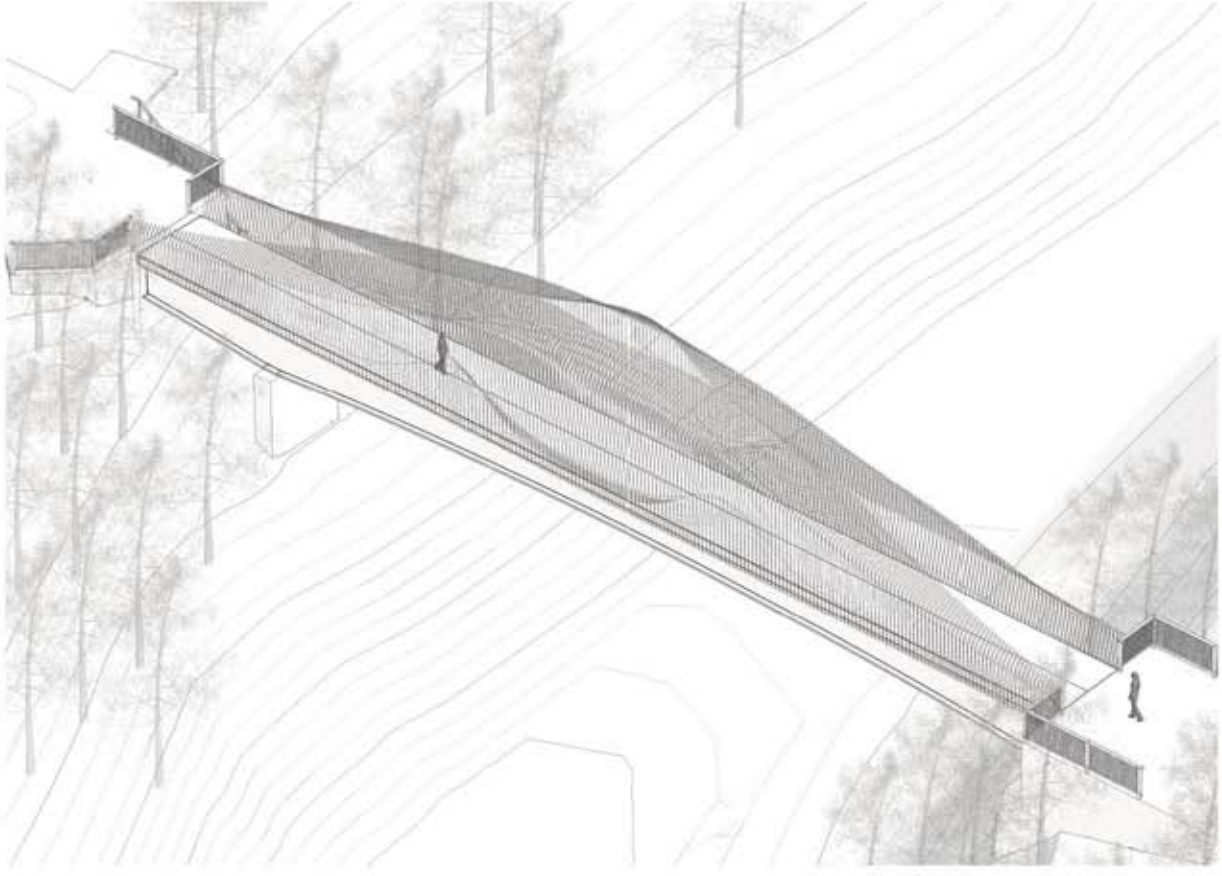


N

College Avenue

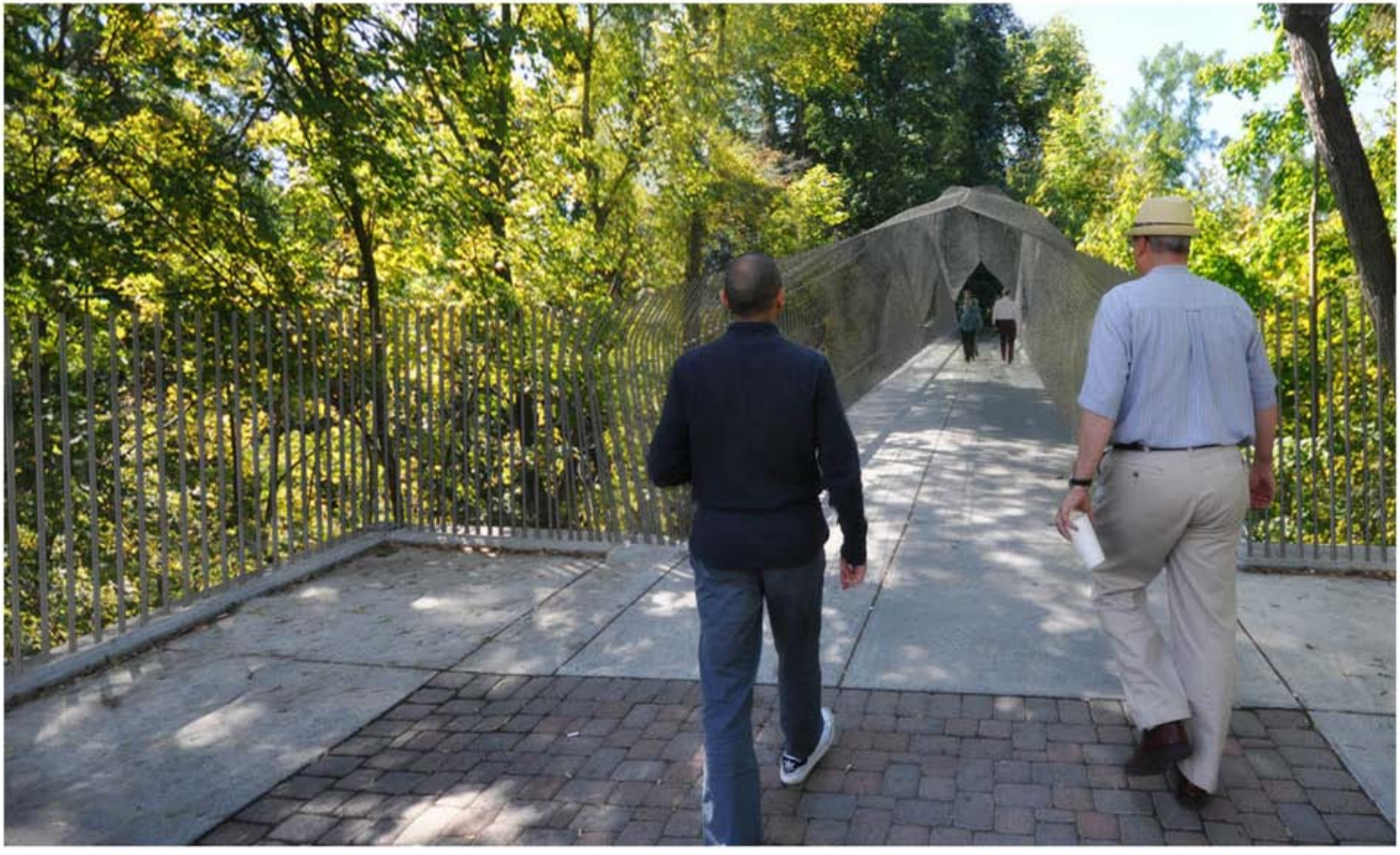
Trolley Bridge
at Cascadilla Creek Gorge

Proposal A



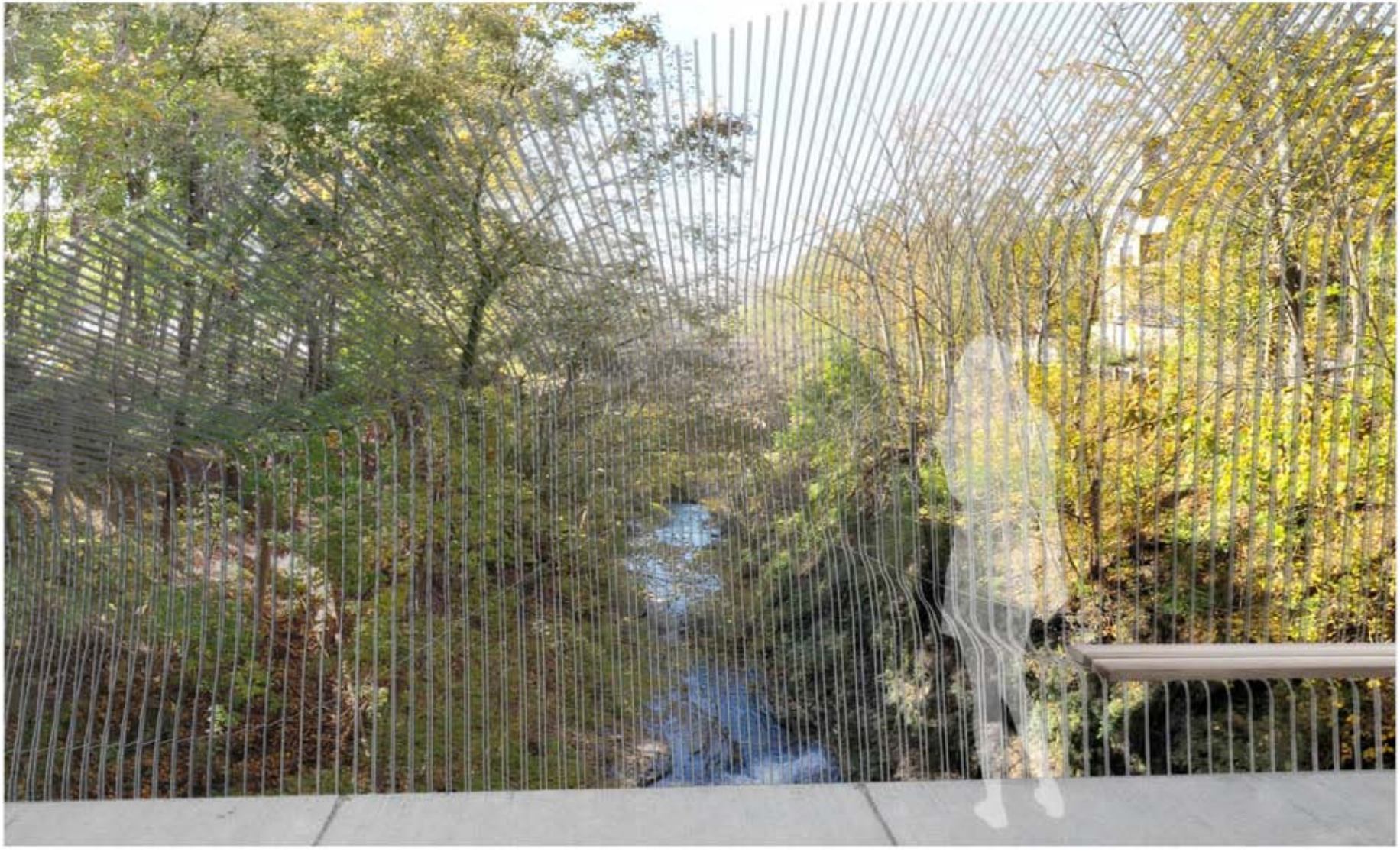
Trolley Bridge
at Cascadilla Creek Gorge

