

# Racine Street Bridge

## Aesthetic Structure Lighting Alternatives

Menasha, WI

Pictured: Nitschke Bridge – Green Bay, WI

# Lighting Infrastructure Integration with Bridge Construction

Goal for this meeting:

- Looking for conceptual level preference of what aspects of the structure should be emphasized by adding colored lighting
- Once this is known, we can approximate what/where infrastructure will need to be installed with the structure this spring

Infrastructure to be included with the bridge construction is highest priority

- Will likely need to install some anticipatory infrastructure so that we are not handcuffed down the line if preferences change
- All proposed infrastructure must be approved by WisDOT B.O.S. for compliance
  - Rebar spacing in parapets, piers, deck etc
  - Added weight to mechanical deck must be accounted for

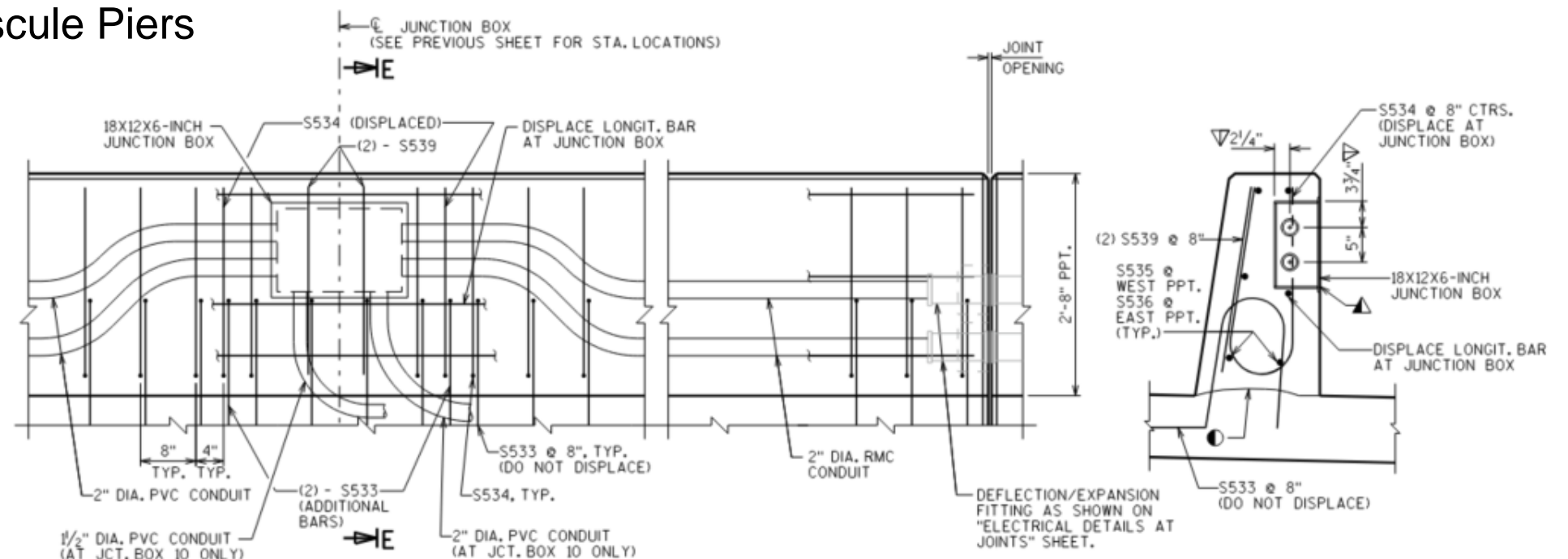
Baseline Infrastructure required regardless of preferred alternative:

- Junction Boxes in parapet at each pier location
- Junction Boxes on each end of the Bascule Piers
- PVC Conduit in each parapet
- Rigid Steel Conduit in Bascule

## Estimate

- Materials & Construction Cost w/ 20% Contingency = \$90K
- Labor Mark-Up for Expedited Work Order = \$10K
- Design Engineering, Procurement Facilitation, Bidding Documents = \$35K

**Approximate Baseline Cost = \$135K**





# Controlling the Light

## Power/Electrical Service

- Intention will be to utilize existing electrical services
  - 120/240V at the roundabouts on either side of the Racine St Bridge
  - Main service in the Operator House and secondary panel in the South Bascule
- Some aesthetic lighting options will require transformers to drop down to 48V
  - Intention is to locate these in junction boxes in the parapets as necessary
- This electrical service would provide standard “white” lighting only → Color changing is not an option without advanced controls

