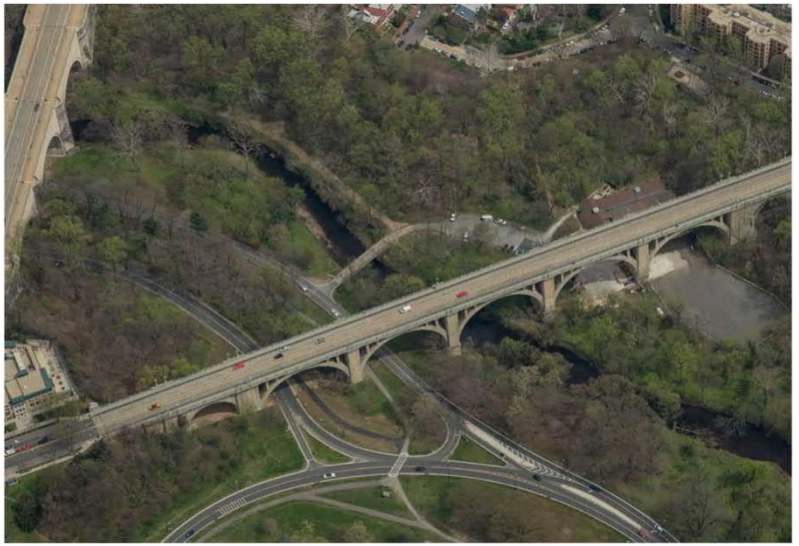
# DISTRICT DEPARTMENT OF TRANSPORTATION

## William Howard Taft Memorial Bridge
## Pedestrian Railing Improvement Concept Design

# DISTRICT DEPARTMENT OF TRANSPORTATION

July 20, 2023

Presented to:



## William Howard Taft Memorial Bridge
## Pedestrian Railing Improvement Concept Design

## Presentation Outline

- Project Owner, Design Team and Stakeholders
- Need and Purpose of the Project
- Project Location, Bridge Description and History, and Existing Features
- Section 106 Process
- Precedents and Design Criteria
- Overall Plan and Elevation
- Concept Options
- Preliminary Cost Estimate
- Reference Items

# Project Owner, Design Team and Stakeholders

- Project owner: District Department of Transportation (DDOT)
- Design Team: WSP
- Stakeholders:
  - Commission of Fine Arts (CFA)
  - National Capital Planning Commission (NCPC)
  - District of Columbia State Historic Preservation Office (DCSHPO)
  - The National Park Service (NPS)
  - The Federal Highway Administration (FHWA)
  - Several citizens groups
  - Advisory Neighborhood Commissions (ANC)
  - DC Councilmembers
  - DC Residents, Businesses and tourists
  - Smithsonian
  - Historic Preservation Group (Cleveland Park, Woodley Park, Kalorama Park, Dupont Circle)

# Need and Purpose of the Project

## Need:

- DC Government Office of the Chief Medical Examiner data showed that 26 Bridge-related suicides occurred in DC between January 1, 2010, and June 1, 2022, of which 13 fatalities were from the Taft Bridge.

## Purpose:

- Develop a suicide deterrent barrier system (SDB) that reduces the potential of suicide attempts.
- Minimize the impact to the existing historic bridge fabric and surrounding viewsheds.
- Provide a deterrent barrier that is compatible with the bridge aesthetics.

# Project Location

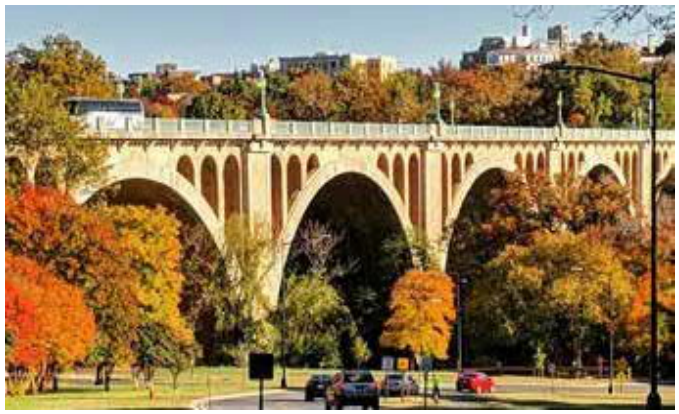

VICINITY MAP

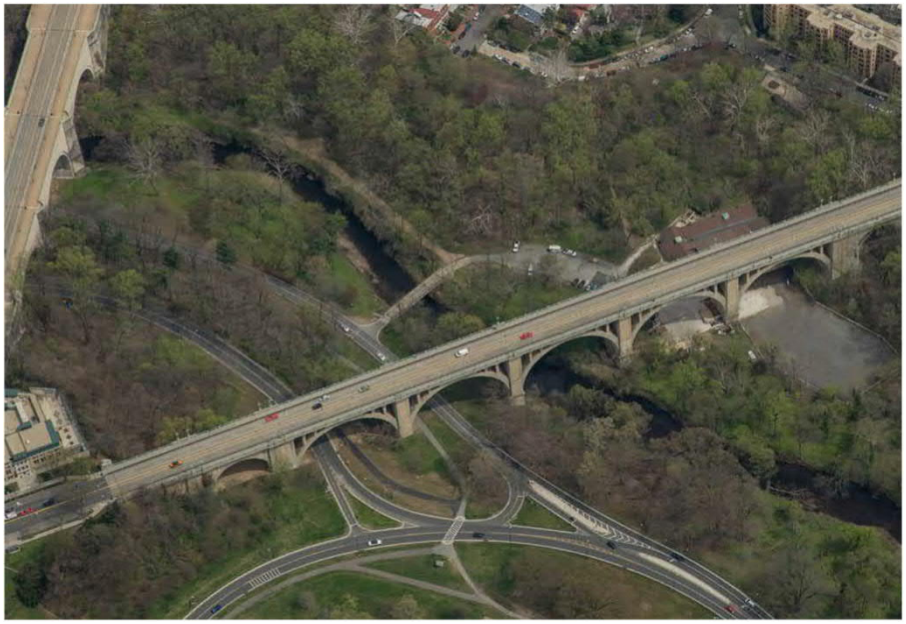
Google Map


LOCATION MAP

Google Map

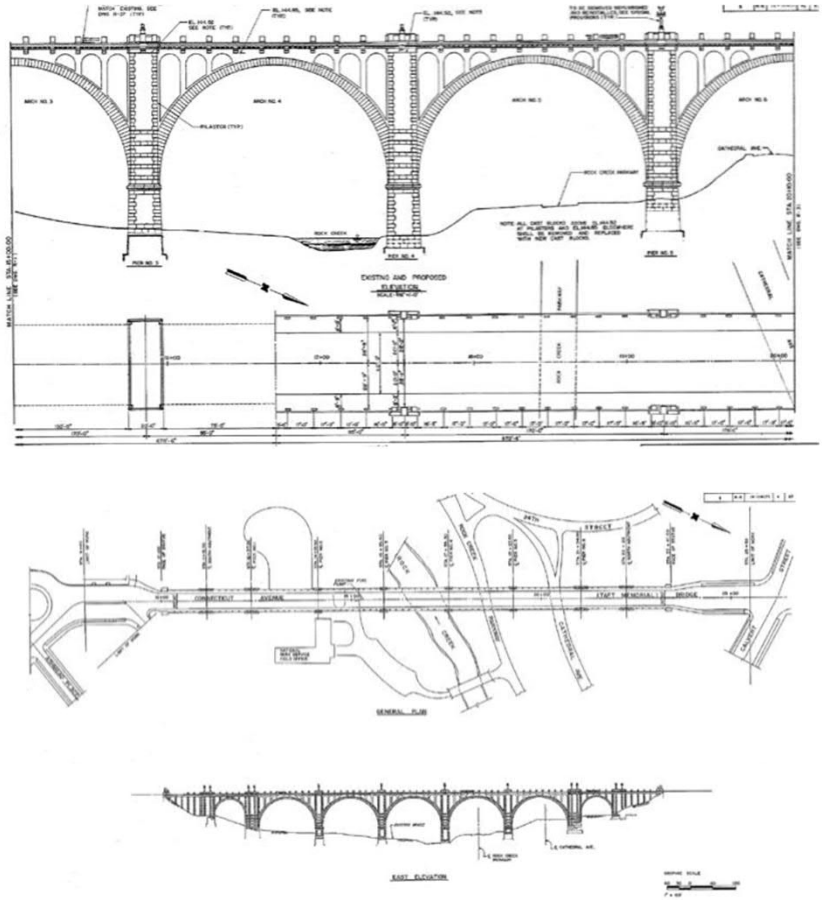
# General Views of the Bridge





# Bridge Description and History (1)

- Constructed between 1897 and 1907.
- Designed by George S. Morison (Engineer) and Edward Pearce Casey (Architect).
- With total length of 1331 ft.
- The bridge crosses over Rock Creek Park and carries Connecticut Avenue.
- It is considered one of the largest unreinforced concrete arch bridges in the world.
- The bridge rises 136 feet from the floor of Rock Creek Park.
- The construction of the William Howard Taft Bridge made vast stretches of upper Northwest Washington D.C. more easily accessible and thus more desirable as residential areas.
- The bridge is supported by seven arches; the five large arches are 150 feet long each, and the two smaller arches measure 82 feet long each.



Partial plan and elevation 1995 Rehab of Connecticut Ave Bridge (Taft Memorial Bridge)

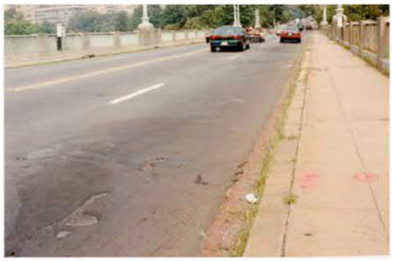
# Bridge Description and History (2)

- Originally, the bridge had a curb-to-curb width of 39 feet and a 6'-0" pedestrian walkway on both the east and west sides of the bridge travel lanes.
- The bridge included a metal railing system, concrete pilasters and architectural bridge lighting.
- Two Perry lions are installed at each end of the bridge.
- The Perry lions were restored in 1965 and then were replaced in 2000.
- Twelve Baristow eagle lampposts are installed on each side of the bridge. The twelve lampposts are distributed along the length of the bridge as follows: two groups of two posts at the north end of the bridge, four single lampposts at equal spacing, and two group of two lampposts near the south end of the bridge.