Proposal A



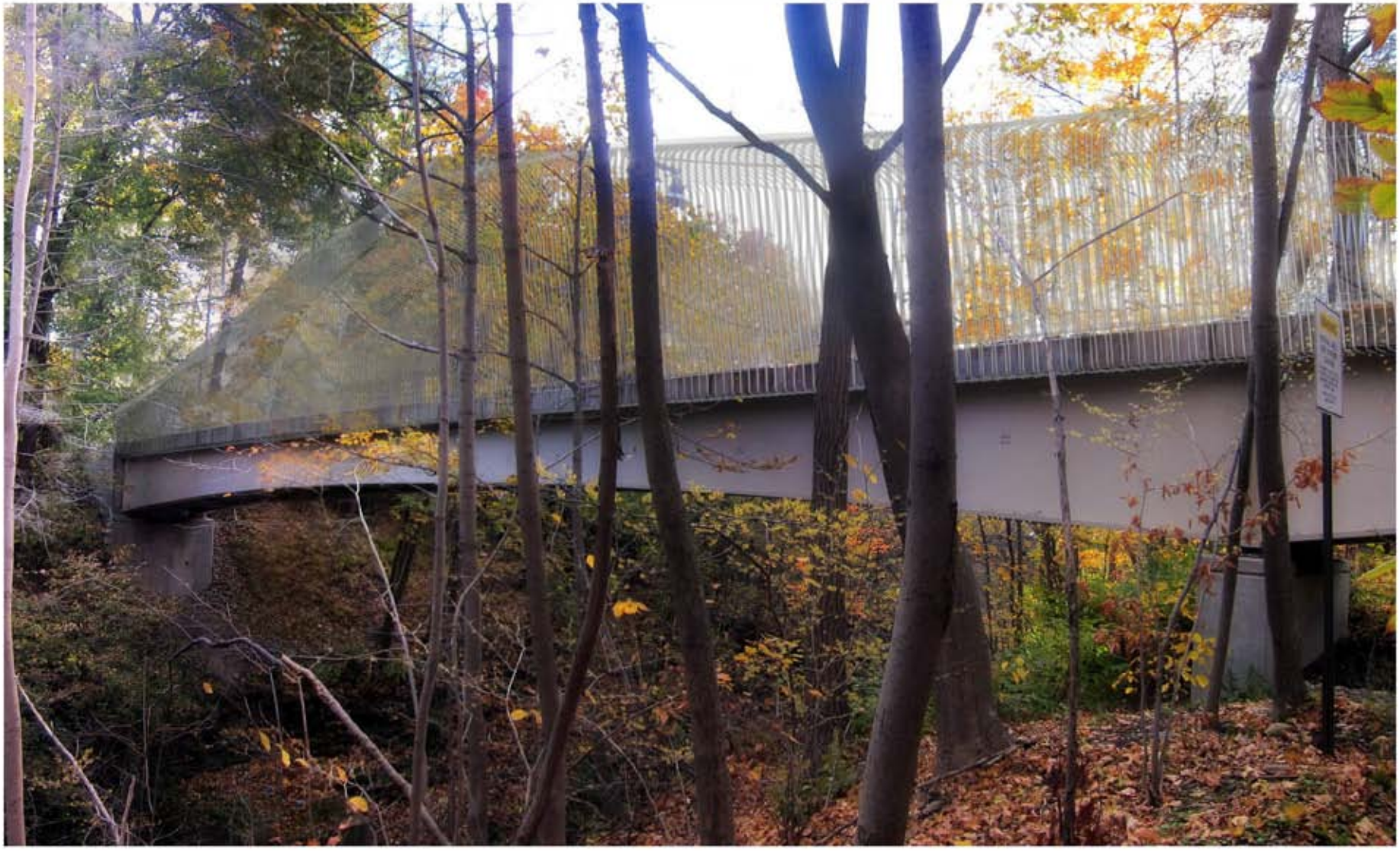
Trolley Bridge
at Cascadilla Creek Gorge

Proposal A



Trolley Bridge
at Cascadilla Creek Gorge

Proposal A

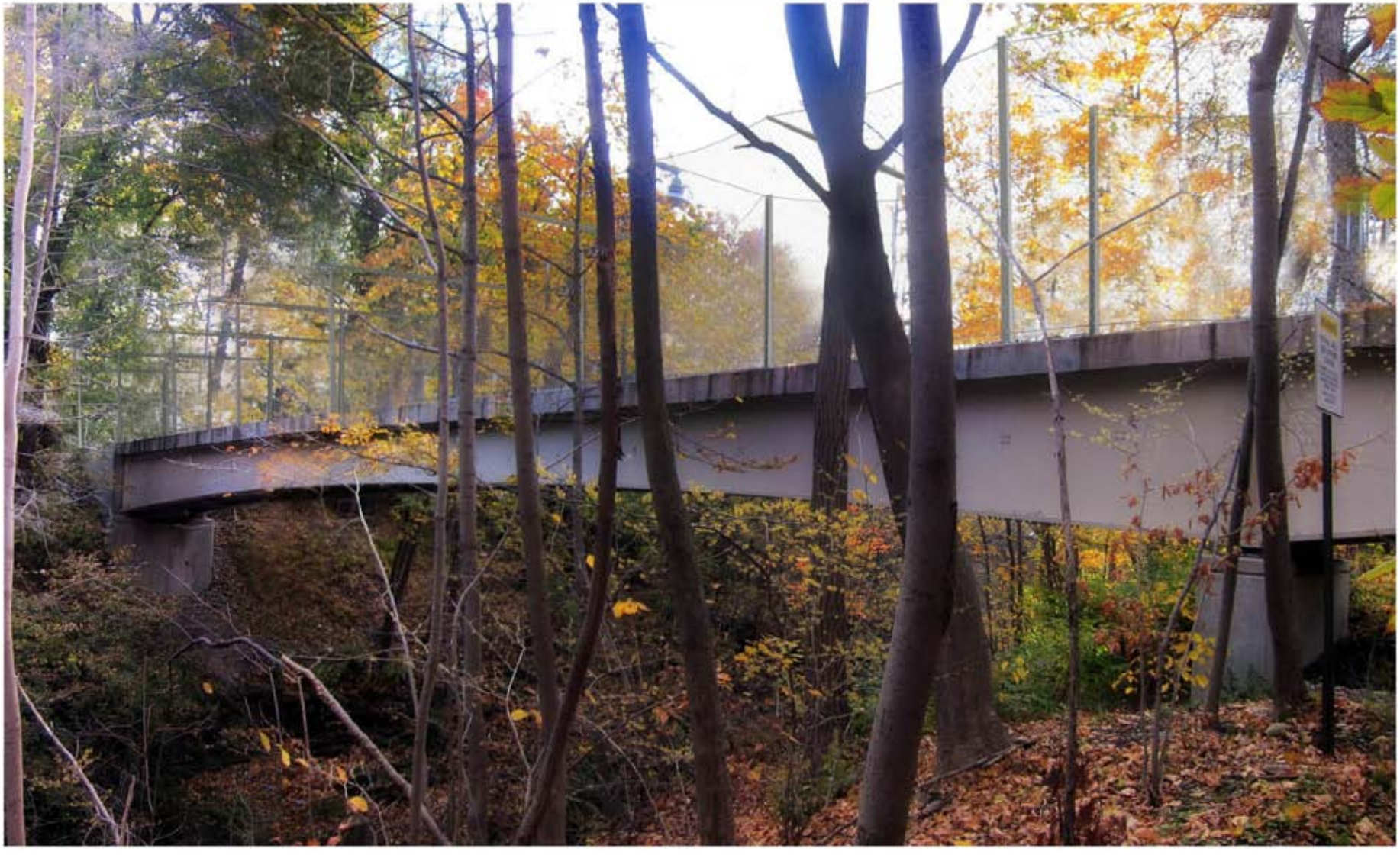


Trolley Bridge
at Cascadilla Creek Gorge

Proposal C

Trolley Bridge
at Cascadilla Creek Gorge

Proposal C



Beebe Dam Bridge
at Fall Creek Gorge

Span: 118 feet
Height Above Ground: 57 feet
Railing Height: 56"

High pedestrian-only traffic
Moderate visibility
Not an iconic campus bridge

Ownership: Cornell University
First built around 1900 to accomodate the trolley line, it was converted to a footbridge in the 1940s and totally reconstructed in 2006.