## Color Changing Capabilities

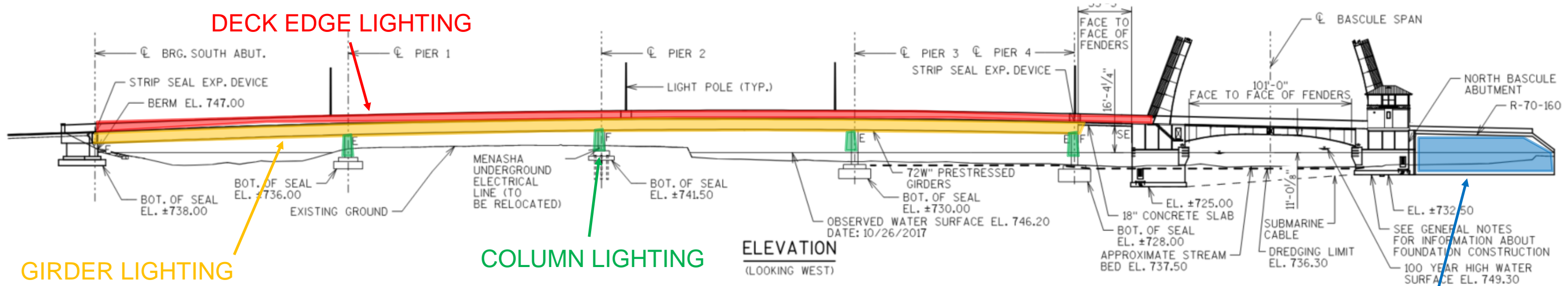
- DMX controller is required for color changing
- Controller is required regardless of complexity scenes
- Controller may be operated via wifi, cell phone app, in-person, etc
- Controllers are typically specific to the lighting manufacturer
- Will require submersible cabling or wireless antennas for communication across drawbridge
  - May have capacity within existing submersible raceway
- Most manufacturers will set up scenes and train staff

Approximate Cost = \$10k for procurement and training  
- Cost Included in Baseline Infrastructure

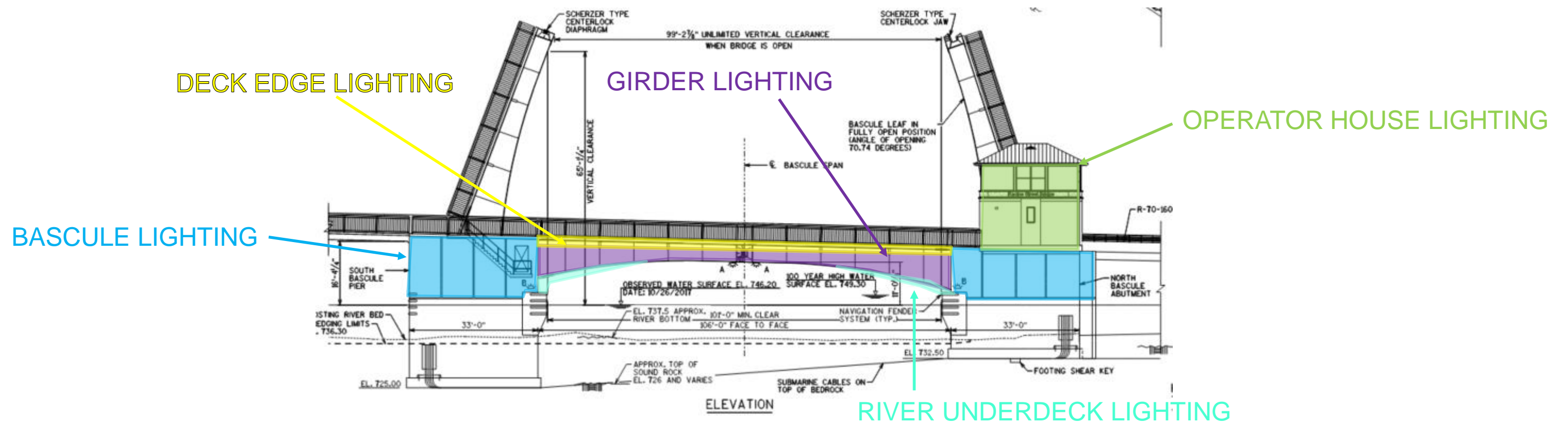


AESTHETIC STRUCTURE LIGHTING  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT

## Static Structure – Lighting Alternatives



## Mechanical Structure – Lighting Alternatives



## AESTHETIC STRUCTURE LIGHTING RACINE STREET BRIDGE – MENASHA, WI ALTERNATIVES DOCUMENT



# Column Lighting



Racine St Bridge: Photometric Rendering



Isolated Rendering



Example Structure: Biloxi Bay Bridge, Biloxi MS

**AESTHETIC STRUCTURE LIGHTING**  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT

# Column Lighting

## Description:

- Single Flood Light of wall mounted luminaire washing column from the top-down

## Structural Considerations:

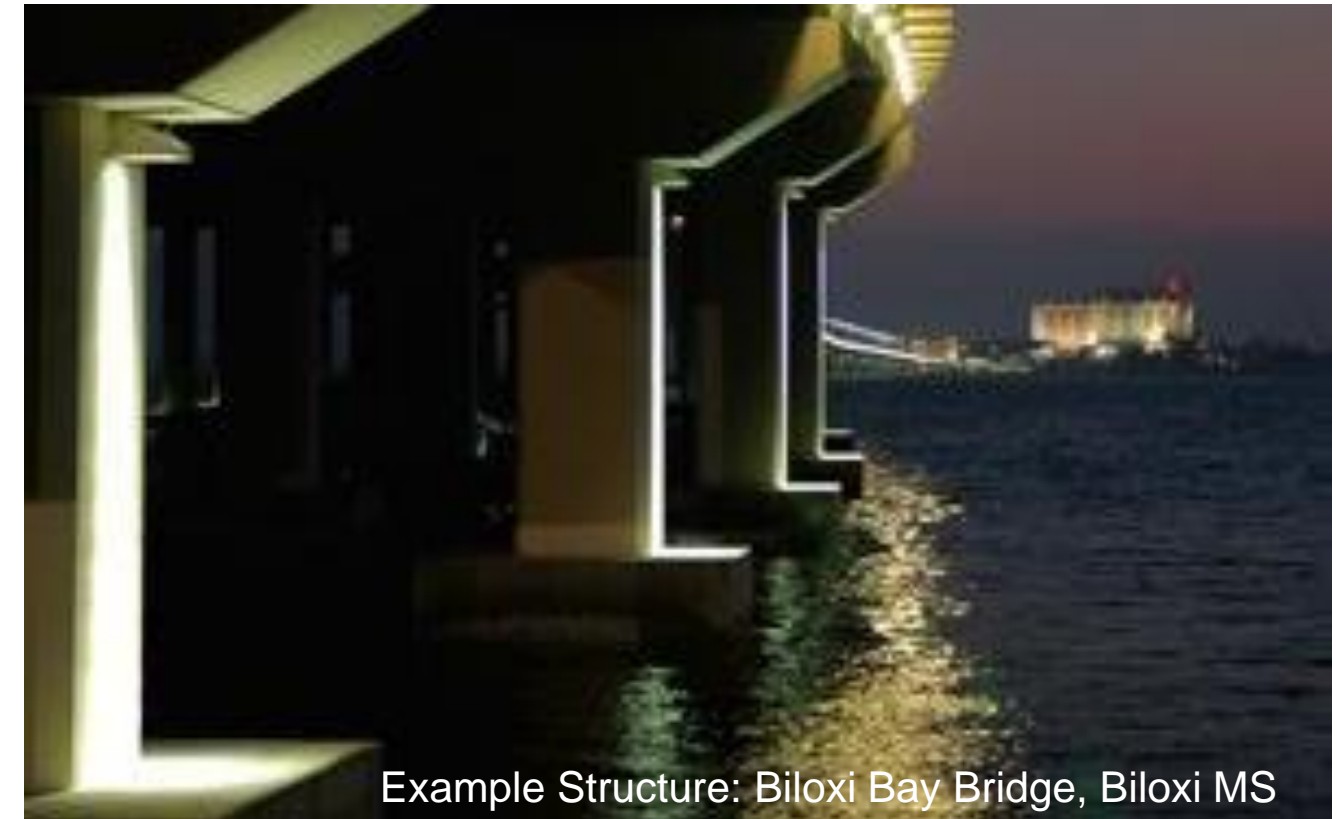
- Baseline Infrastructure

## Construction and Maintenance Considerations:

- Luminaire likely needs to be installed from the river i.e. from a barge
- Will be very difficult to reach for future maintenance, but LED technology should not need to be maintained very frequently

## Cost Estimate:

- Baseline Infrastructure & Controls = \$135K
- Product Procurement, Additional Infrastructure & Construction = \$40K
- **Construction Estimate = \$175K**



Example Structure: Biloxi Bay Bridge, Biloxi MS



Potential Products

	Infrastructure Requirements	Construction / Maintenance Difficulty	Light Pollution	Neighboring Light Trespass	Energy Use	Total Cost
<b>Column Lighting</b>	+	+++	+	+	+	+
Girder Lighting	+	++	++	++	++	++
Edge of Deck Lighting	++	++	+++	+++	+++	++
Bascule Lighting	+	+++	+	++	+	++
Operator House Lighting	++	+++	++	++	++	++
River Underdeck Lighting	+	+++	+	+	+	+
City Sign Lighting	+	+	+++	++	+	+



# Girder Lighting



Structure Rendering



Isolated Rendering



Example Structure: Main St Bridge – Oshkosh, WI

**AESTHETIC STRUCTURE LIGHTING**  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT



# Girder Lighting

## Description:

- Flood Lighting directed out across girders

## Performance Considerations:

- Lateral wash flood lights will produce a gradient of color as it fades away from the luminaire
- Horizontal wash linear lights will produce a more uniform spread down the girder
  - Cost approaches \$1M