Streetsofwashington.com

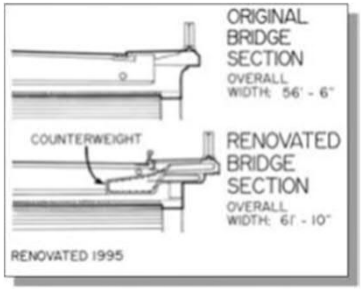

Streetsofwashington.com

Streetsofwashington.com



Bridge before 1995 renovation
DDOT Historic Collections

Library of Congress Collection




Library of Congress Collection

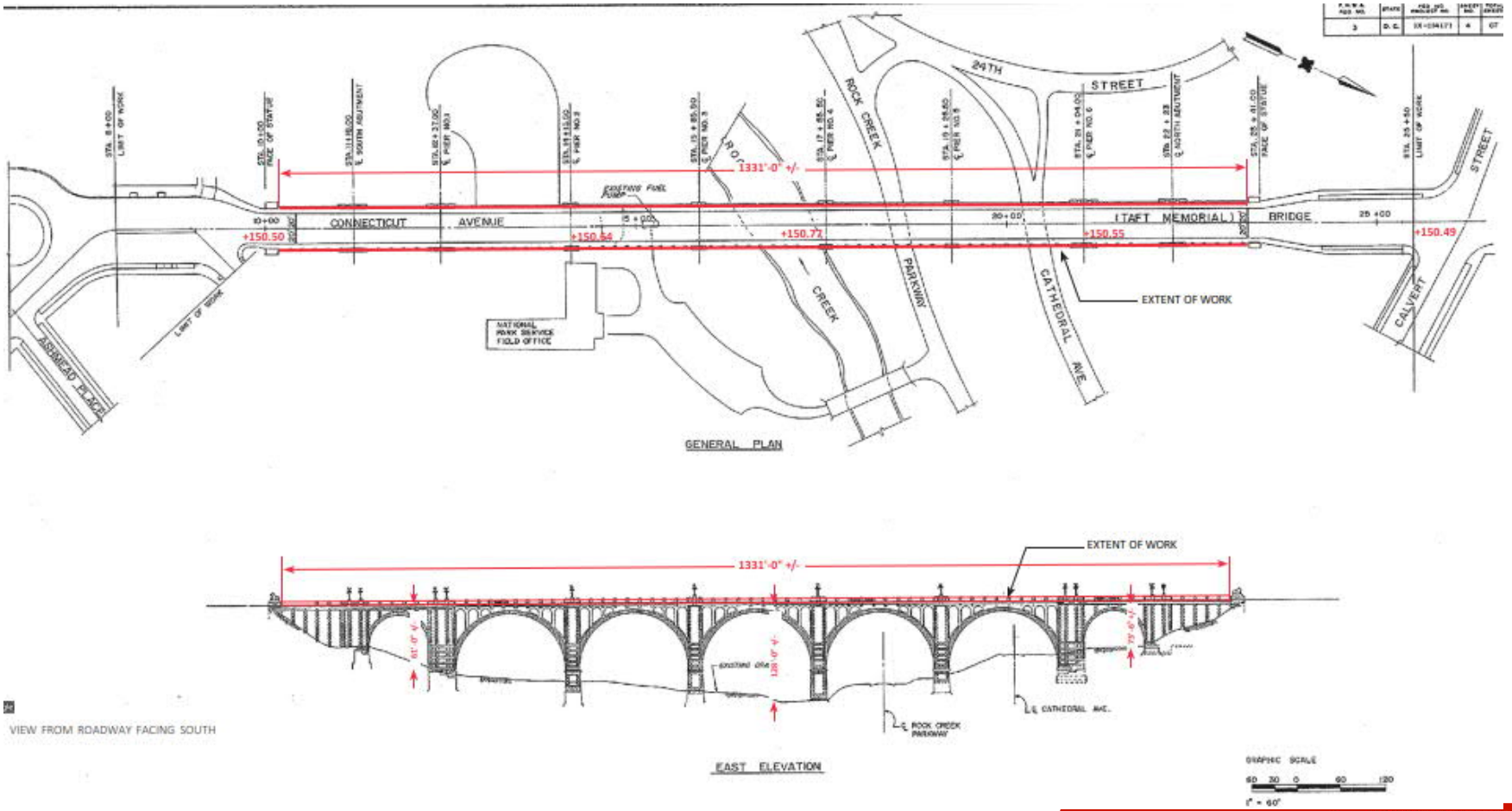
# Bridge Description and History (3)

- From 1993 to 1995 a comprehensive bridge rehabilitation occurred involving:
  - The replacement and widening of the bridge deck.
  - The curb-to-curb width was increased from 39 feet to 40 feet.
  - The pedestrian walkway width was increased from 6 feet to 7’-6”.
  - A traffic barrier was added to separate traffic lanes from pedestrian walkways.
  - The total width of the deck increased from 59 feet to 64’-8”.
  - Concrete piers were rehabilitated.
  - Existing lanterns and pilasters were removed and reinstalled
  - Existing railings were replaced.
  - A precast concrete element was added at the bottom of the railings to increase the railing height.


Google Image

Google Image

# Existing Features (1)



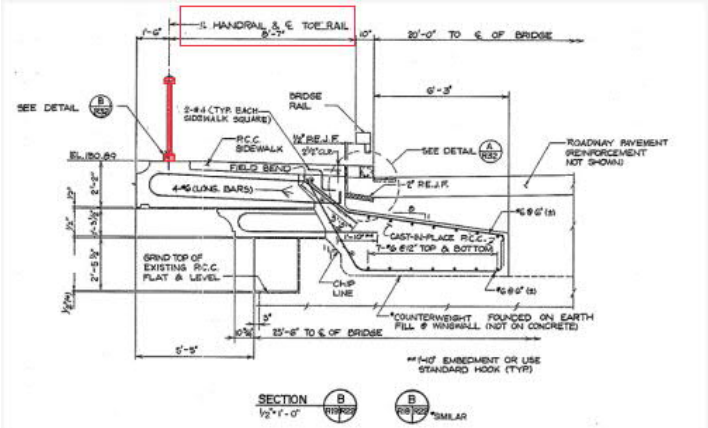
# Existing Features (2)

View from roadway facing south

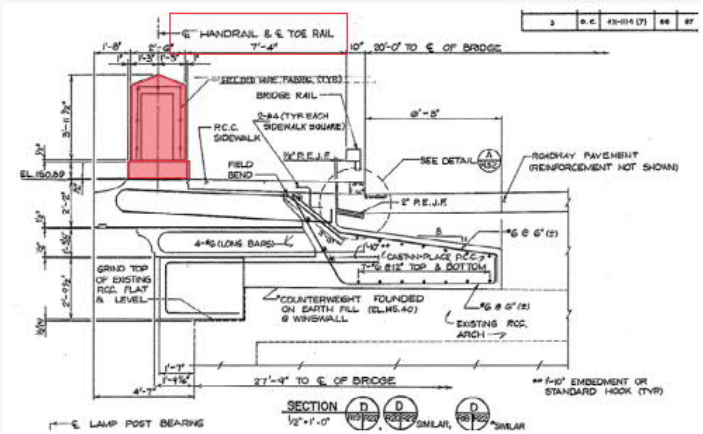
View from roadway facing north

# Existing Features (3)

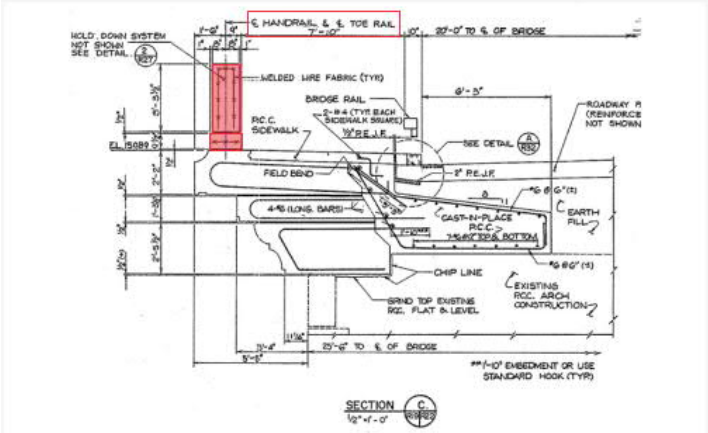
- Typical pilaster width perpendicular to bridge centerline: 1’-4” with inside face 8’-7” from face of traffic railing
- Lamppost pilaster width directly under the lamppost in the direction perpendicular to bridge centerline: 3’-10” with inside face 7’-4” from face of traffic railing



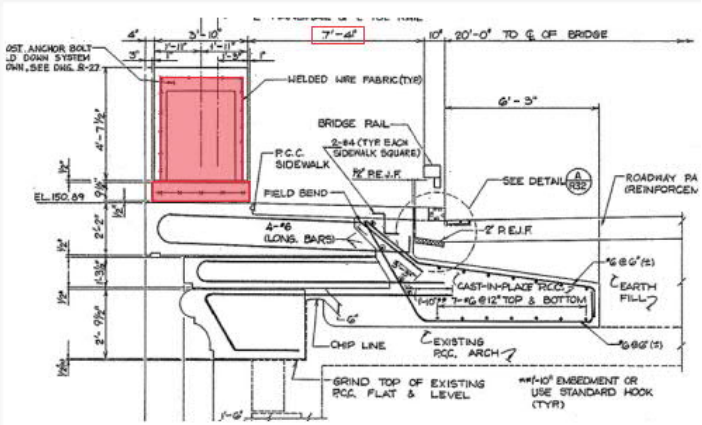

SECTION AT RAILING




SECTION AT PILASTERS TO EITHER SIDE OF LAMPPOSTS

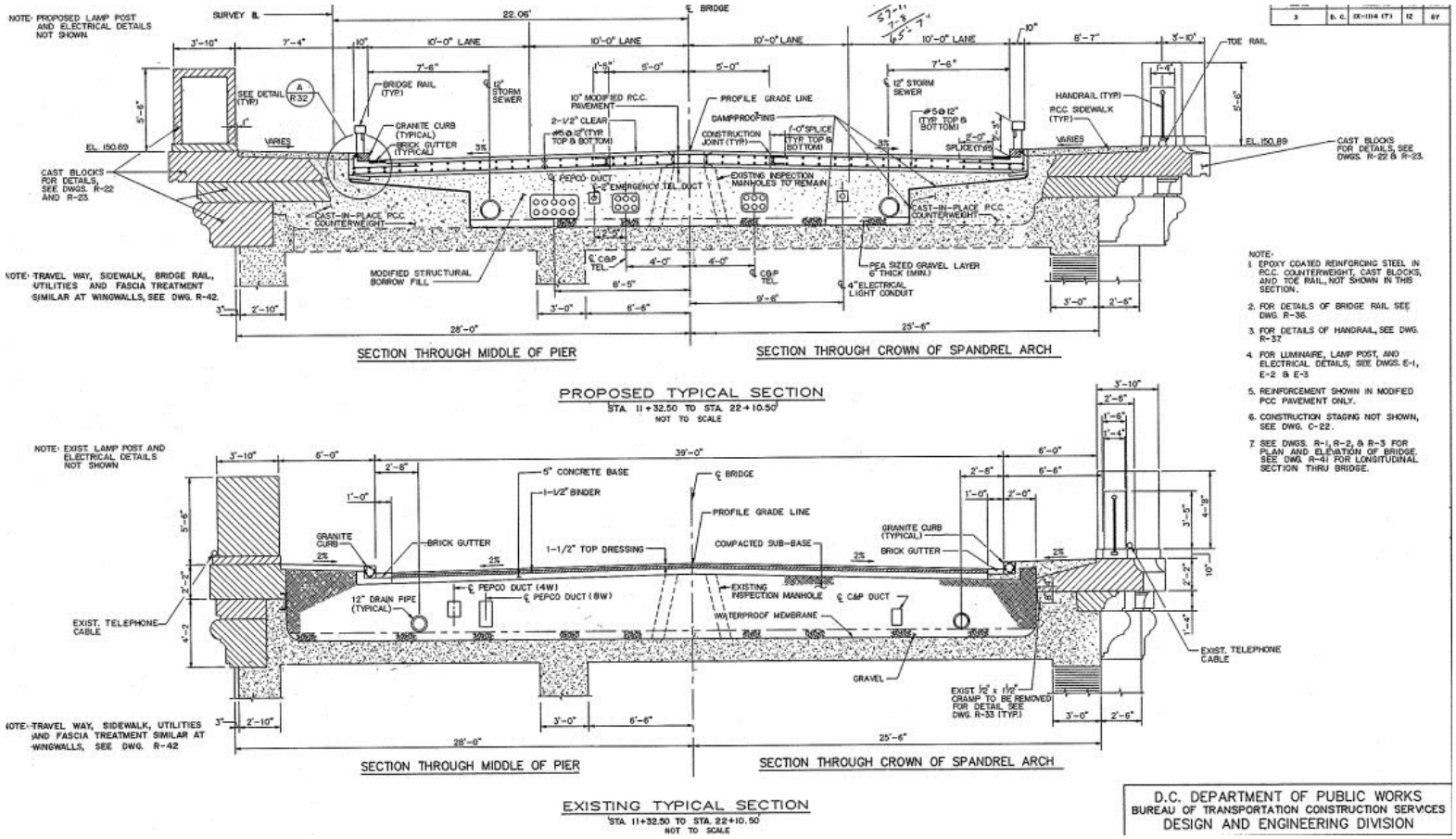



SECTION AT TYPICAL PILASTERS



SECTION AT LANTERN PILASTERS

# Existing Features (4)




Google Image

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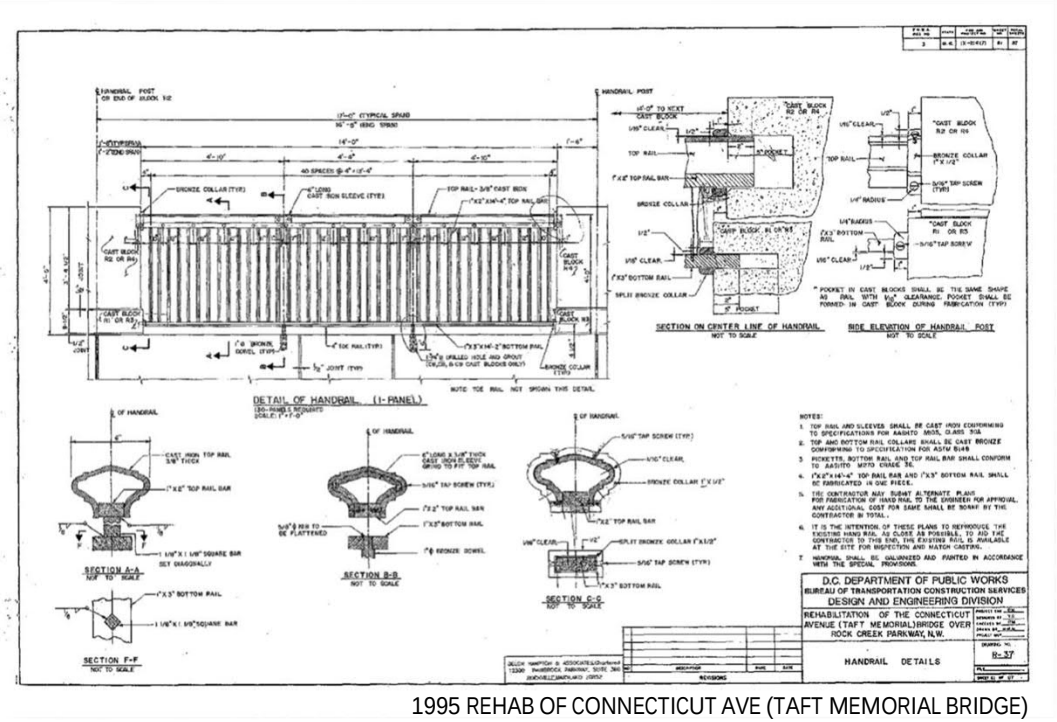
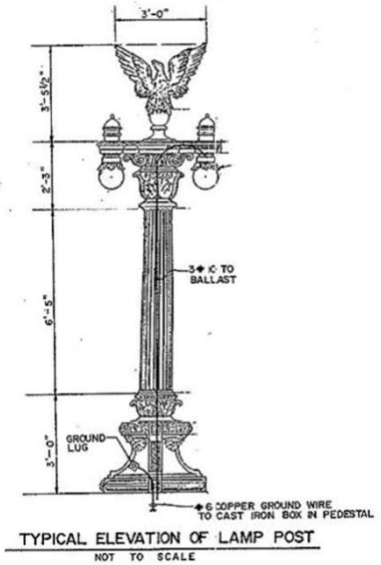
# Existing Features (5)




1995 REHAB OF CONNECTICUT AVE (TAFT MEMORIAL BRIDGE)

Image of Perry lion




Rehab of Connecticut Ave
(Taft Memorial Bridge

Baristow eagle lamp post

# Section 106 Process

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve throughout the country. If a federal or federally assisted project has the potential to affect historic properties, a Section 106 review will take place.