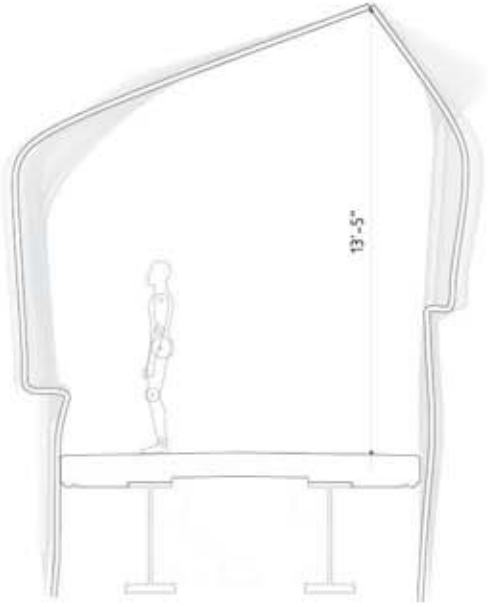
Beebe Dam Bridge
at Fall Creek Gorge

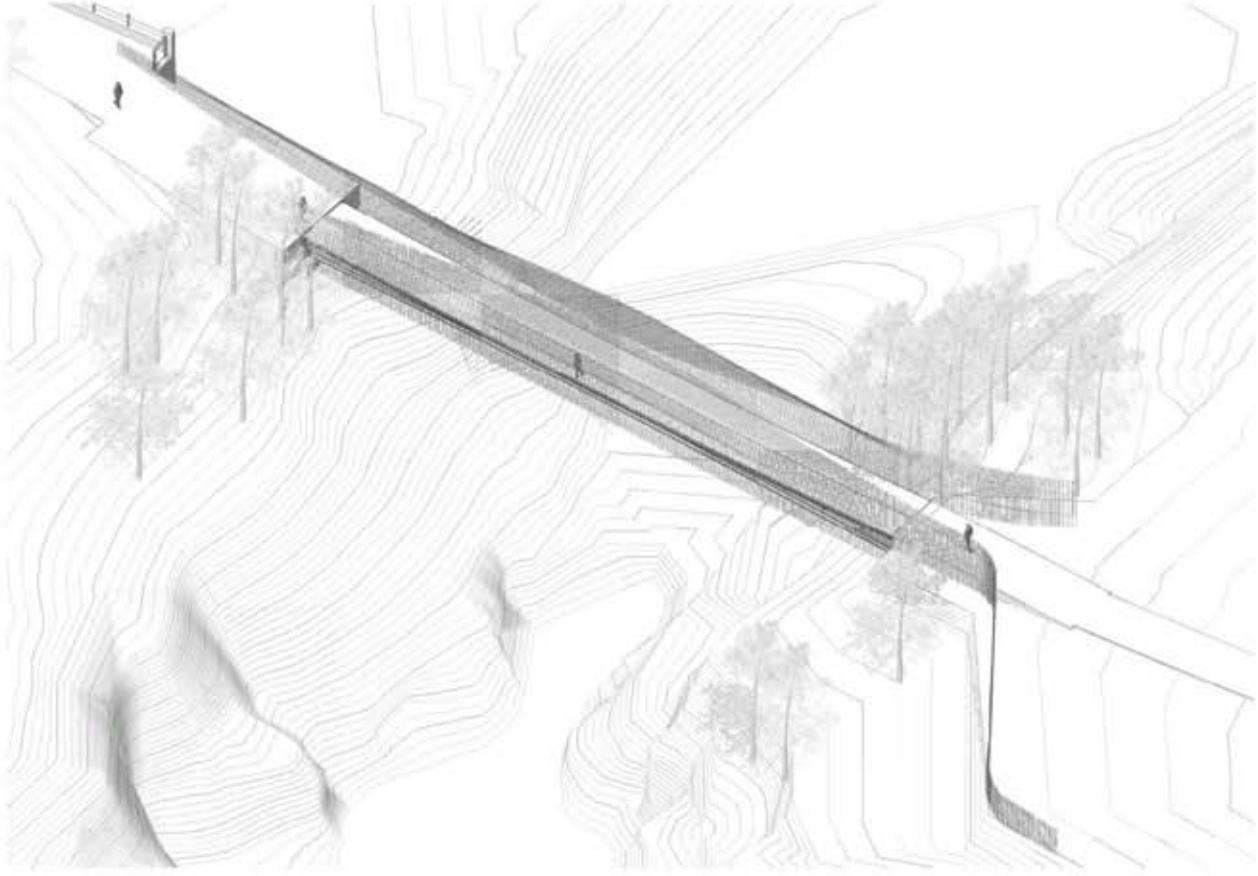
Existing

N

Beebe Dam Bridge
at Fall Creek Gorge

Proposal A





Beebe Dam Bridge
at Fall Creek Gorge

Proposal A

Beebe Dam Bridge
at Fall Creek Gorge

Proposal A

Beebe Dam Bridge
at Fall Creek Gorge

Proposal A

Beebe Dam Bridge
at Fall Creek Gorge

Proposal B

Suspension Bridge
at Fall Creek Gorge

Span: 270 feet
Height Above Ground: 108 feet
Railing Height: 60"

Medium-Low pedestrian-only traffic
Moderate visibility
Iconic campus bridge

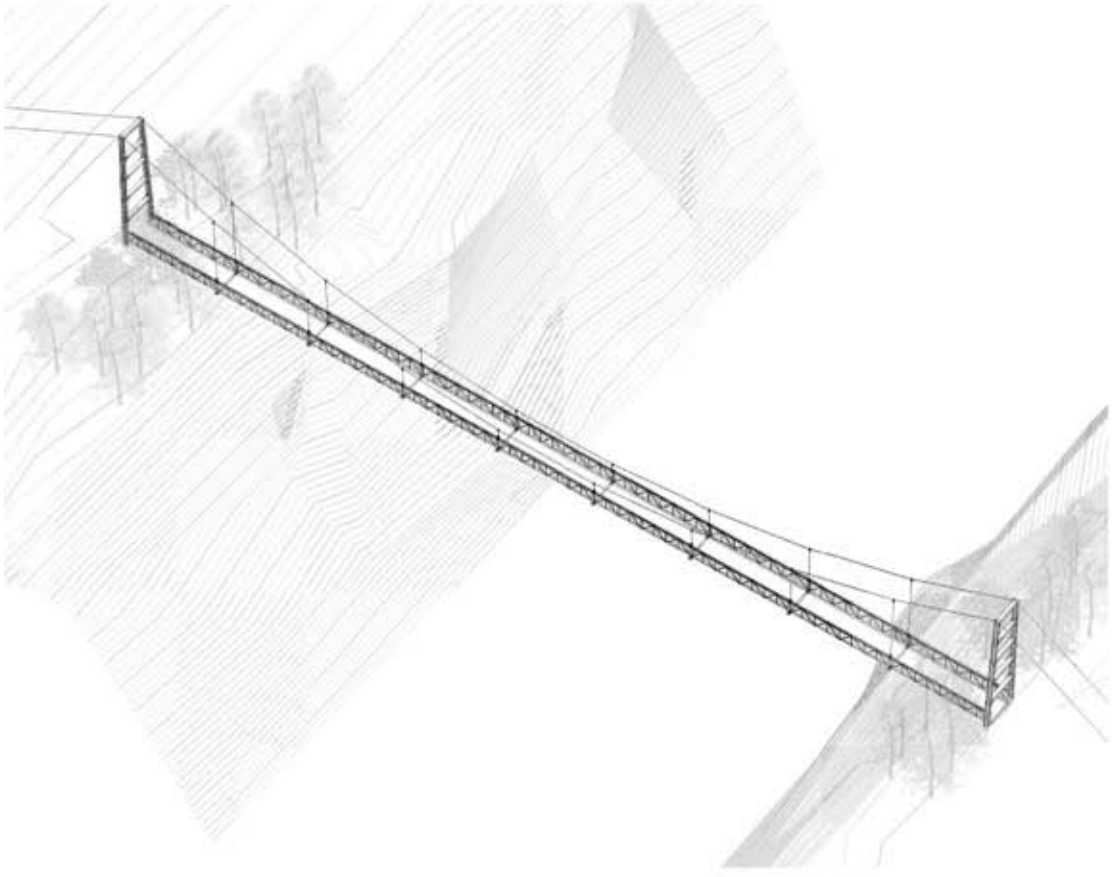
Ownership: Cornell University
Maps from early 1900s show a footbridge across the gorge in the area. The present bridge was constructed in 1960, with repairs in 1974, 1978, 1979, 1984, and 2003.