## Structural Considerations:

- Baseline Infrastructure

## Construction and Maintenance Considerations:

- Lights will be located under the bridge deck → Installation may be possible from above, or may need to utilize a barge
- Will be very difficult to reach for future maintenance
  - LED technology should not need to be maintained very frequently



Example Structure: Main St Bridge – Oshkosh, WI

## Cost Estimate – Entire Structure:

- Baseline Infrastructure & Controls = \$135K
- Product Procurement, Additional Infrastructure & Construction = \$100K
- **Construction Estimate = \$235K**

## Cost Estimate – Drawbridge Only:

- Baseline Infrastructure & Controls = \$50K
- Product Procurement, Additional Infrastructure & Construction = \$25K
- **Construction Estimate = \$75K**

	Infrastructure Requirements	Construction / Maintenance Difficulty	Light Pollution	Neighboring Light Trespass	Energy Use	Total Cost
Column Lighting	+	+++	+	+	+	+
<b>Girder Lighting</b>	+	++	++	++	++	++
Edge of Deck Lighting	++	++	+++	+++	+++	++
Bascule Lighting	+	+++	+	++	+	++
Operator House Lighting	++	+++	++	++	++	++
River Underdeck Lighting	+	+++	+	+	+	+
City Sign Lighting	+	+	+++	++	+	+