(https://www.achp.gov/protecting-historic-properties/section-106-process/introduction-section-106)

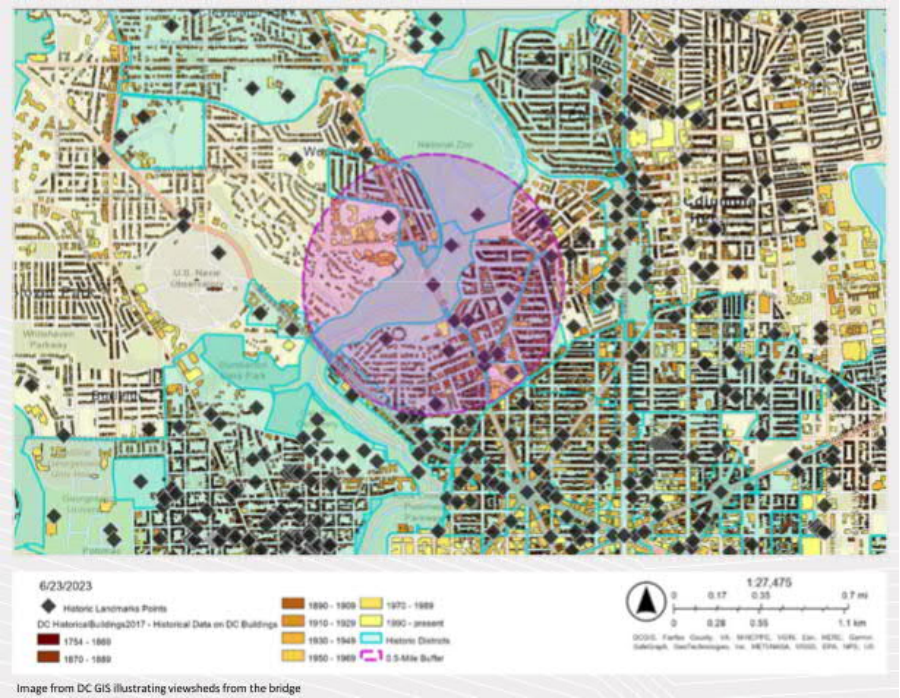
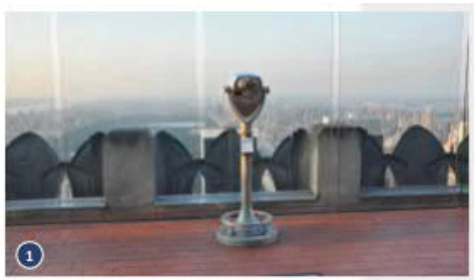


Image from DC GIS illustrating viewsheds from the bridge

# Precedents (1)

- Several study reports for the installation of suicide deterrent barriers were reviewed:
  - Golden Gate Bridge
  - Sunshine Skyway Bridge
  - Cornell University
  - Governor Thomas Johnson Bridge
  - National survey (Switzerland)
- Precedents in the available literature were reviewed including local, national and international precedents
- Materials /systems used:
  - Glass railings
  - Metal railings (vertical pickets and ClearVu systems)
  - Netting (both horizontal and vertical)

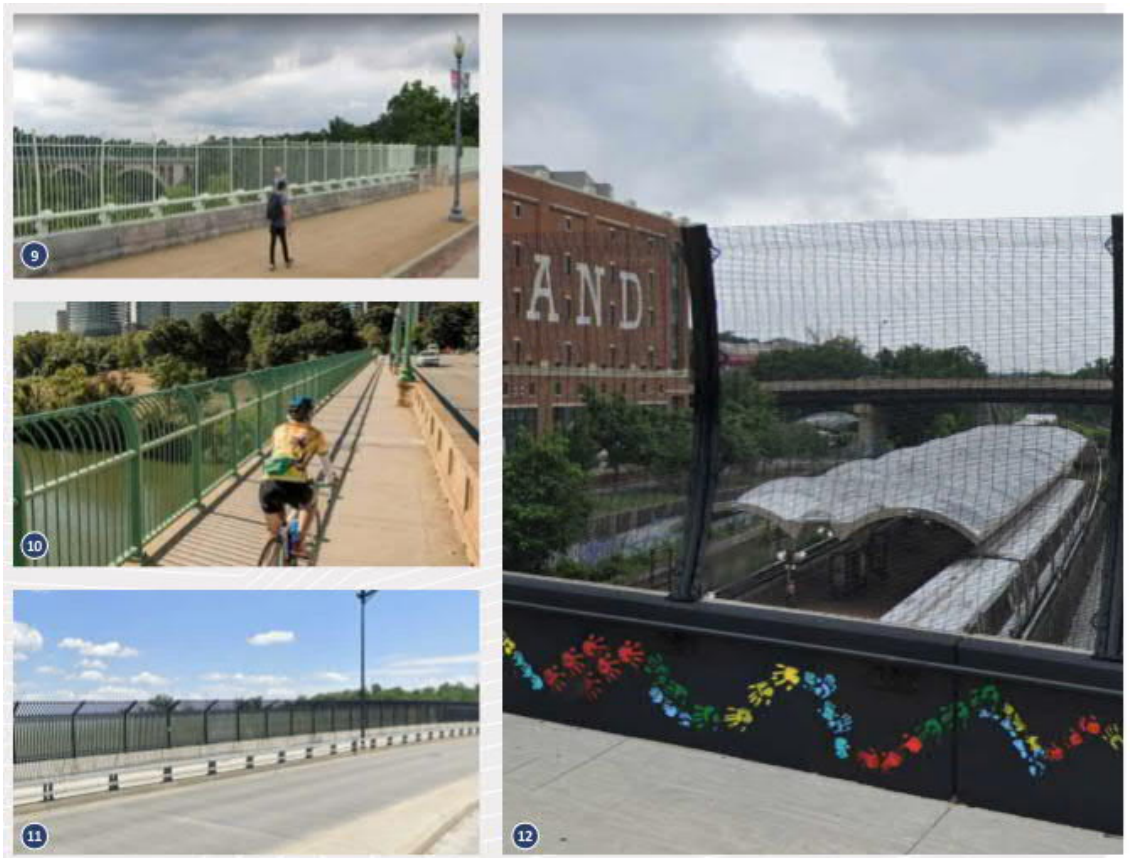
# Precedents (2)




| CAPTION LIST | SOURCE |
|---|---|
| 1. Empire State Building, New York | Google image |
| 2. Bridge in Madrid, Spain | DDOT |
| 3. Bridge in Madrid, Spain | DDOT |
| 4. Brooklyn Bridge, New York | Google image |
| 5. Pedestrian bridge, Switzerland | Hammerglass image |
| 6. Golden Gate Bridge, San Francisco | Golden Gate Physical Suicide Deterrent Study |
| 7. Bridge netting | Google image |
| 8. Pedestrian bridge, Switzerland | Google image |
| 9. Duke Ellington Bridge, Washington DC | Google image |
| 10. Key Bridge, Washington DC | Google image |
| 11. 9th Street bridge, Washington DC | Google image |
| 12. Monroe Street bridge, Washington DC | DDOT |

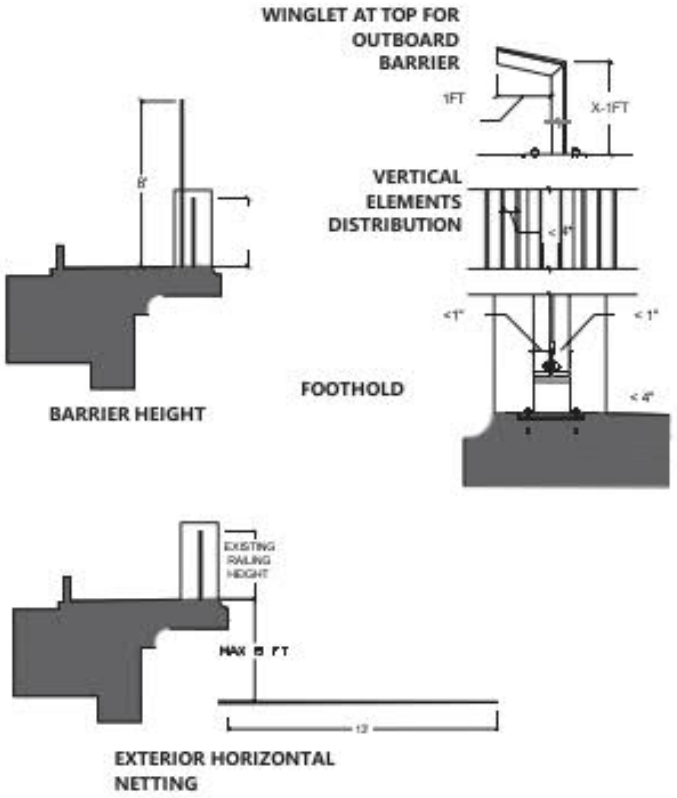
# Precedents (3)

## Vertical Pickets & ClearVu Systems

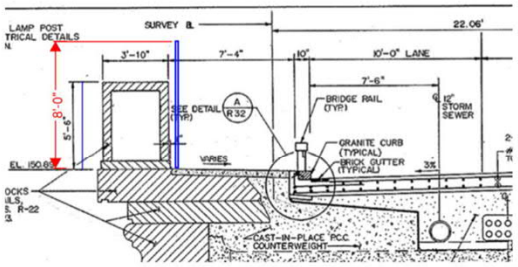


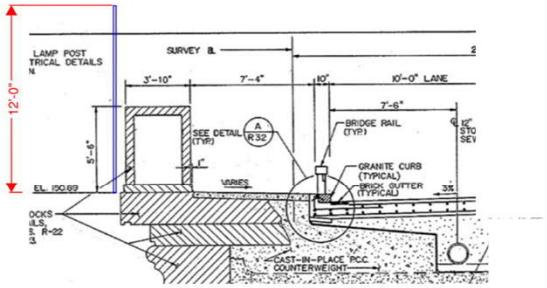
# Design Criteria (1)

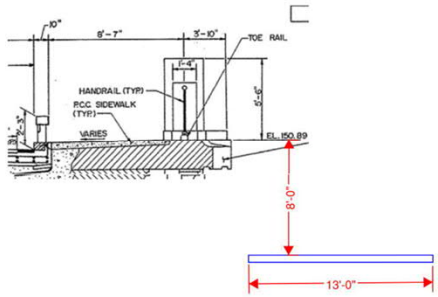
- Barrier Height
  - o Ideal height (8’-0" above any foothold)
  - o Height reduction (curved top/angled inward)
- Handholds
  - o Maximize finger clearance to prevent handholds
- Footholds
  - o Minimize horizontal element projection
- Materials
  - o Metal picket fencing, ClearVu, glass, netting