Suspension Bridge
at Fall Creek Gorge

Existing

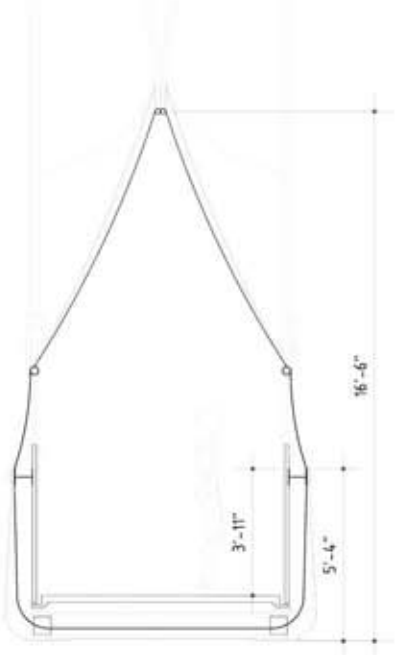
N

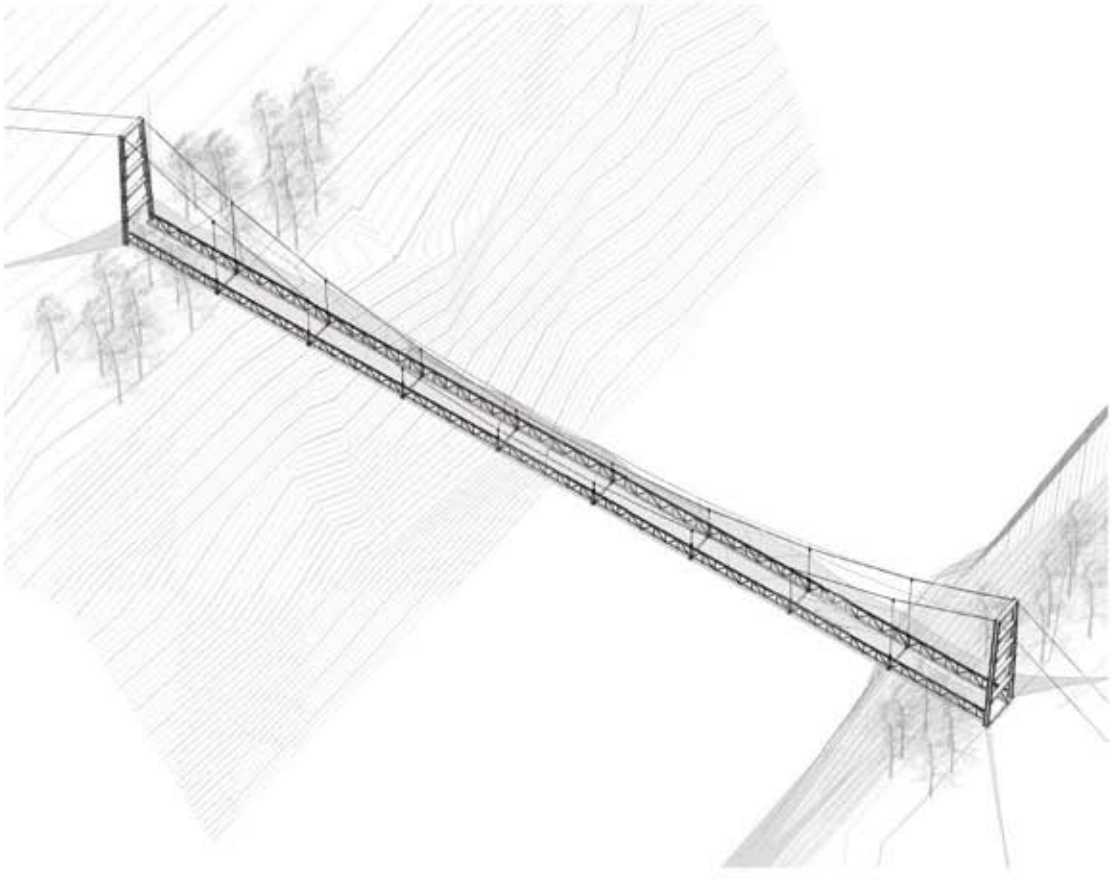
University Avenue



Suspension Bridge
at Fall Creek Gorge

Proposal A





Suspension Bridge
at Fall Creek Gorge

Proposal A

Suspension Bridge
at Fall Creek Gorge

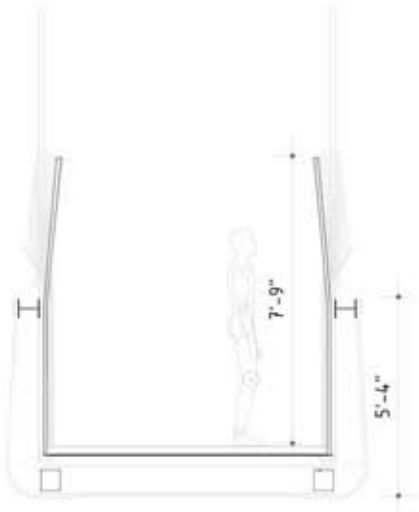
Proposal A

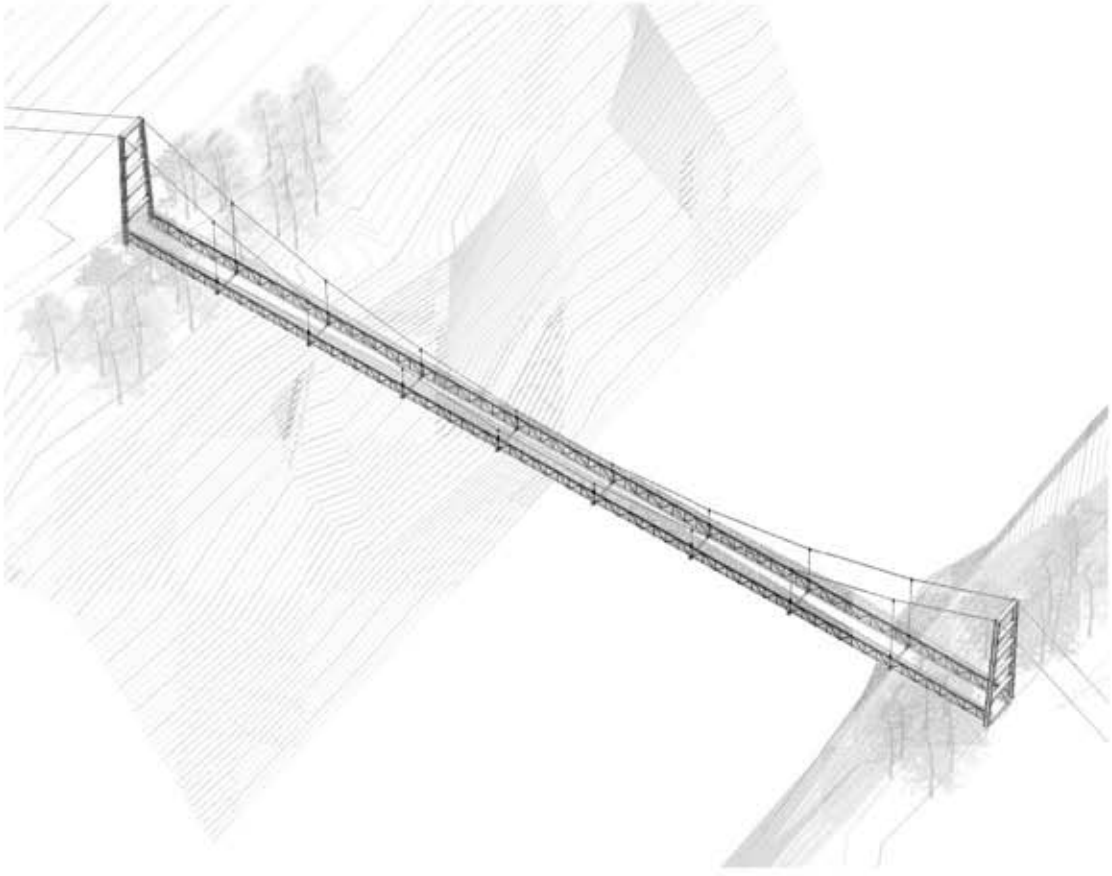
Suspension Bridge
at Fall Creek Gorge

Proposal A

Suspension Bridge
at Fall Creek Gorge

Proposal B





Suspension Bridge
at Fall Creek Gorge

Proposal B

Suspension Bridge
at Fall Creek Gorge

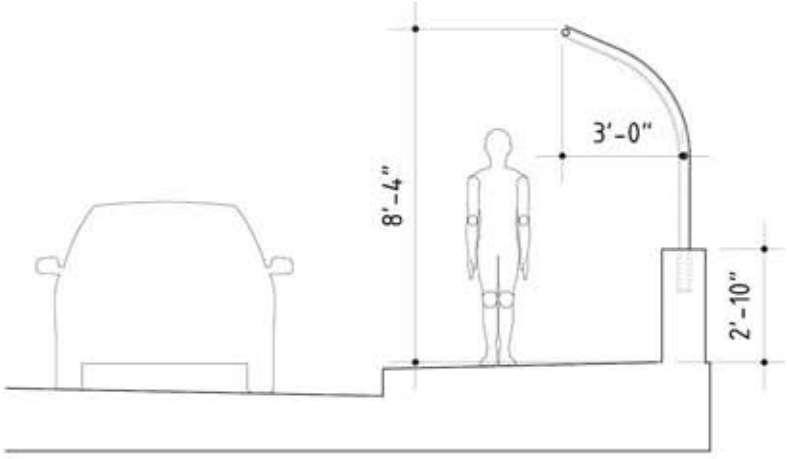
Proposal B

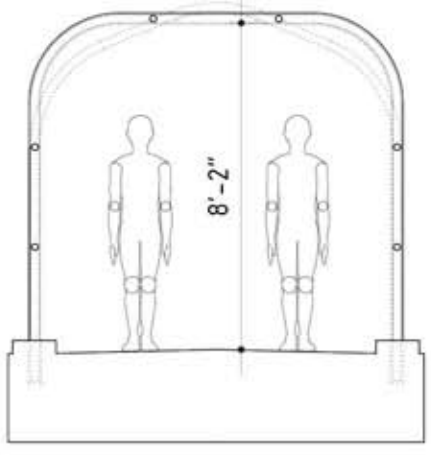
Suspension Bridge
at Fall Creek Gorge

Proposal B

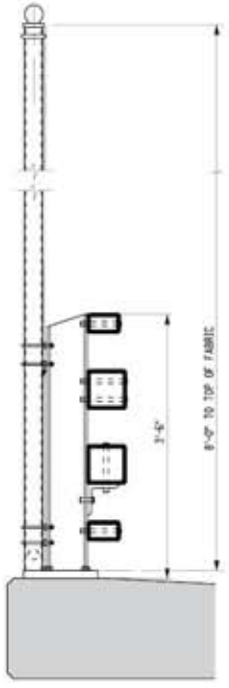
Means Restriction
Materials & Methods

Conventional Systems
Leaning & Enclosed Fences

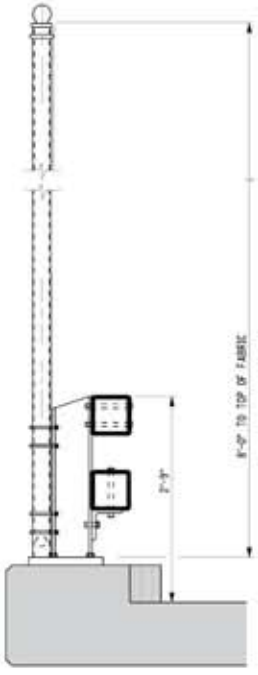




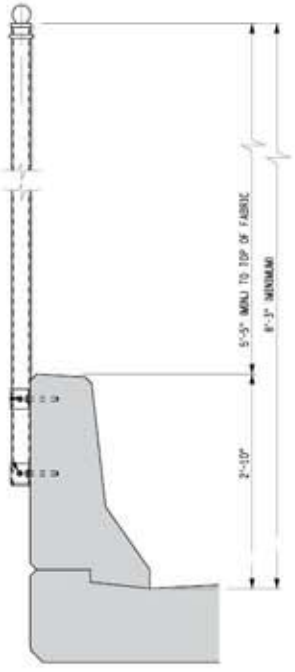
Conventional Systems
Fence Details (Vehicular Bridge)
NY State Department of Transportation