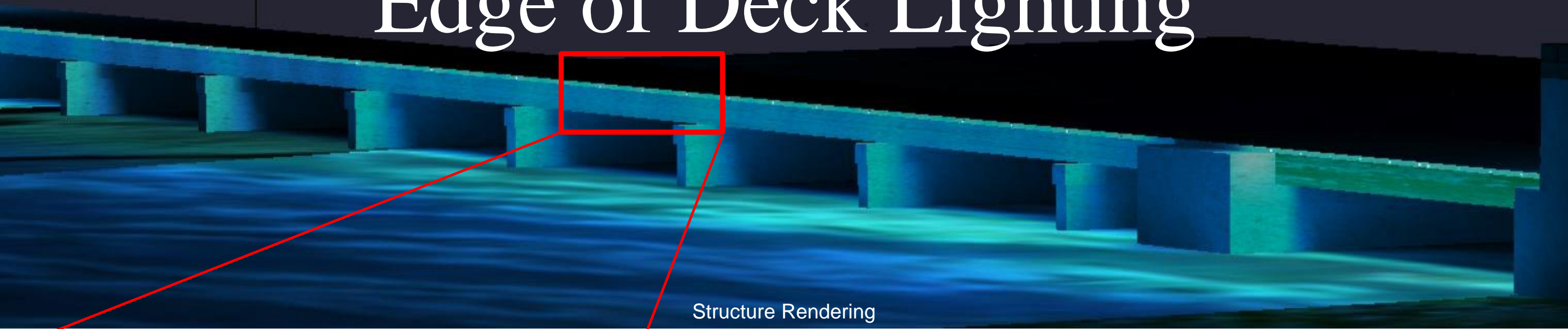


Potential Products

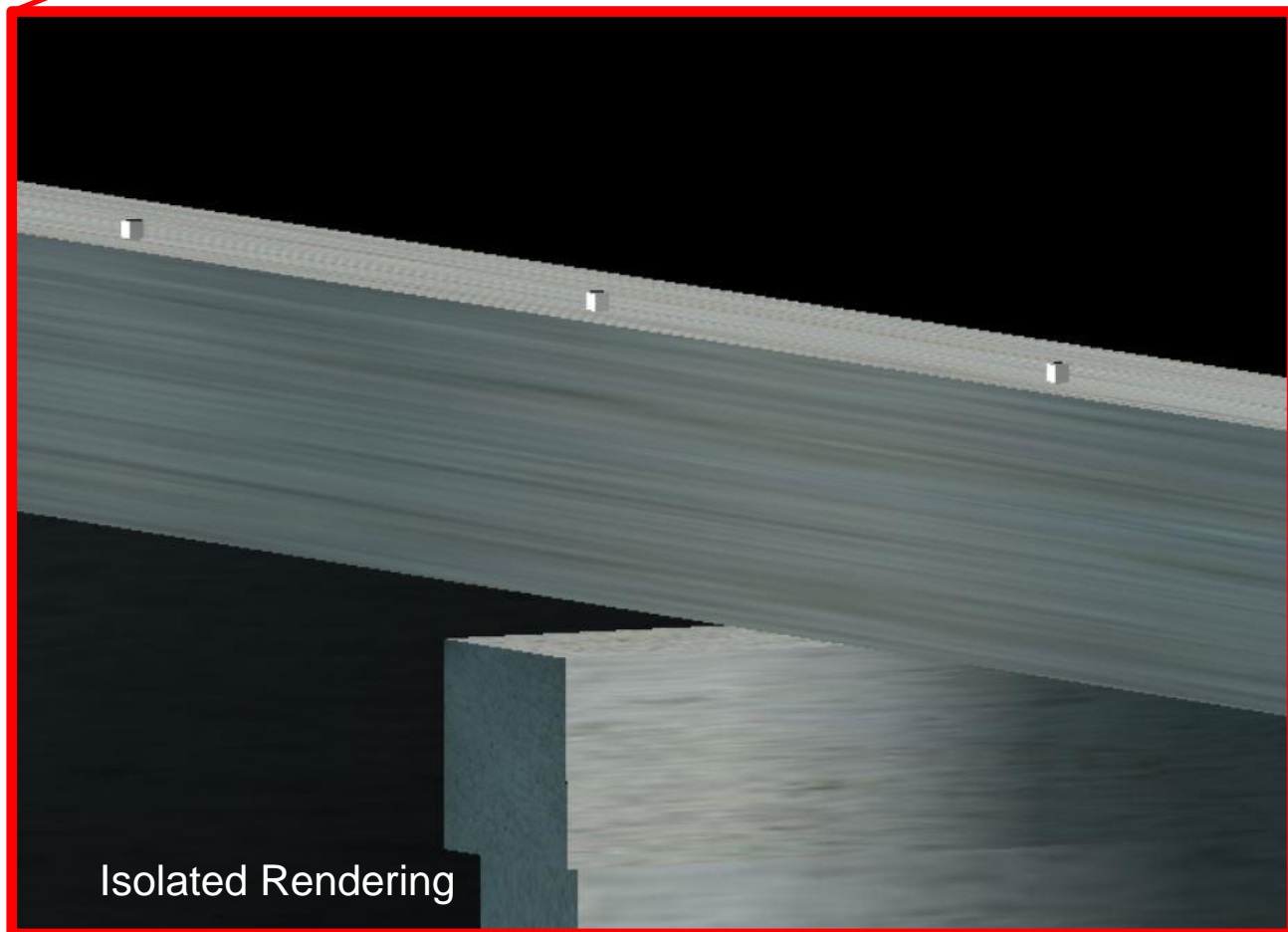
## AESTHETIC STRUCTURE LIGHTING RACINE STREET BRIDGE – MENASHA, WI ALTERNATIVES DOCUMENT