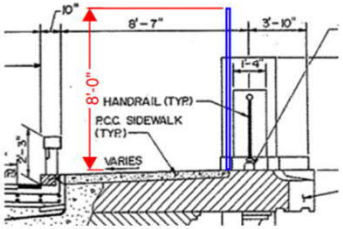


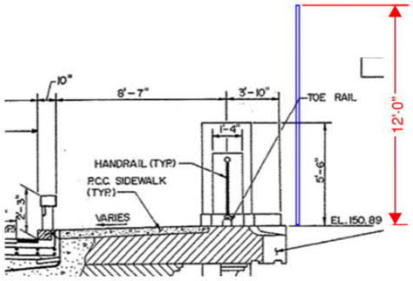
# Design Criteria Applied to Existing Bridge



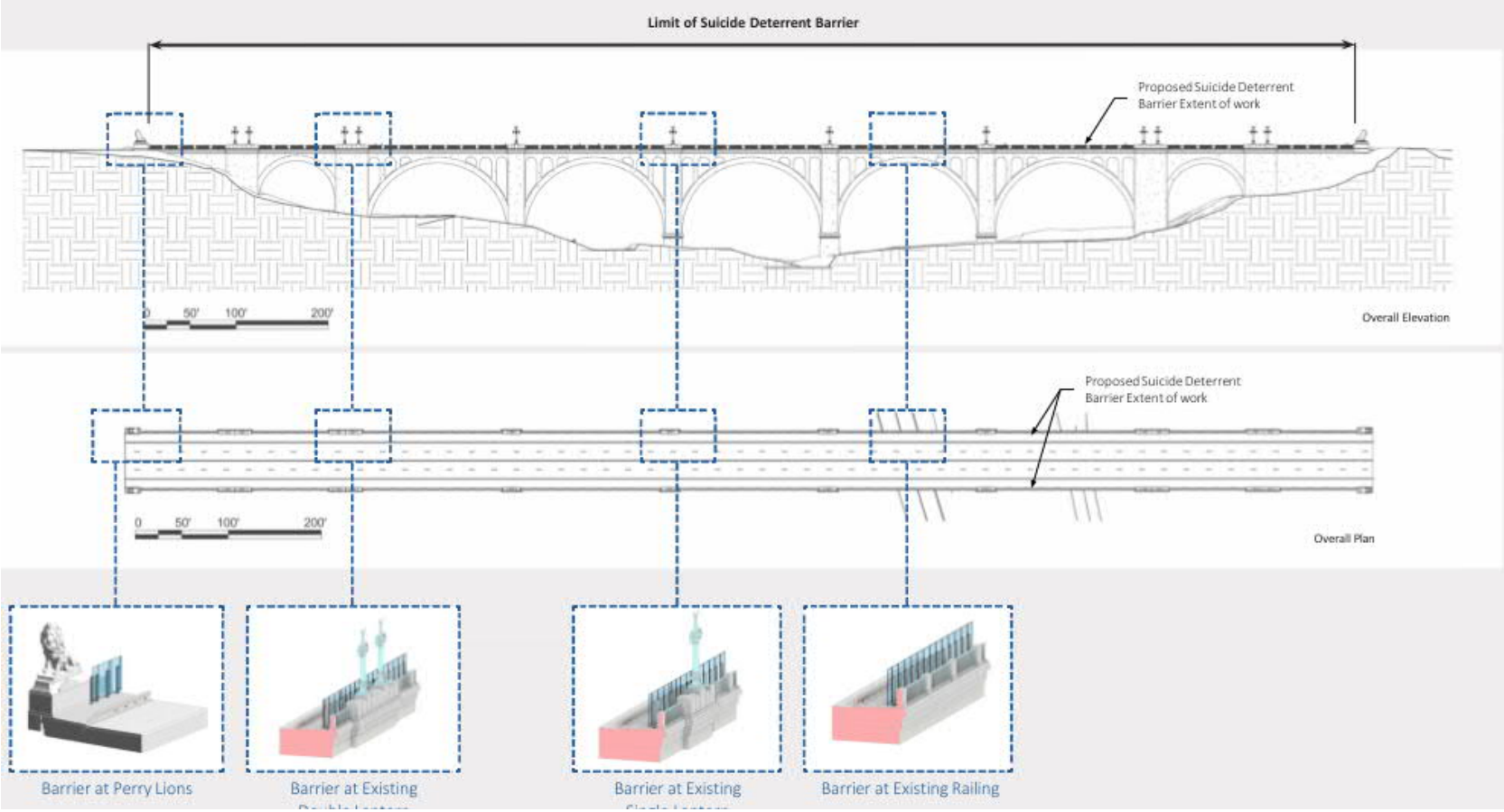




Inboard options

Outboard Options

Horizontal Netting

# Overall Plan and Elevation



# Concept Options

Concept 1

WSP rendering

Concept 2

WSP rendering

Concept 3

WSP rendering

# Concept Option 1 (1)

- Preferred option
- Glass panel system mounted inboard of the existing railing
- 4'-0" +/- x 8'-0" glass panels
- 8’-6” total height (8’-0” feet tall glass panels with 6” clear below the panels)
- Vertical metal posts
- Continuous single plane in front of the widest pilasters
- 6’-6”+/- pedestrian walkway clear width for the entire bridge length
- Each glass panel is supported by four bolts through the panels.
- Panels can easily be removed for maintenance

# Concept Option 1 (2)

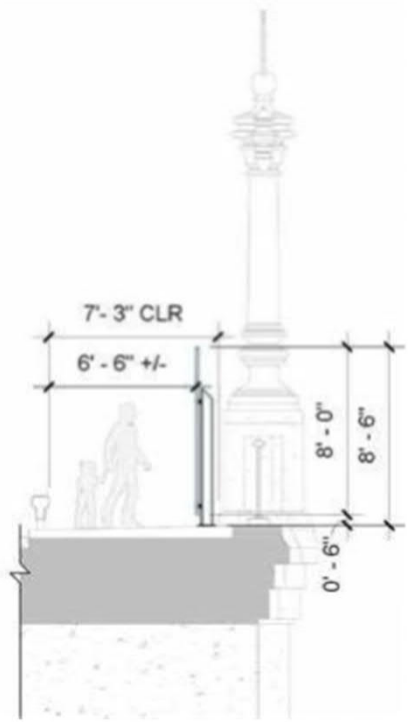
# Concept Option 1 (3)

Renderings from Rock Creek Park

# Concept Option 1 (4)

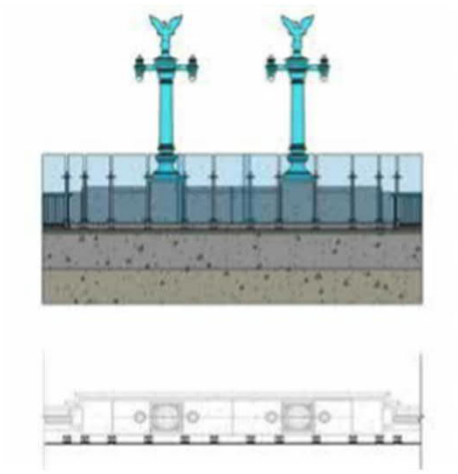
Rendering of glazing panels at single lantern

Rendering of glazing panels at double lanterns

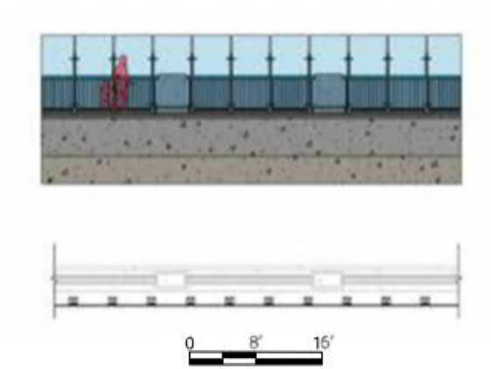



Section at existing lantern

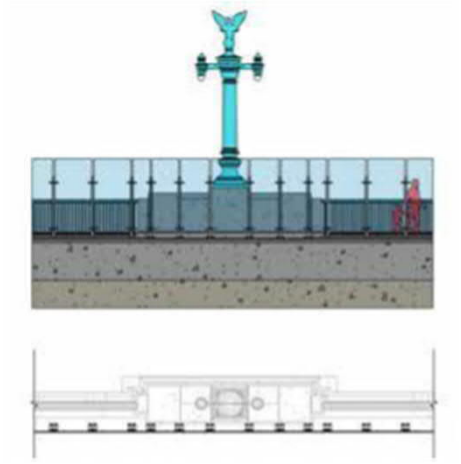
# Concept Option 1 (5)



Rendering at double lanterns



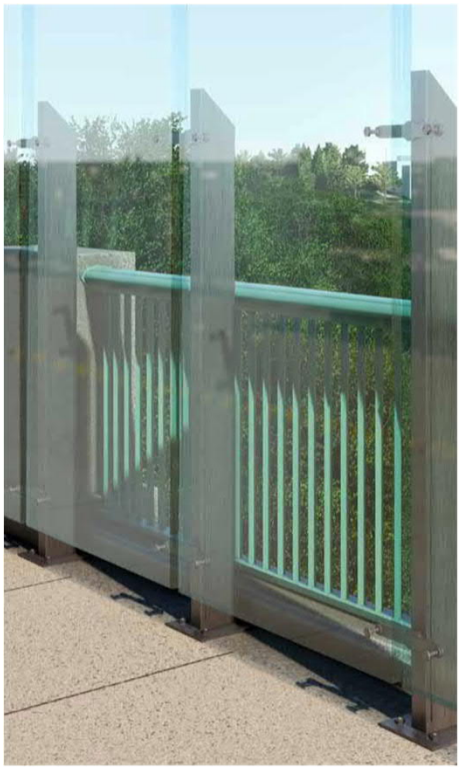

Rendering at typical railing and pilasters



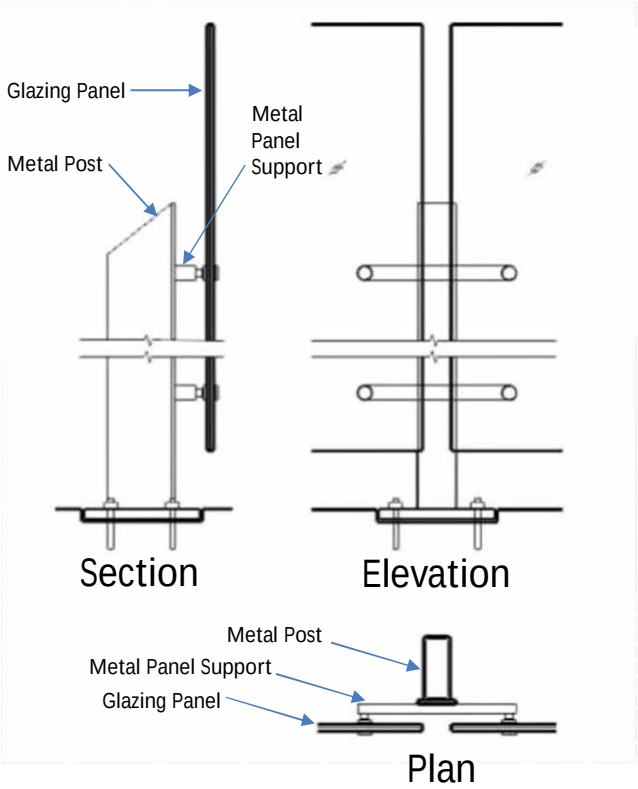
Rendering at single lantern

# Concept Option 1 (6)

Post and connection details and glazing



Detail rendering




Post and connection details

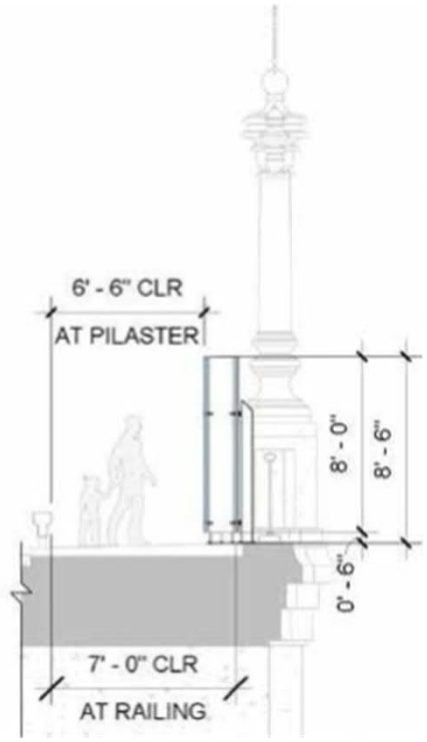

Examples of glazing film

# Concept Option 1 Variant

- Barrier is just inboard of the existing typical pilasters for most of the length
- Panels jog around lamppost pilasters

Rendering at railing and typical pilasters

Rendering of panels jogging around lamppost pilasters




Section at existing lantern

# Concept Option 2 (1)

- ClearVu system
- 8’-0” tall welded wire mesh
- 8’-6” total height of the barrier (8’-0” tall panels with 6” clear below the panels)
- Vertical metal posts
- Continuous single plane inboard of the widest pilasters
- 6’-10” +/- pedestrian walkway width