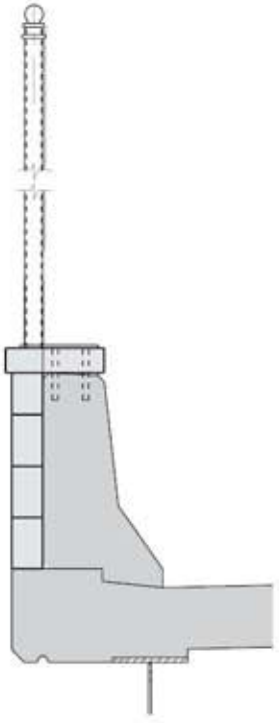
(4) Steel Rails
+ Fence



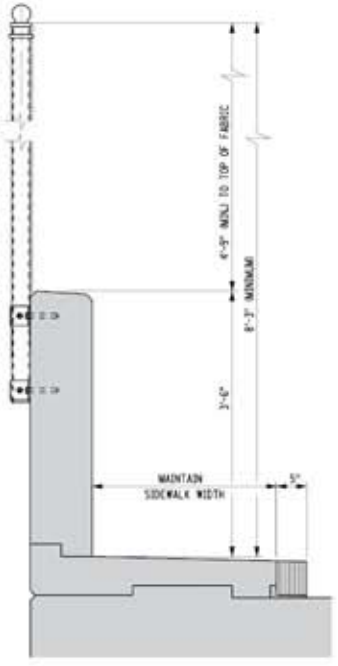
(2) Steel Rails
+ Fence



Concrete Barrier
+ Fence

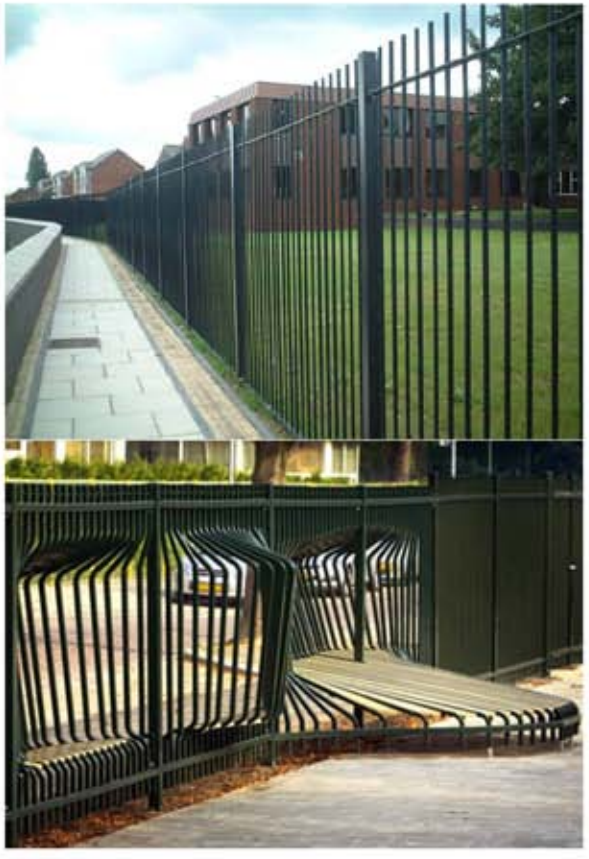


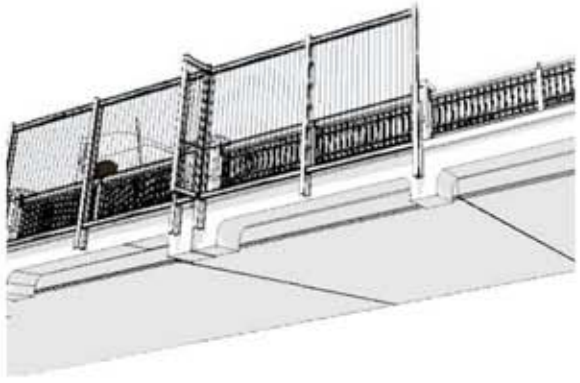
Concrete Barrier+
Brick Veneer
+ Fence

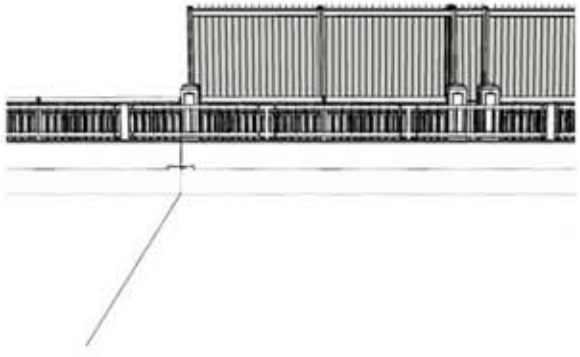


"Texas"
Concrete Barrier
+ Fence

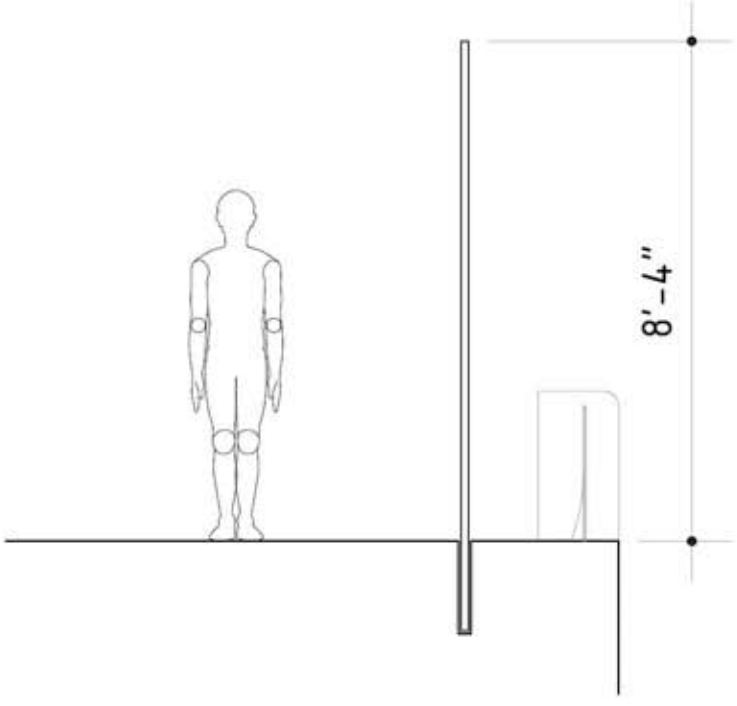
Material: **Bar System**



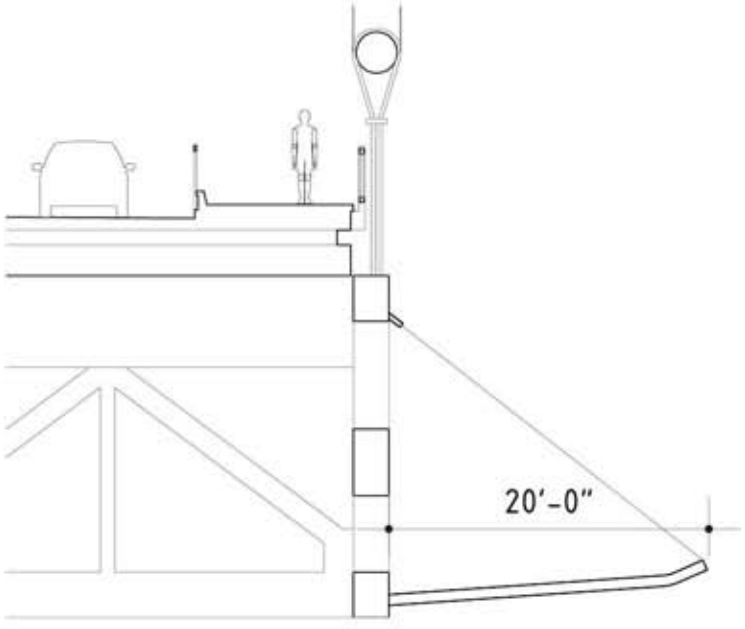




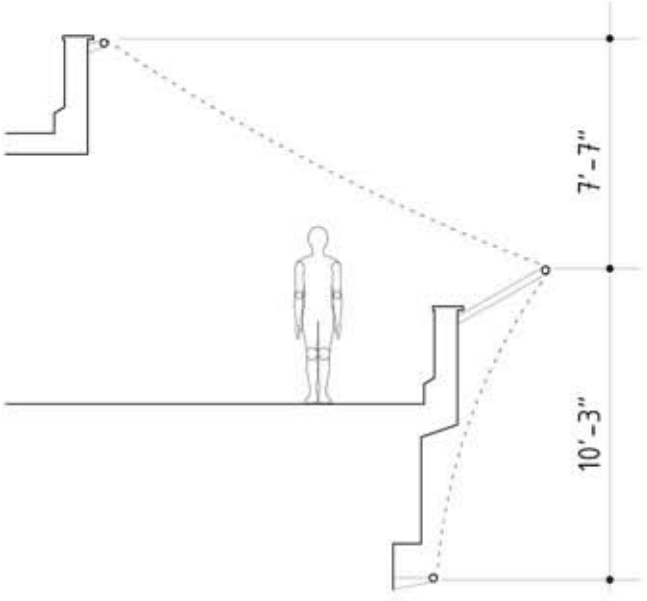
Material: **Glass Wall**
Rockefeller Center



Material: **Horizontal Net Suspended Below**
Golden Gate Means Restriction Project