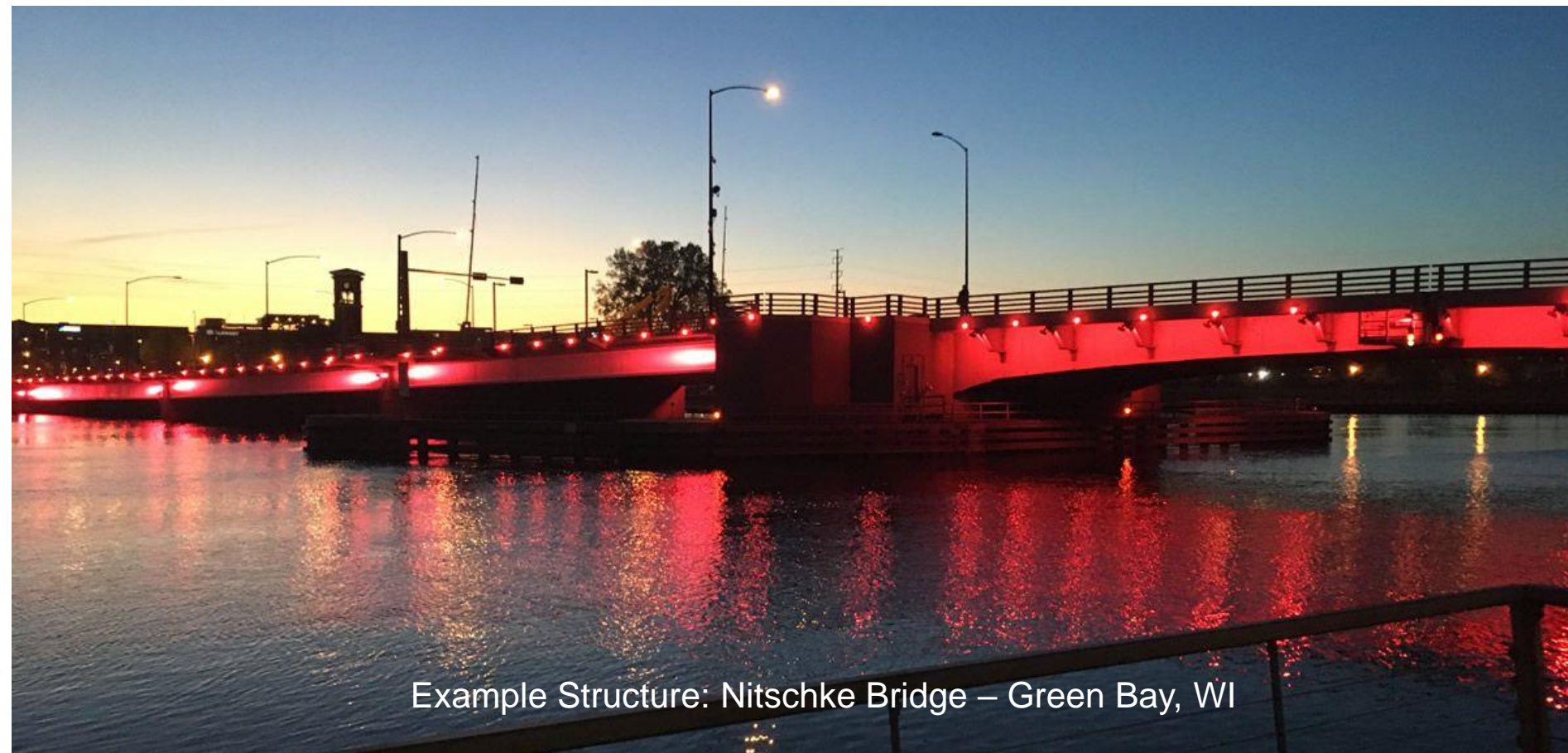
# Edge of Deck Lighting



Structure Rendering



Isolated Rendering



Example Structure: Nitschke Bridge – Green Bay, WI

AESTHETIC STRUCTURE LIGHTING  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT



# Edge of Deck Lighting

## Description:

- Spot lighting across the edge of the bridge deck creating somewhat of an outline

## Performance Considerations:

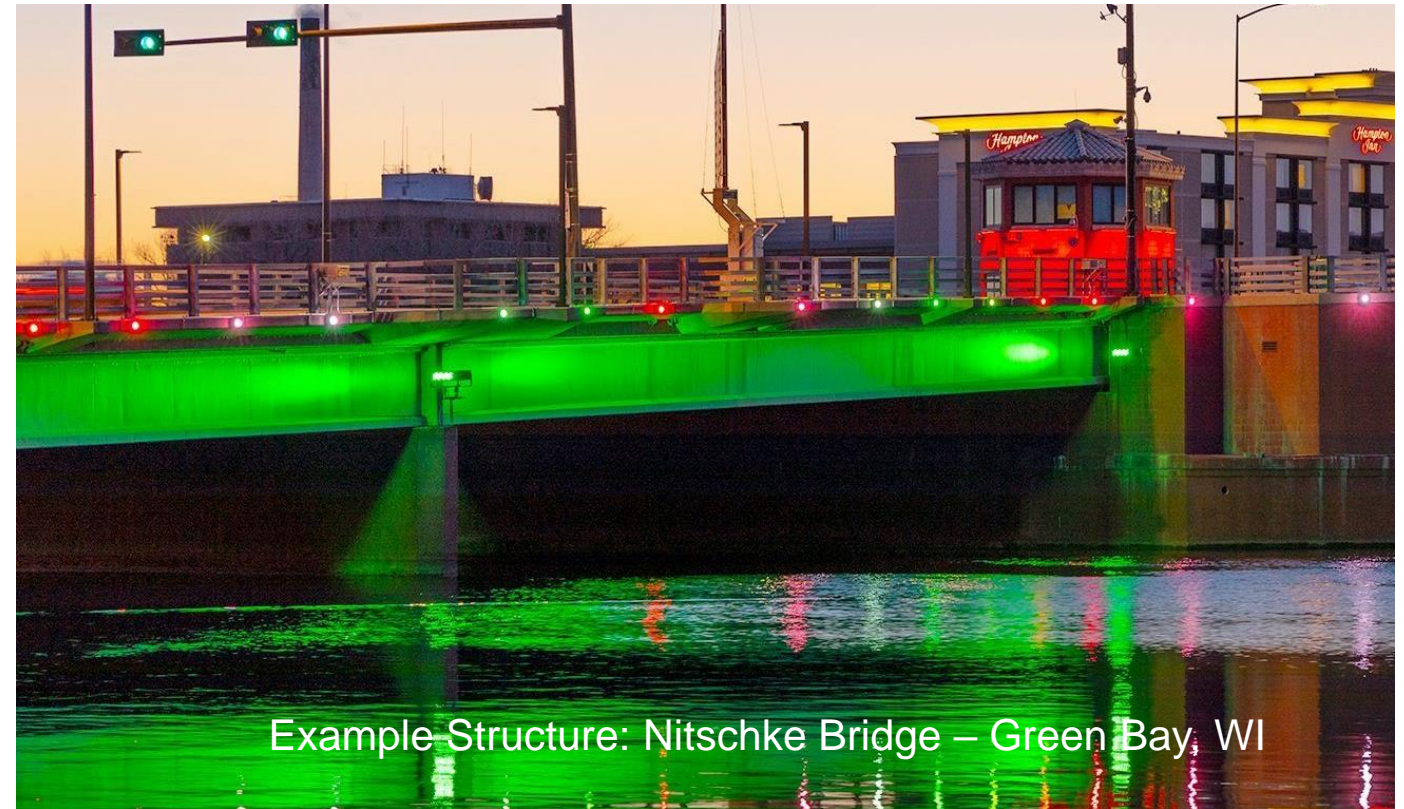
- Options can get expensive for a bridge this long → one option to consider would be highlighting the drawbridge only
- Linear lights will produce a sleek defined outline like on the Hoan Bridge
  - Cost approaches \$1M

## Structural Considerations:

- Baseline Infrastructure
- Will require transformers to supply the appropriate voltage → Need to fit in the junction boxes embedded in parapet

## Construction and Maintenance Considerations:

- Lights will be located along the side of the bridge deck → Installation may be possible from above, or may need to utilize a barge
- Dot lights can be embedded in concrete, but that can create major maintenance issues if lights become obsolete and no longer available.