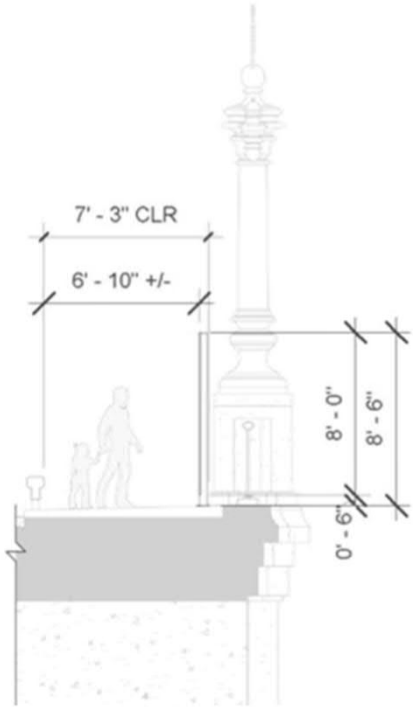
# Concept Option 2 (2)

Renderings from Rock Creek Park

# Concept Option 2 (3)

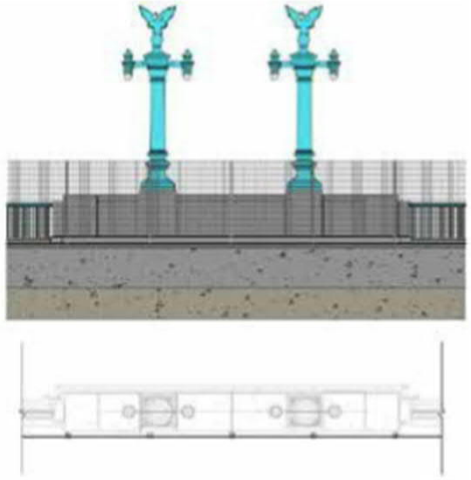
Rendering of panels at single lantern

Rendering of panels at double lanterns

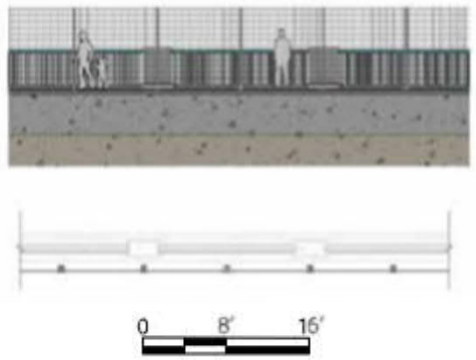



Section at existing lantern

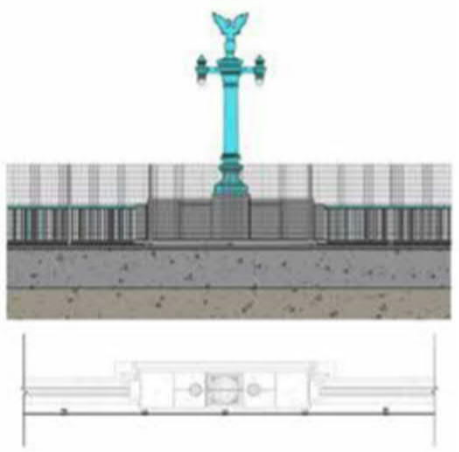
# Concept Option 2 (4)



Rendering at double lanterns




Rendering at typical railing and pilasters

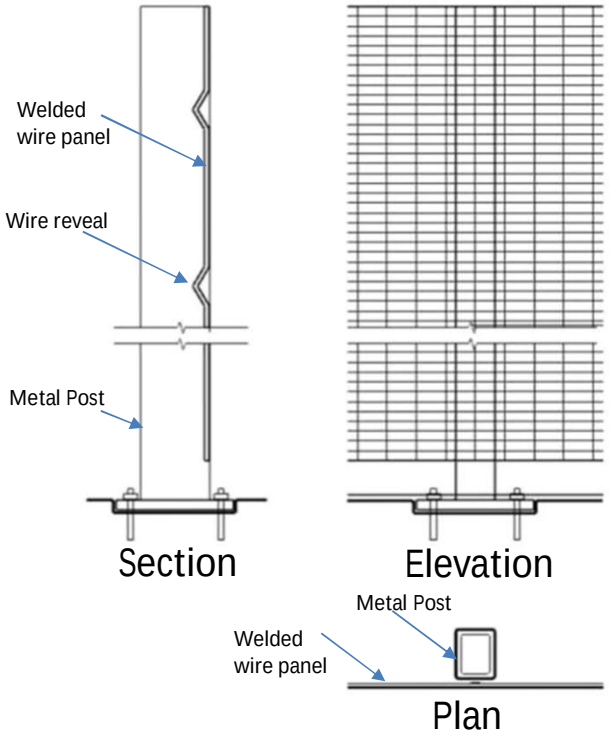


Rendering at single lanterns

# Concept Option 2 (5)

System details

Detail rendering




Post and connection details

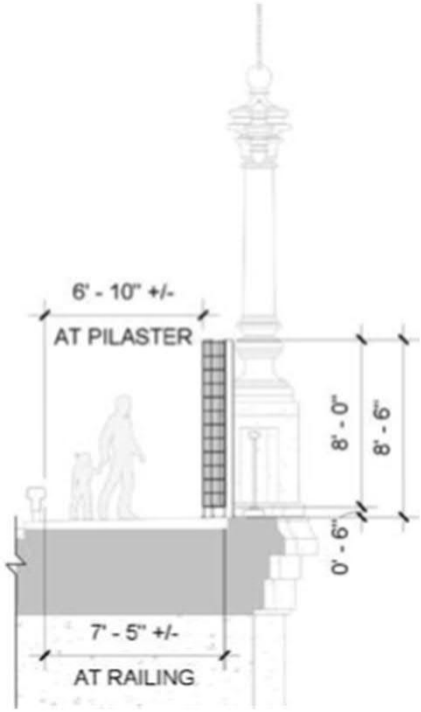
ClearVu detail image

# Concept Option 2 Variant

- Barrier just inboard of the existing typical pilasters for most of the length
- Panels jog around lamppost pilasters

Rendering at railing and typical pilasters

Rendering of panels jogging around lamppost pilasters




Section at existing lantern

# Concept Option 3 (1)

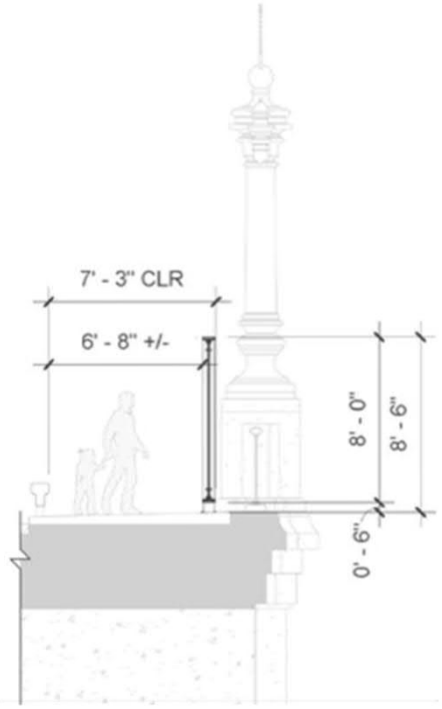
- 8’-0” h x 8’-6” with metal frame panels
- 8’-6” total height of the barrier (8’-0” tall panels with 6” clear below the frame panels)
- Tensioned vertical stainless-steel wires
- Continuous single plane inboard of the widest pilasters
- 6’-8” +/- pedestrian walkway width

# Concept Option 3 (2)

Renderings from Rock Creek Park

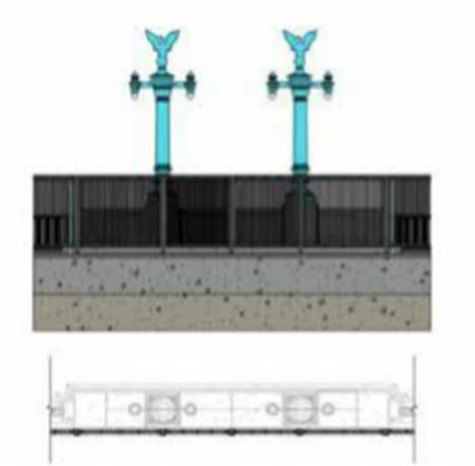
# Concept Option 3 (3)

Rendering of panels at single lantern

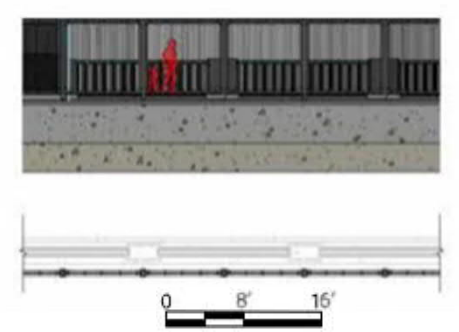



Section at existing lantern

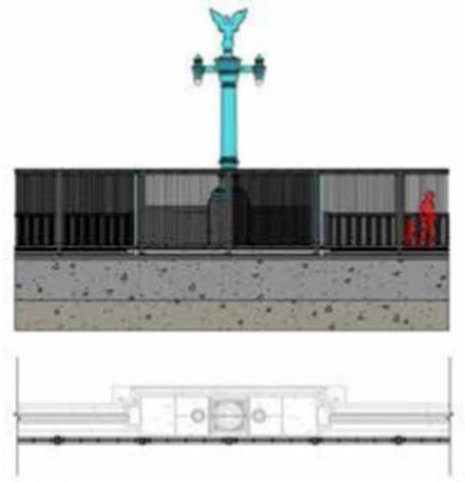
# Concept Option 3 (4)