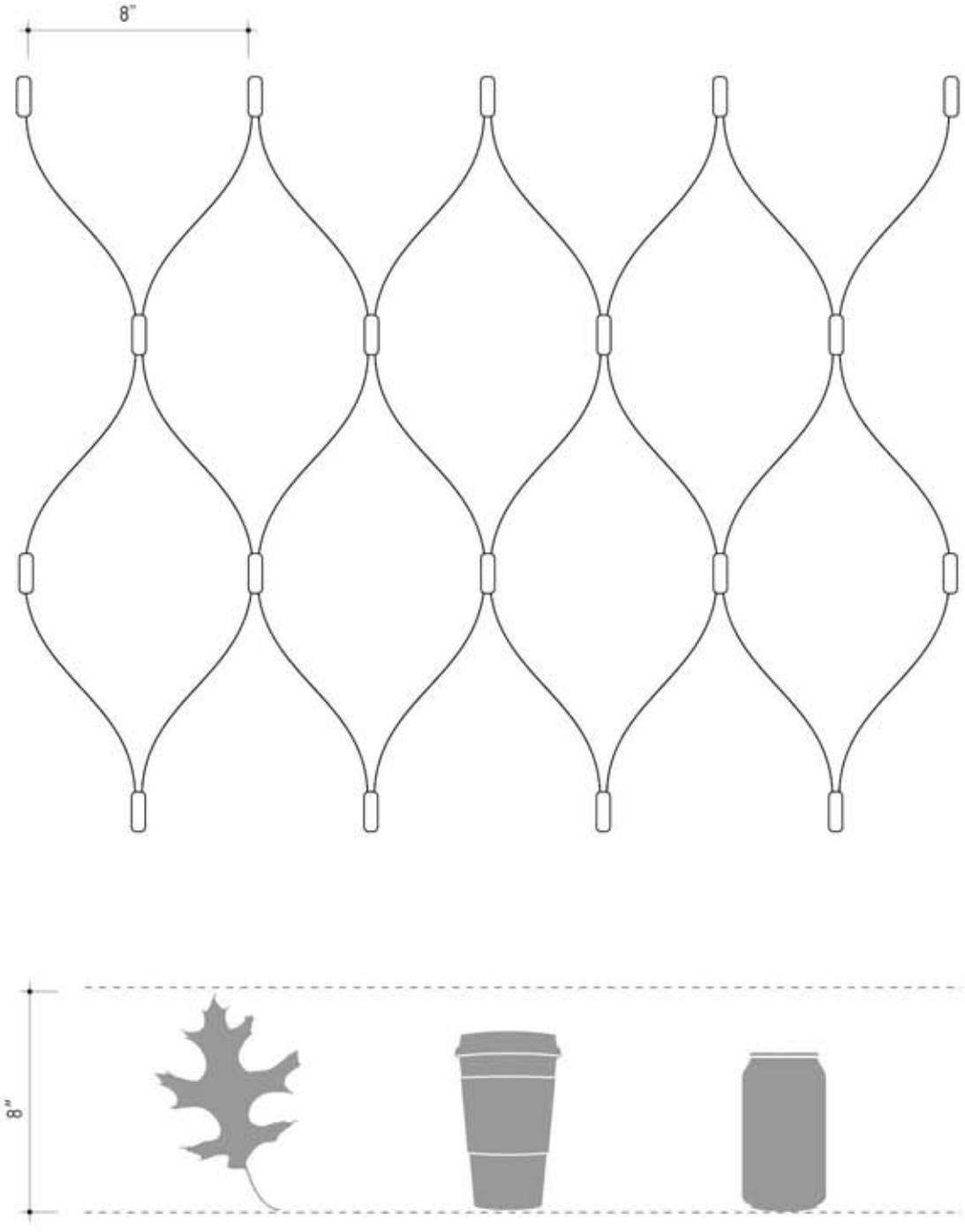


Material: **Tensile Steel Mesh**
Stadion Center, Austria

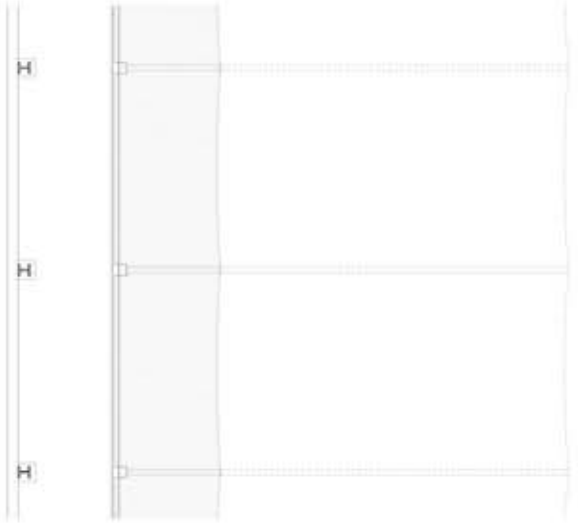


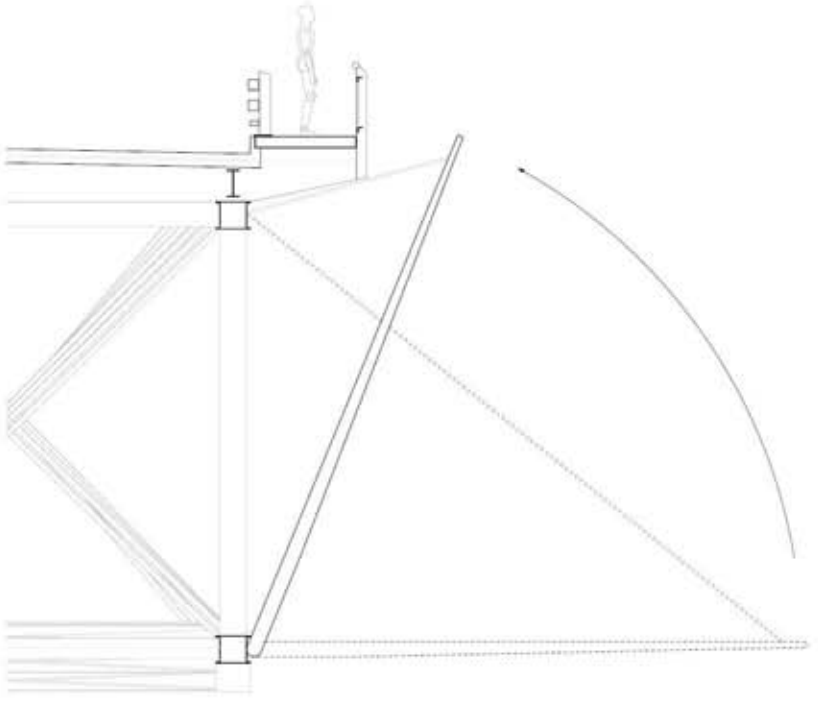
Debris Removal

Debris Removal: **Horizontal Net Sizing**

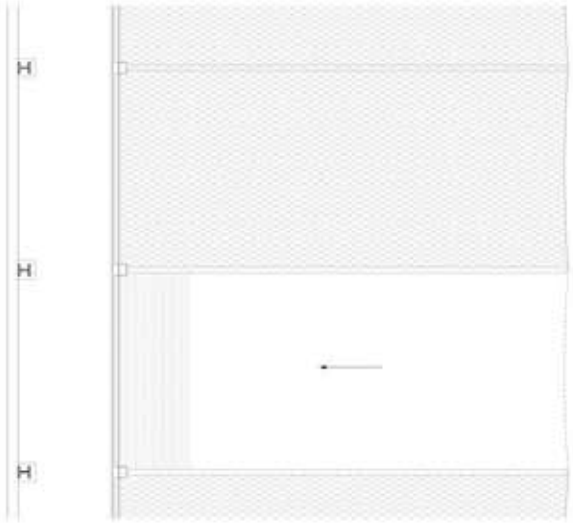


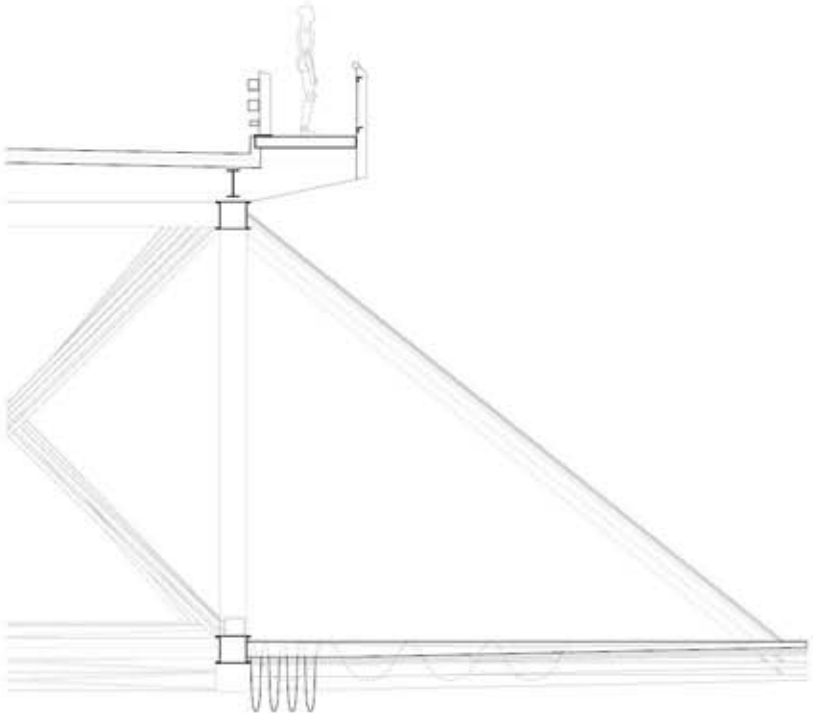
Debris Removal: **Horizontal Net Retraction**



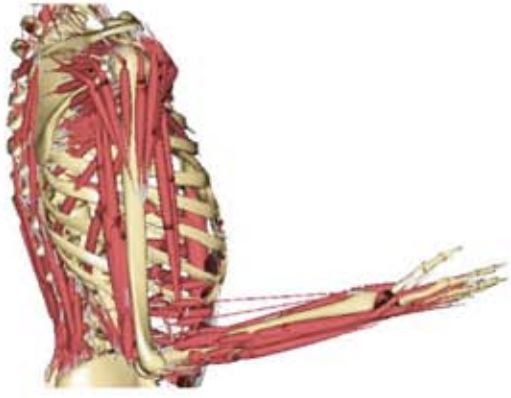