Rendering at double lanterns



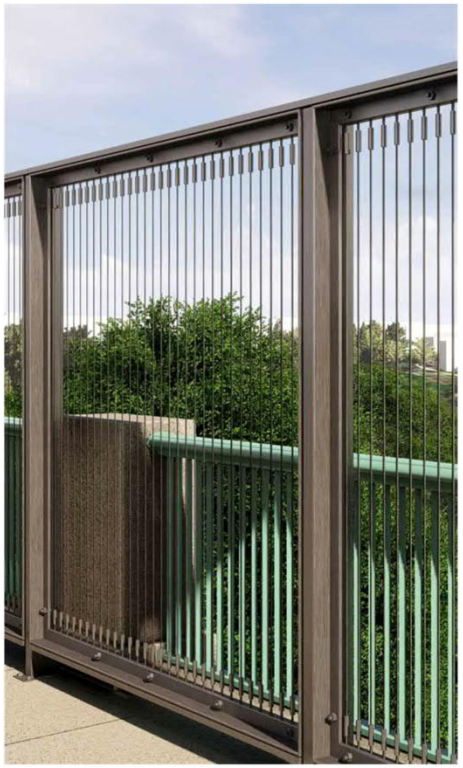

Rendering at typical railing and pilasters



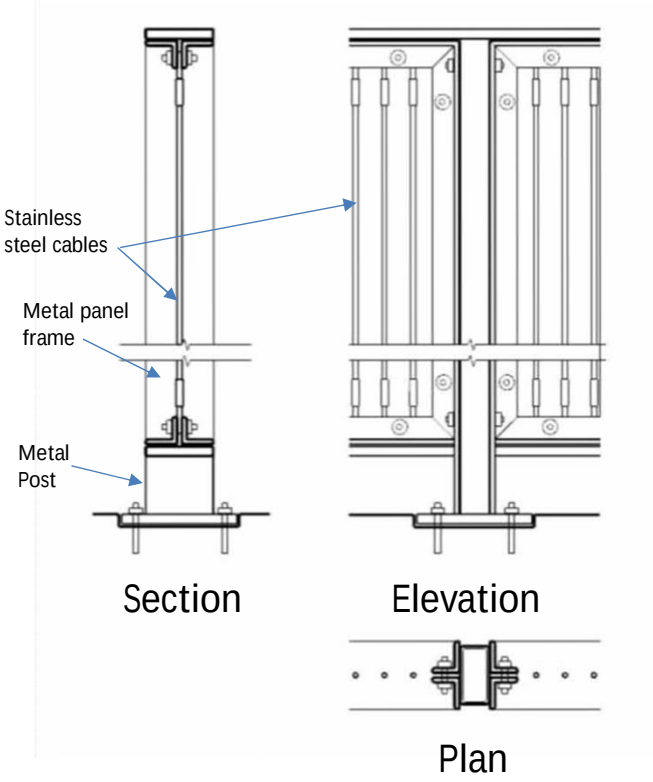
Rendering at single lanterns

# Concept Option 3 (5)

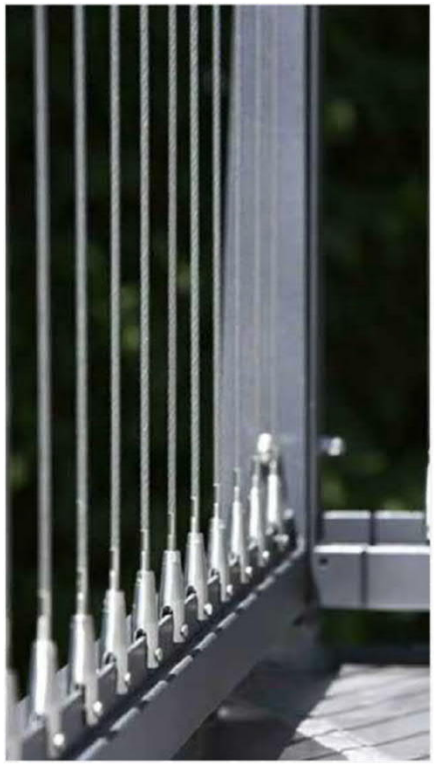
System details



Detail rendering




Post and connection details



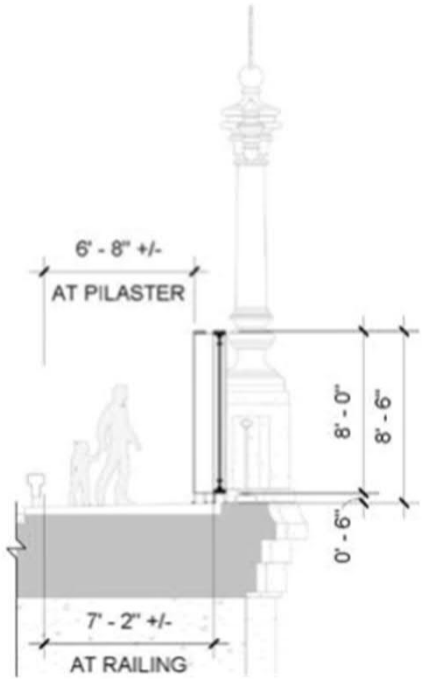
Stainless steel cable system

# Concept Option 3 Variant

- Barrier just inboard of the existing typical pilasters for most of the length
- Panels jog around lamppost pilasters

Rendering at railing and typical pilasters

Rendering of panels jogging around lamppost pilasters




Section at existing lantern

# Preliminary Cost Estimate

$3.9 MILLION +/-

$1.2 MILLION +/-

$2.5 MILLION +/-

District Department of Transportation

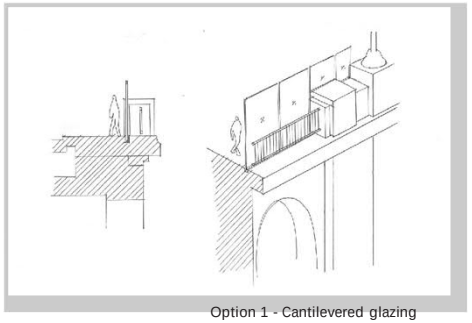
250 M St SE | Washington, DC 20003 | 202.673.6813

# REFERENCE ITEMS

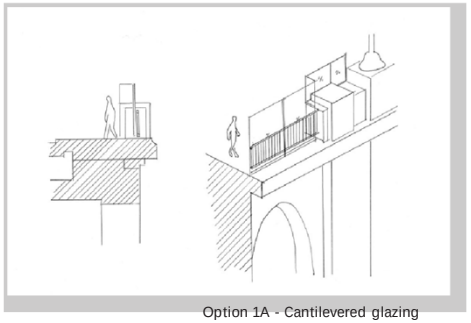
## WILLIAM H TAFT MEMORIAL BRIDGE - SUICIDE DETERRENCE BARRIERS DESIGN CRITERIA

| GROUP | REFERENCE | DATE | TYPE OF OPTION | BARRIER HEIGHT | NETTING LENGTH | NETTING DEPTH | CLEARANCE | FOOTHOLD | HANDHOLD | INWARD PROJECTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING | WILLIAM H TAFT BRIDGE, WASHINGTON, DC | 1909 | EXISTING RAILING | 4.5' | - | - | 3.5" | YES | - | - | EXISTING RAILING 4.5' IN HEIGHT, NO DETERRENCE YET |
| | DUKE ELLINGTON BRIDGE, WASHINGTON, DC | 1986 | VERTICAL BARRIER | 6.0' | - | - | 3.5" | YES | - | YES | 6.0' FENCING ATTACHED OUTBOARD OF EXISTING FENCE, 8.0' ABOVE DECK |
| GOV THOMAS JOHNSON BRIDGE | MDOT GOVERNOR THOMAS JOHNSON BRIDGE EVALUATION OF SUICIDE DETERRENT SYSTEMS | 2022 | PHYSICAL BARRIER BEHIND EXISTING CONCRETE PARAPET | 10'-8" MIN | - | - | NONE INDICATED | YES 10" | NOT INDICATED | YES | NEEDS TO BE LARGER TO FACILITATE STANDING ON PARAPET |
| | MDOT GOVERNOR THOMAS JOHNSON BRIDGE EVALUATION OF SUICIDE DETERRENT SYSTEMS | 2022 | PHYSICAL BARRIER ON TOP OF EXISTING CONCRETE PARAPET | 8'-10" MIN | - | - | NONE INDICATED | NONE | NOT INDICATED | NO | |
| | MDOT GOVERNOR THOMAS JOHNSON BRIDGE EVALUATION OF SUICIDE DETERRENT SYSTEMS | 2022 | NETTING NEAR ROADWAY | - | 13" MIN | SMALL | NONE INDICATED | YES 10" | NOT INDICATED | - | NETTING NEAR PARAPET REQUIRES MORE HORIZONTAL PROTECTION |
| | MDOT GOVERNOR THOMAS JOHNSON BRIDGE EVALUATION OF SUICIDE DETERRENT SYSTEMS | 2022 | NETTING BELOW ROADWAY | - | 13" MIN | LARGE | NONE INDICATED | - | NOT INDICATED | - | NETTING BELOW PARAPET HAS MORE DEPTH BUT LESS HORIZONTAL PROTECTION |
| | MDOT GOVERNOR THOMAS JOHNSON BRIDGE EVALUATION OF SUICIDE DETERRENT SYSTEMS | 2022 | HYBRID PHYSICAL BARRIER/NETTING | VARIES | VARIES | VARIES | NONE INDICATED | - | NOT INDICATED | YES | |
| GOLDEN GATE BRIDGE | GOLDEN GATE PHYSICAL SUICIDE DETERRENT SYSTEM PROJECT | 2008 | VERTICAL BARRIER TO OUTISDE RAILING (1A) | 8.0' | - | - | NONE INDICATED | - | NOT INDICATED | - | |
| | GOLDEN GATE PHYSICAL SUICIDE DETERRENT SYSTEM PROJECT | 2008 | HORIZONTAL BARRIER TO OUTISDE RAILING (1B) | 12.0' | - | | 5.375" | - | NOT INDICATED | YES | 8'-0" ABOVE 4'-0" GUARDRAIL WITH HORIZONTAL CABLES 1'-0" WINGLET AT TOP |
| | GOLDEN GATE PHYSICAL SUICIDE DETERRENT SYSTEM PROJECT | 2008 | REPLACE OUTSIDE HANDRAIL WITH VERTICAL BARRIER (2A) | 12.0' | - | - | 4.5" | - | - | - | VERTICAL STEEL RODS |
| | GOLDEN GATE PHYSICAL SUICIDE DETERRENT SYSTEM PROJECT | 2008 | REPLACE OUTSIDE HANDRAIL WITH HORIZONTAL BARRIER (2B) | 10.0' | - | - | 4.4" | - | - | YES | HORIZONTAL CABLES 1'-0" WINGLET AT TOP |
| | GOLDEN GATE PHYSICAL SUICIDE DETERRENT SYSTEM PROJECT | 2008 | ADD NET SYSTEM THAT EXTENDS HORIZONTALLY (3) | - | 20.0' | 20.0' | NONE INDICATED | - | - | - | NETTING 20' FROM BRIDGE, EXTENDS 5' ABOVE BOTTOM CHORD OF BRIDGE. PTD METAL MESH |
| FLORIDA SKYWAY BRIDGE | FLORIDA SUNSHINE SKYWAY BRIDGE | 2019 | VERTICAL TRANSPARENT PANEL BARRIER | - | - | - | - | - | - | - | NOT PURSUED DUE TO WEIGHT AND UV DAMAGE |
| | FLORIDA SUNSHINE SKYWAY BRIDGE | 2019 | WIRE NET FENDING OPTION | 7.5' | - | - | - | CHAMPER AT TOP | - | - | OUTBOARD OPTIONS EXTENDING FROM OUTSIDE OF EXISTING TRAFFIC RAILING |
| | FLORIDA SUNSHINE SKYWAY BRIDGE | 2019 | EXTERIOR HORIZONTAL NETTING OPTION | - | 13.0' | 13.0' | - | - | - | - | HORIZONTAL NETTING BELOW BRIDGE. SPECIAL SNOOPER TRUCK REQUIRED. |
| NATIONAL SURVEY SWITZERLAND | COMPARING SUICIDE PREVENTION MEASURES: NATIONAL SURVEY IN SWITZERLAND | 2017 | VERTICAL BARRIER | 4.90' | - | - | - | - | - | - | 1.5 M HEIGHT 68% REDUCTION |
| | COMPARING SUICIDE PREVENTION MEASURES: NATIONAL SURVEY IN SWITZERLAND | 2017 | VERTICAL BARRIER | 9.0' | - | - | - | - | - | - | 2.75 M HEIGHT 68% REDUCTION |
| | COMPARING SUICIDE PREVENTION MEASURES: NATIONAL SURVEY IN SWITZERLAND | 2017 | VERTICAL BARRIER | 10.8' | - | - | - | - | - | - | 3.3 M HEIGHT 69% REDUCTION |
| | COMPARING SUICIDE PREVENTION MEASURES: NATIONAL SURVEY IN SWITZERLAND | 2017 | SAFETY NET | - | - | - | - | - | - | - | SAFETY NETTING LED TO 77.1% REDUCTION |

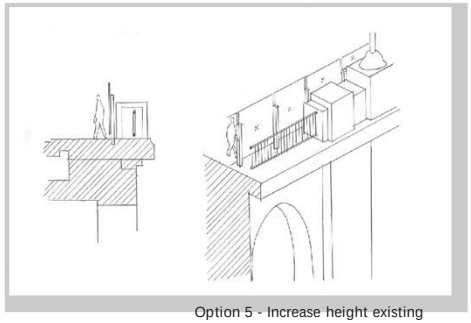
| WILLIAM H TAFT MEMORIAL BRIDGE - SUICIDE DETERRENCE BARRIERS (DRAFT) | | | | | | | | | | | | | | EVALUATIONS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SUBSET | NUMBER | CONCEPT OPTIONS | MATERIALS | | | | | | | | ANALYSIS | | | SAFETY (1 POOR - 3 GOOD) | | PHYSICAL DETERRENCE (1 POOR - 3 GOOD) | VISUAL IMPACTS (1 POOR (high Visual Impact) - 3 GOOD (Low Visual Impact)) | | | | | STRUCTURAL (1 POOR - 3 GOOD) | | MAINTENANCE (1 POOR (Higher Maintenance) 3 GOOD (Lower Maintenance)) | | | COST (1 POOR (Higher Cost) - 3 GOOD (Lower Cost)) | SUM |
| | | | GLAZING | METAL | STONE | COMPOSITE | ACRYLIC | CAST-IRON | CHAIN LINK | OTHER | ADVANTAGES | DISADVANTAGES | | SAFETY RISK TO EMERGENCY PERSONNEL | SAFETY RISK TO GENERAL PUBLIC | REDUCES POTENTIAL FOR JUMPING | VISUAL IMPACT TO ROADWAY | VISUAL IMPACT FROM ROCK CREEK PARK | VISUAL IMPACT <1 MILE | IMPACTS TO HISTORIC CHARACTER OF BRIDGE | CONTROVERSIAL SOLUTION | WIND LOADING FACTORS | WEIGHT LOADING FACTORS | COST TO MAINTAIN DETERRENT FEATURES | COST FOR ROUTINE BRIDGE MAINTENANCE | EASE OF CLEANING | OVERALL COST | TOTAL (HIGHER VALUE BETTER) |
| | | | | | | | | | | | | Relative Weight → | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1.5 | 1.5 | 1.5 | 1.5 | |
| NONE | 0 | MAINTAIN EXISTING BRIDGE WITH NO MODIFICATIONS | NO | NO | NO | NO | NO | NO | NO | NO | NONE | PROJECT SCOPE NOT SATISFIED. OPTION IS A NON-STARTER | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| INBOARD OF EXISTING RAILING | 1 | MAINTAIN EXISTING RAILING, NEW GLASS/ACRYLIC 7'-6" CANTILEVERED GLASS PANEL IN FRONT OF EXISTING RAILING AND PILASTERS | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILINGS,<br>2. 7'-6" HEIGHT<br>3. LIMITED VISUAL IMPACT | 1. REDUCES PEDESTRIAN WALKWAY SOME,<br>2. POTENTIAL FOR DAMAGE TO GLAZING,<br>3. POTENTIAL FOR GRAFFITI?! | | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 3 | 1 | 59 |
| | 1a | MAINTAIN EXISTING RAILING, NEW GLASS/ACRYLIC 7'-6" CANTILEVERED GLASS PANEL IN FRONT OF EXISTING RAILING AND ON TOP OF PILASTERS | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILINGS,<br>2. 7'-6" HEIGHT<br>3. LIMITED VISUAL IMPACT | 1. REDUCES PEDESTRIAN WALKWAY SOME,<br>2. POTENTIAL FOR DAMAGE TO GLAZING,<br>3. POTENTIAL FOR GRAFFITI?! | | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 3 | 1 | 57 |
| | 2 | MAINTAIN EXISTING RAILING, NEW GLASS/ACRYLIC 7'-6" CANTILEVERED GLASS PANEL IN FRONT OF EXISTING RAILING AND AROUND PILASTERS | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILINGS,<br>2. 7'-6" HEIGHT<br>3. LIMITED VISUAL IMPACT | 1. POTENTIAL FOR DAMAGE TO GLAZING,<br>2. POTENTIAL FOR GRAFFITI?! | | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 3 | 1 | 59 |
| | 3 | MAINTAIN EXISTING RAILING, NEW GLASS/ACRYLIC 7'-6" GLASS PANEL WITH POSTS. SPAN BETWEEN SECTIONS WITH METAL PANEL OR GLASS | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILINGS,<br>2. 7'-6" HEIGHT<br>3. LIMITED VISUAL IMPACT | 1. POTENTIAL FOR DAMAGE TO GLAZING,<br>2. POTENTIAL FOR GRAFFITI?! | | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 1 | 1 | 3 | 3 | 3 | 1 | 59 |
| | 4 | MAINTAIN EXISTING RAILING, NEW METAL RAILING INBOARD OF RAILINGS AND PILASTERS (CLEAR-VU OPTION) | NO | YES | NO | NO | NO | NO | NO | NO | 1. SOME IMPACT TO EXISTING RAILINGS<br>2. 8'-0" HEIGHT | 1. MORE VISUAL IMPACT FROM ROADWAY | | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 62 |
| MODIFY EXISTING RAILINGS AT EXISTING PLANE | 5 | MAINTAIN EXISTING RAILING, ADD NEW METAL RAILINGS ON TOP OF EXISTING RAILING | NO | YES | NO | NO | NO | YES | NO | NO | 1. NO IMPACT TO PEDESTRIAN ZONE | 1. IMPACT TO EXISTING RAILINGS. 2. CHANGE IN VISUAL APPEARANCE. | | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 46 |
| | 6 | MAINTAIN EXISTING RAILING, ADD NEW GLASS RAILING ON TOP OF EXISTING RAILING | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO PEDESTRIAN ZONE | 1. IMPACT TO EXISTING RAILINGS. 2. CHANGE IN VISUAL APPEARANCE. | | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 54.5 |
| | 7 | REPLACE EXISTING METAL RAILING WITH TALLER RAILING AT 8'-0" SPAN BETWEEN PILASTERS WITH RAILING OR METAL PANEL | NO | YES | NO | NO | NO | YES | NO | NO | 1. MAINTAINS SIMILAR ARCHITECTURAL VOCABULARY WITH VERTICALITY | 1. REMOVES EXISTING BUILDING FABRIC.<br>2. LOSES CHARACTER OF ORIGINAL | | 3 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 56 |
| | 8 | REPLACE EXISTING METAL RAILING WITH GLASS PANELS. WRAP PANELS AT FRONT OF PILASTERS. | YES | NO | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO PEDESTRIAN ZONE | 1. REMOVES EXISTING BUILDING FABRIC.<br>2. LOSES CHARACTER OF ORIGINAL | | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 52 |
| | 9 | REPLACE EXISTING METAL RAILING WITH NEW RAILING AT 8' 0" SPAN BETWEEN SECTIONS WITH METAL PANEL | NO | YES | NO | NO | NO | NO | NO | NO | 1. MAINTAINS SIMILAR ARCHITECTURAL<br>2. NO IMPACT TO PEDESTRIAN ZONE | 1. REMOVES EXISTING BUILDING FABRIC.<br>2. LOSES CHARACTER OF ORIGINAL | | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 54 |
| | 10 | REMOVE AND REPLACE RAILINGS WITH NEW METAL RAILINGS. INCREASE HEIGHT OF PILASTERS WITH CONCRETE OR GLASS. | NO | YES | YES | NO | NO | NO | NO | NO | 1. MAINTAINS SIMILAR ARCHITECTURAL<br>2. NO IMPACT TO PEDESTRIAN ZONE | 1. LOSS OF HISTORIC RAILING ELEMENTS 2. CHANGES BRIDGE CHARACTER | | 3 | 3 | 3 | 1 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 3 | 2 | 1 | 47 |
| MODIFY EXISTING RAILINGS OUTBOARD | 11 | MAINTAIN EXISTING RAILING, NEW METAL RAILING OUTBOARD OF RAILINGS AND PILASTERS | NO | YES | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILING IF SECURED OUTBOARD,<br>2. NO IMPACT TO PED WALKWAY. | 1. POTENTIAL NEGATIVE VISUAL IMPACT 2. CHANGES BRIDGE CHARACTER | | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 2 | 3 | 42 |
| | 12 | MAINTAIN EXISTING RAILING, NEW GLASS/ACRYLIC RAILING OUTBOARD OF RAILINGS AND PILASTERS | YES | YES | NO | NO | NO | NO | NO | NO | 1. NO IMPACT TO EXISTING RAILING IF SECURED OUTBOARD,<br>2. NO IMPACT TO PEDESTRIAN WALKWAY. | 1. POTENTIAL NEGATIVE VISUAL IMPACT,<br>2. RAILING TO BE HIGHER<br>3. RAILING +/- 12'-0"<br>4. OPTION TO BE CANTILEVERED | | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 1 | 39 |
| OTHER OPTIONS | 13 | NETTING SYSTEM EXTENDING HORIZONTALLY FROM BRIDGE 13'-0" | NO | YES | NO | NO | NO | NO | NO | YES | 1. NO IMPACT TO EXISTING RAILINGS OR ROADWAY VIEWS. | 1. MAINTENANCE COSTS<br>2. VISUAL IMPACT FROM GROUND,<br>3. OPPORTUNITY FOR CLIMBING | | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 3 | 1 | 35 |
| | 14 | NETTING/METAL PANEL SYSTEM MOUNTED OUTBOARD OF BRIDGE | NO | YES | NO | NO | NO | NO | NO | YES | 1. OUTBOARD SOLUTION THAT IS AWAY FROM EXISTING RAILING ONLY NEEDS TO BE 8'-0" | 1. VISUAL IMPACTS ROADWAY AND GROUND,<br>2. MAINTENANCE COSTS,<br>3. VISUAL IMPACTS FROM GROUND | | 2 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 3 | 3 | 44 |
| | 15 | ENCLOSURE OPTION | YES | YES | NO | NO | NO | NO | NO | YES | 1. NO IMPACT TO PEDESTRIAN WALKWAY | 1.VISUAL IMPACT ROADWAY AND GROUND.<br>2. MAINTENANCE COSTS | | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 2 | 1 | 3 | 1 | 40.5 |



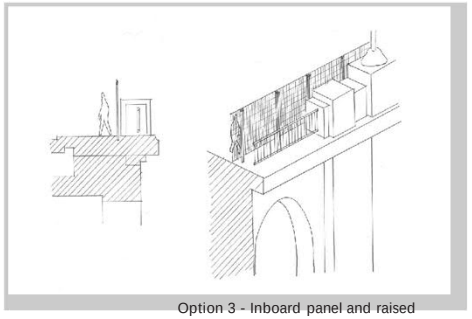
Option 1 - Cantilevered glazing panels



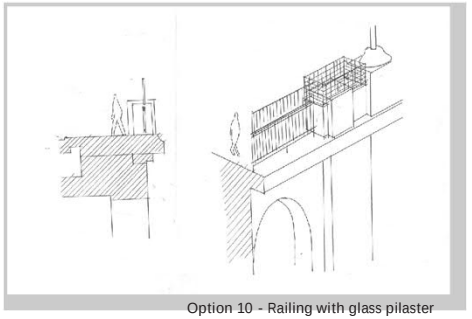
Option 1A - Cantilevered glazing panels



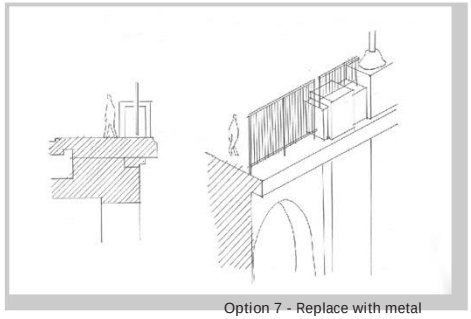
Option 5 - Increase height existing railing



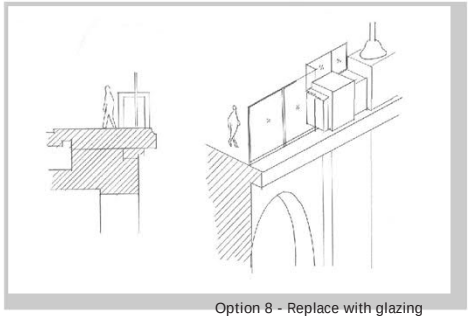
Option 3 - Inboard panel and raised pilaster



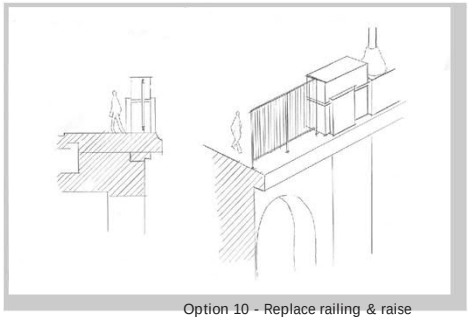
Option 10 - Railing with glass pilaster infill



Option 7 - Replace with metal railing

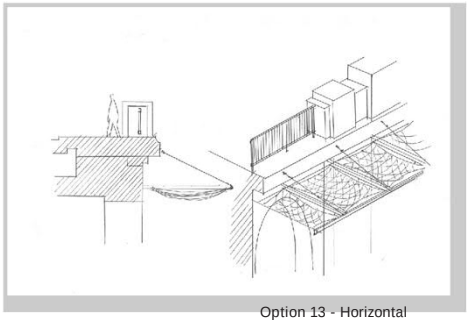


Option 8 - Replace with glazing panel

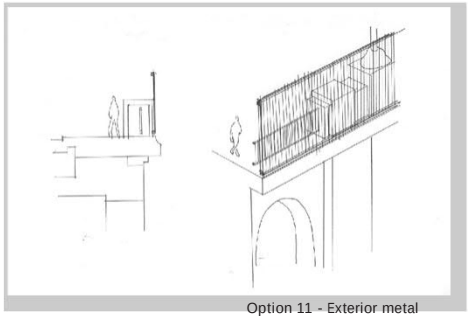


Option 10 - Replace railing & raise pilasters

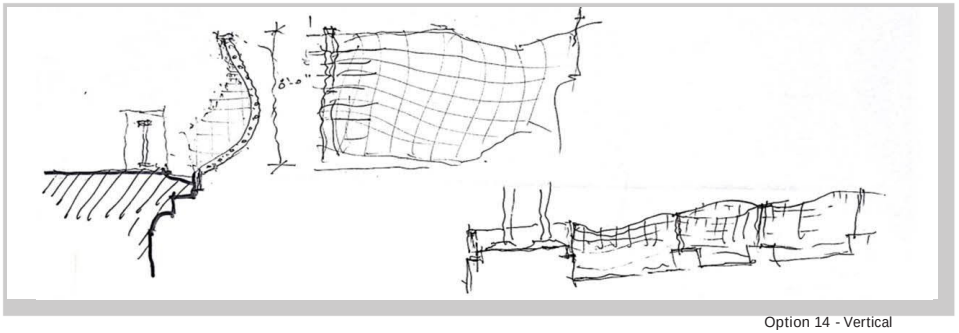
## 7.0 EVALUATED OPTIONS



Option 13 - Horizontal netting



Option 11 - Exterior metal railing



Option 14 - Vertical netting

These options were divided into barrier systems inboard of the existing railing system (Options 1-4), barriers in the same plane as the existing railing system (Options 5-10), barriers outboard of the existing railing system (Options 11-12), and other barrier options including netting systems (Options 13-15).