Debris Removal: **Horizontal Net Retraction**





Ergonomic Modeling: Analysis of Static Ergonomics Body to Object

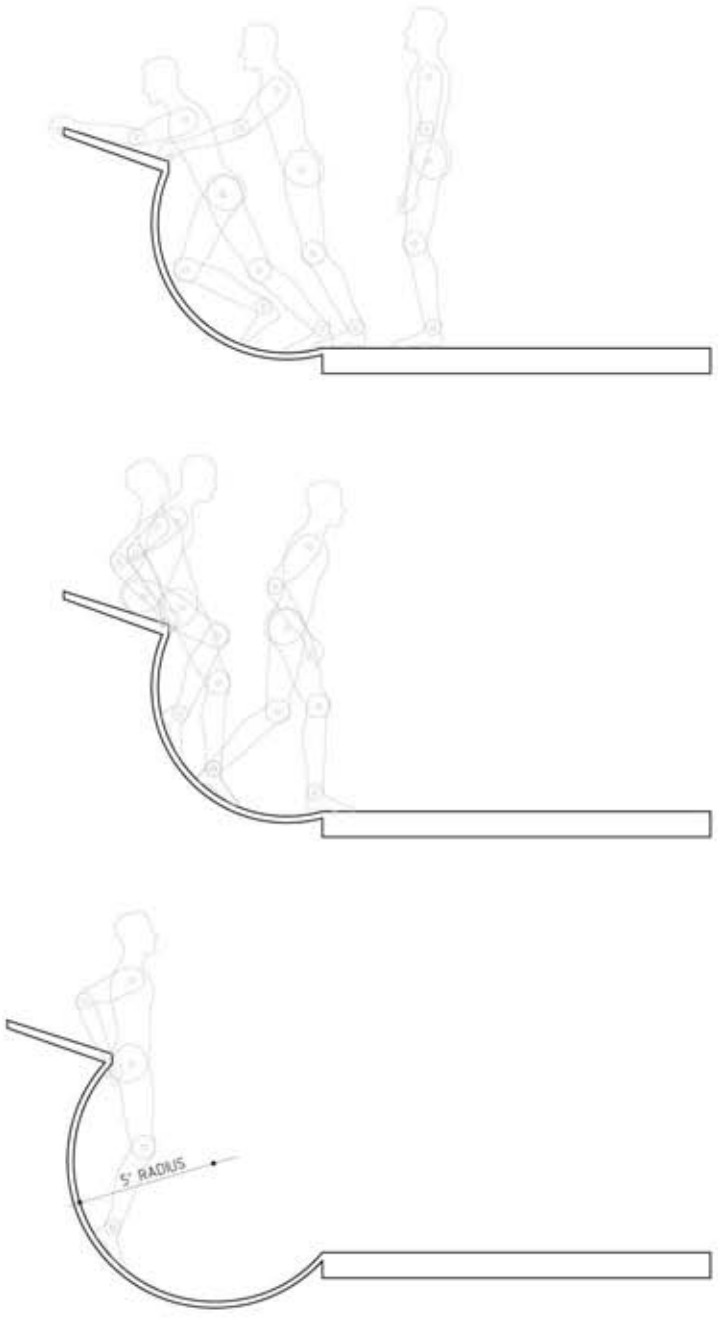


AnyBody software computer ergonomic modeling

Ergonomic Modeling: **Full-Scale Mock-Up**

Ergonomic Modeling: **Full-Scale Mock-Up**

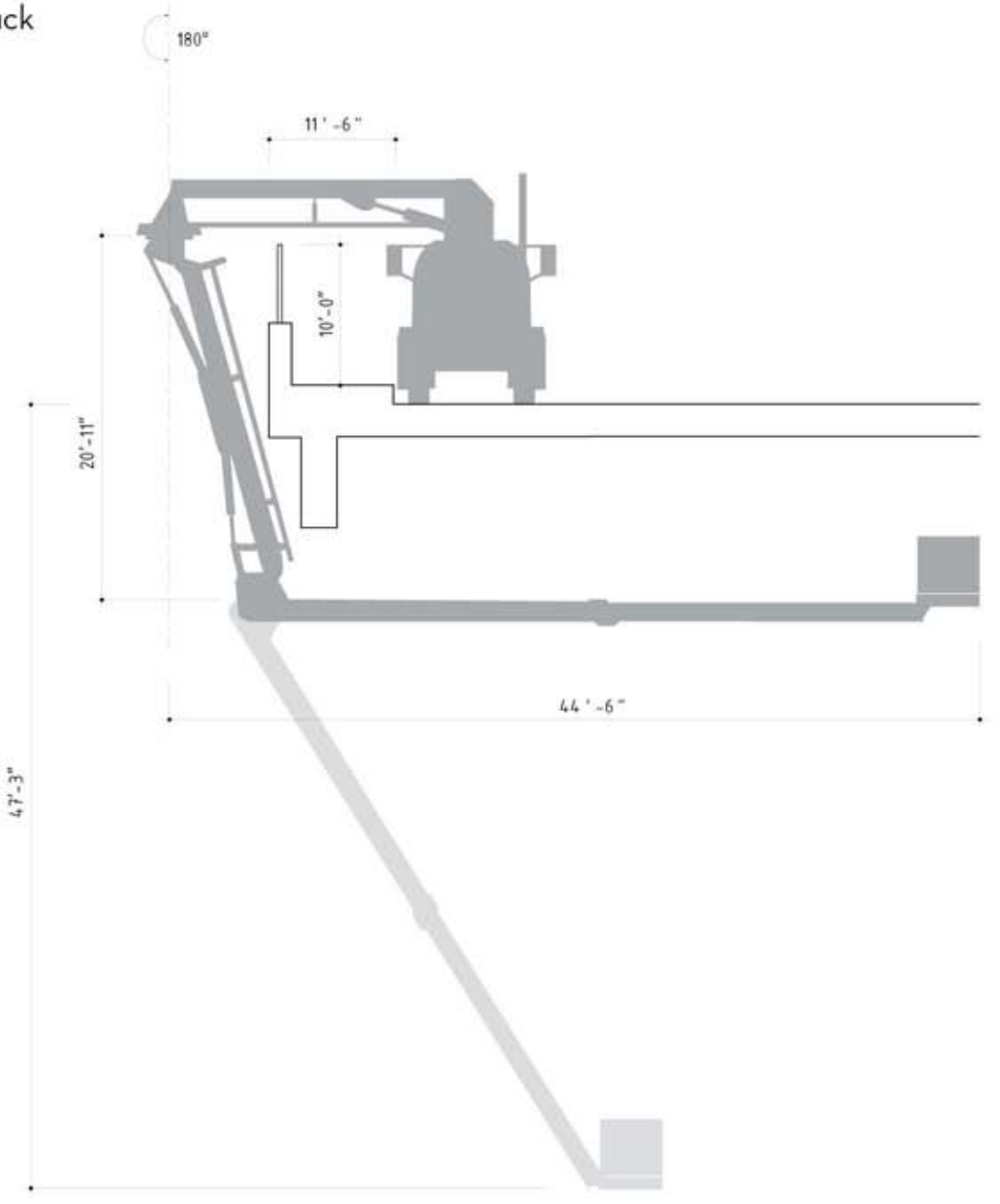
Ergonomic Modeling: **Full-Scale Mock-Up**