Through discussion with the stakeholders, a weighted score was assigned to each option with respect to safety, physical deterrence, visual impacts, structural implications, maintenance and probable cost. Safety, physical deterrence and visual impacts were weighted heaviest at 2.0, maintenance and cost at 1.5 and structural implications at 1.0.

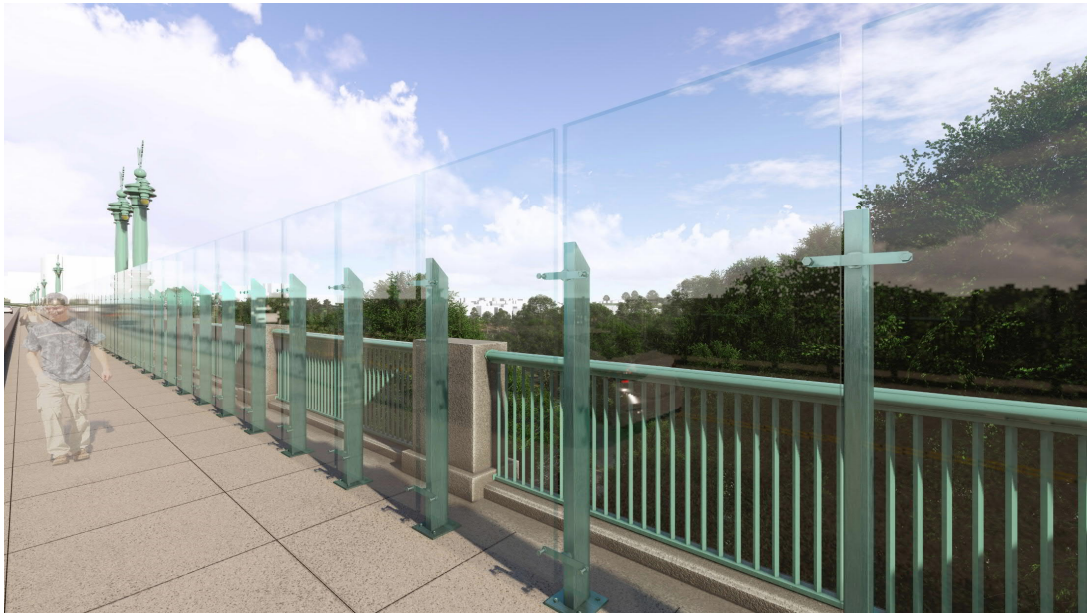
- Inboard options tended to score highest as they were the simplest to construct and shortest in height with limited to no impact to existing historic fabric.
- Outboard options tended to score lower as they involved higher vertical elements to achieve the 8'-0" of vertical height above the existing railing as a deterrence to climbing.
- Netting options scored poorly as there were concerns for visual appearance from Rock Creek Park, and concern with maintenance.
- Vertical barrier options in the plane of the existing railing, although providing the greatest pedestrian space also scored poorly as modification or removal of the existing railing was deemed by the stakeholders as detrimental to the existing historic fabric.

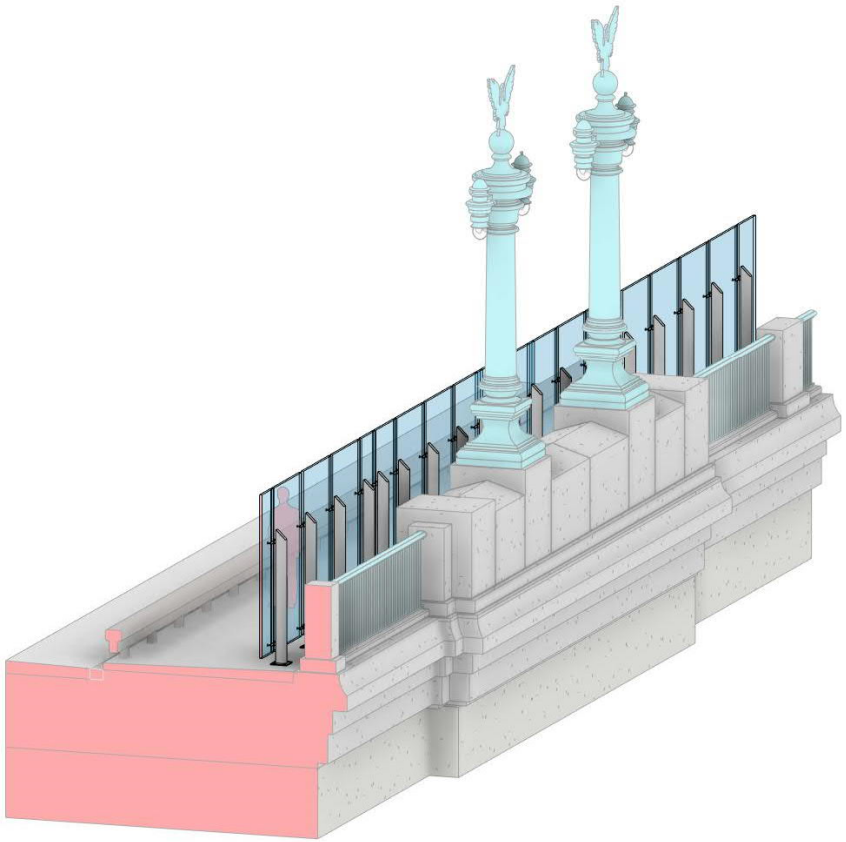
From the aforementioned design criteria and evaluations – three options were selected to pursue for concept submission:

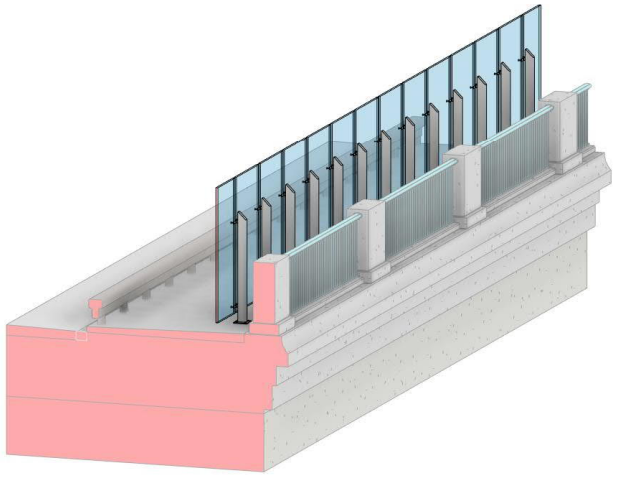
- 8'-0" tall glass panel option secured to vertical metal posts inboard of existing railing
- 8'-0" tall metal Clear-Vu fencing secured to vertical metal posts inboard of existing railing
- 8'-0" tall metal panel frame with stainless steel wiring inboard of existing railing

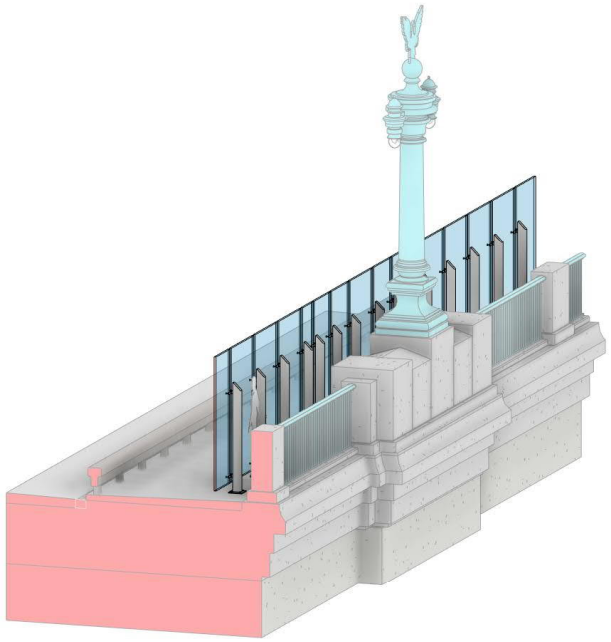
## Concept Option 1 Variant

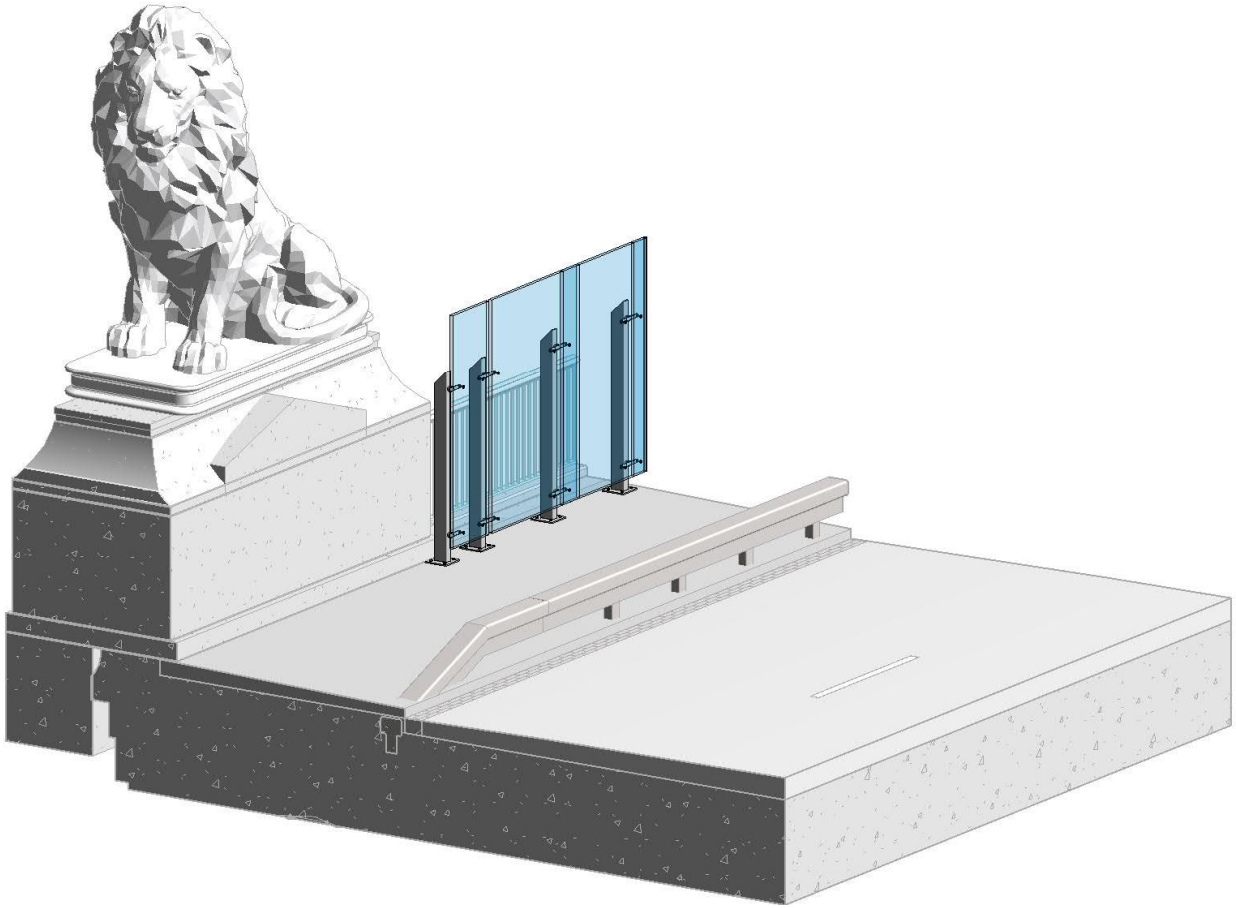
- Painted metal posts







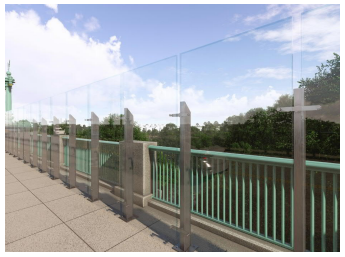




## 10.0 REFERENCES AND COST ESTIMATE


- (1) Streets of Washington.com, John DeFerrari, The Million Dollar Bridge November 30, 2009
- (2) Ibid.
- (3) Ibid.
- Maryland Department of Transportation Governor Thomas Johnson Bridge Evaluation of Suicide Deterrent Systems, 2022
- Golden Gate Physical Suicide Deterrent System Project, 2008
- Florida Sunshine Skyway Bridge, 2019
- Comparing Suicide Prevention Measures; National Survey of Switzerland, 2017
- Preventing Suicide by Jumping from Bridges owned by the City of Ithaca and by Cornell University, 2010


CONCEPT 1



$3.9 MILLION +/-

CONCEPT 2

$1.2 MILLION +/-

CONCEPT 3

$2.5 MILLION +/-