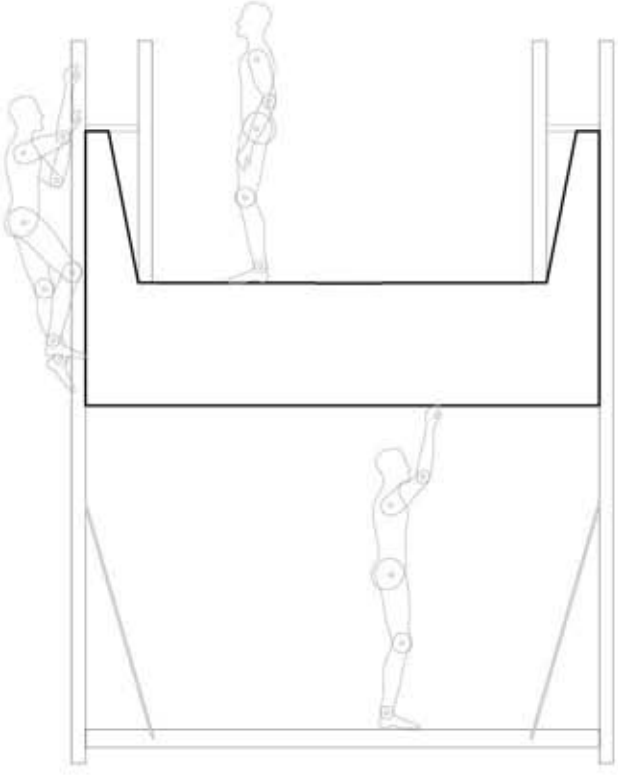
Bridge Maintenance

Bridge Maintenance: NY State DOT "Snooper" Truck

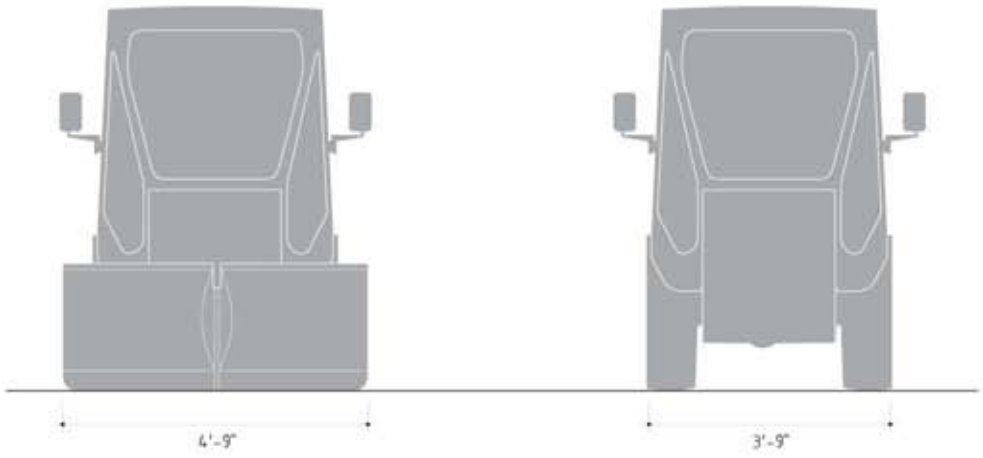
Bridge Maintenance: NY State DOT "Snooper" Truck

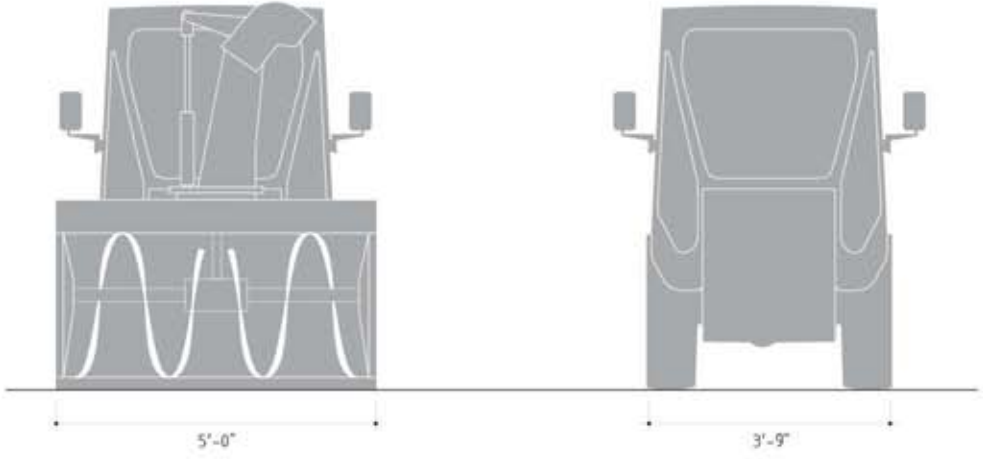


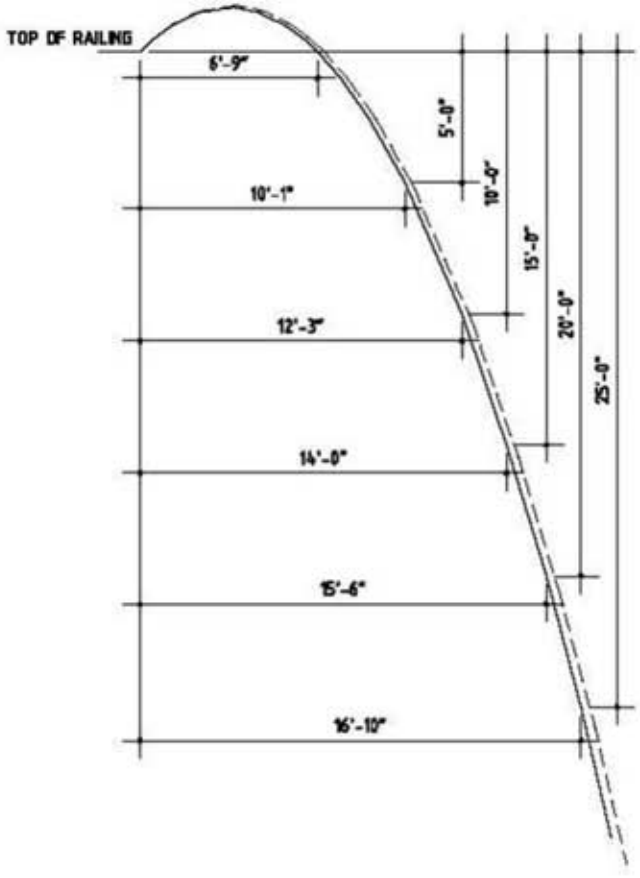
Bridge Maintenance: **Scaffold Rigging**

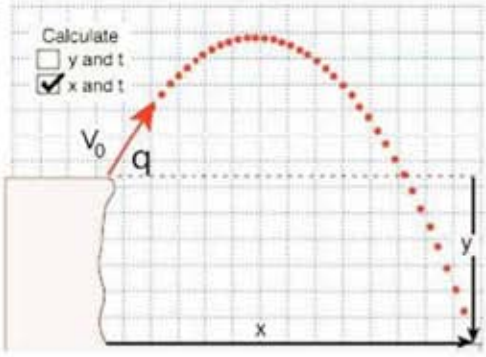


Bridge Maintenance: **Snow Removal**









$$x = v_{0x}\,t$$

$$y = v_{0y}\,t - \tfrac{1}{2}gt^2$$

Using the **quadratic formula** to solve for t gives two values of time for a given value of y.

$$t = \frac{v_{0y}}{g} \pm \sqrt{\frac{v_{0y}^2}{g^2} - \frac{2y}{g}}$$

Substitution of the two time values gives the two values of x corresponding to a given height y