Example Structure: Nitschke Bridge – Green Bay, WI

## Cost Estimate – Entire Structure:

- Baseline Infrastructure & Controls = \$135K
- Product Procurement, Additional Infrastructure & Construction = \$100K
- **Construction Estimate = \$235K**

## Cost Estimate – Drawbridge Only:

- Baseline Infrastructure & Controls = \$50K
- Product Procurement, Additional Infrastructure & Construction = \$30K
- **Construction Estimate = \$80K**

	Infrastructure Requirements	Construction / Maintenance Difficulty	Light Pollution	Neighboring Light Trespass	Energy Use	Total Cost
Column Lighting	+	+++	+	+	+	+
Girder Lighting	+	++	++	++	++	++
<b>Edge of Deck Lighting</b>	<b>++</b>	<b>++</b>	<b>+++</b>	<b>+++</b>	<b>+++</b>	<b>++</b>
Bascule Lighting	+	+++	+	++	+	++
Operator House Lighting	++	+++	++	++	++	++
River Underdeck Lighting	+	+++	+	+	+	+
City Sign Lighting	+	+	+++	++	+	+



Potential Products

## AESTHETIC STRUCTURE LIGHTING RACINE STREET BRIDGE – MENASHA, WI ALTERNATIVES DOCUMENT

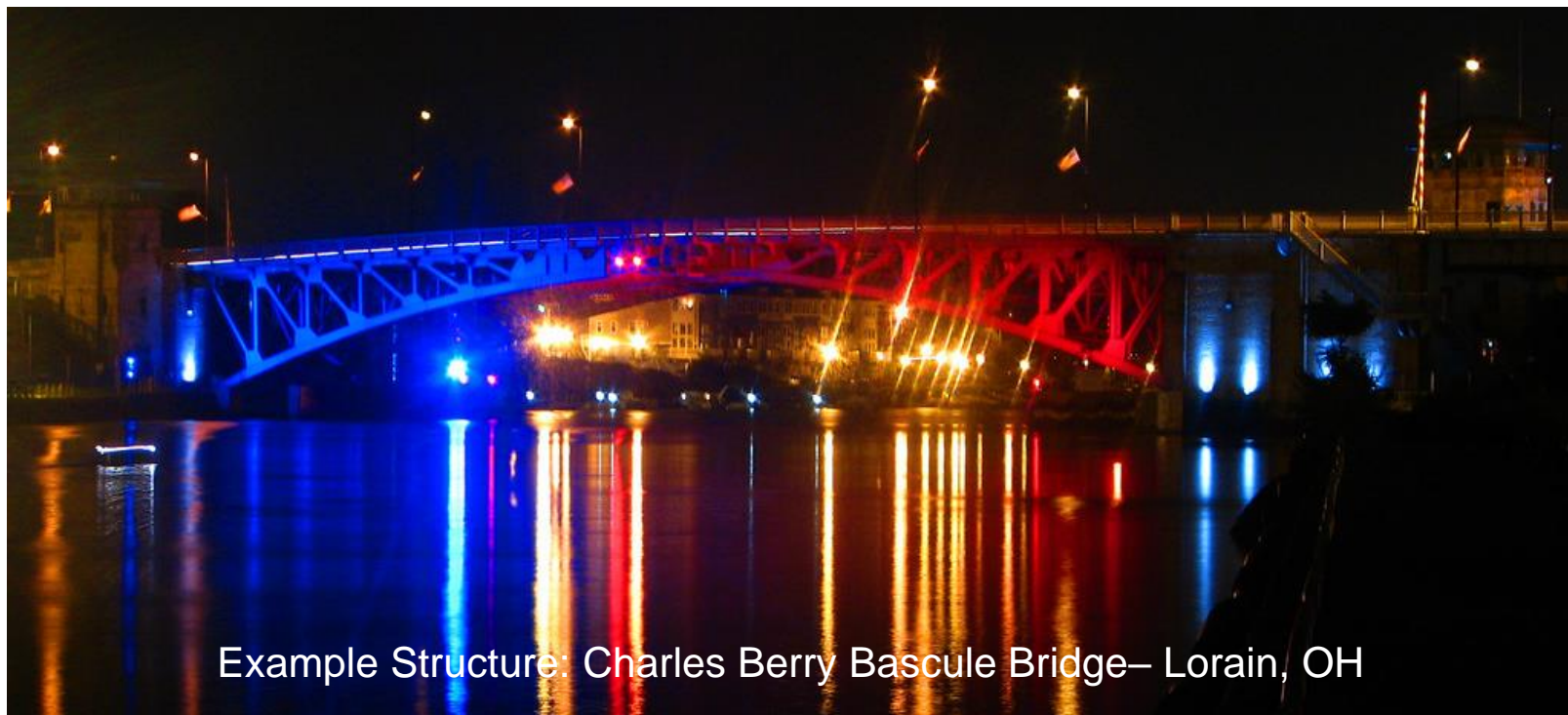




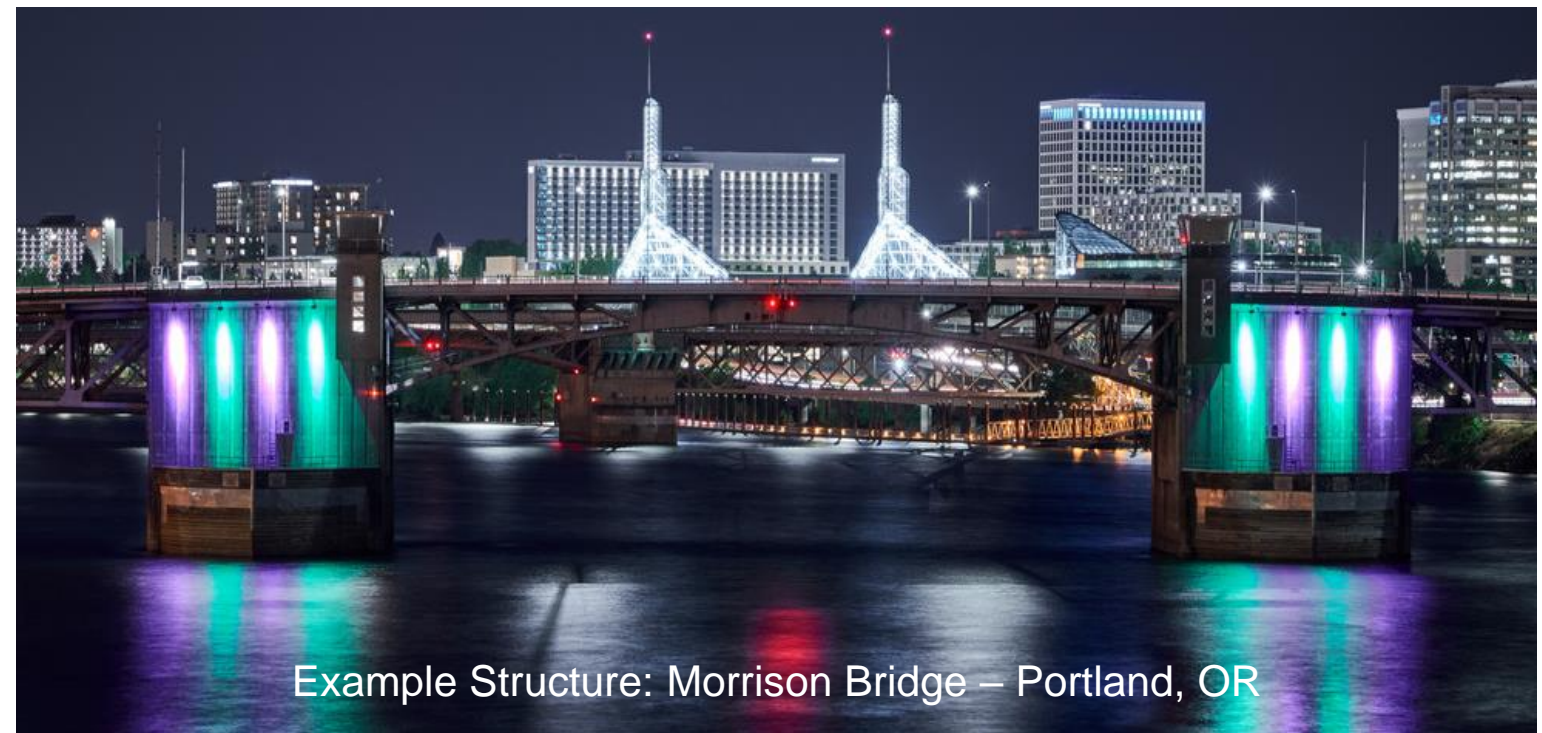
# Bascule & Operator House Lighting



Structure Rendering



Example Structure: Charles Berry Bascule Bridge— Lorain, OH



Example Structure: Morrison Bridge – Portland, OR

**AESTHETIC STRUCTURE LIGHTING**  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT



# Bascule and Operator House Lighting

**Description:**

- Flood Lights washing the structure from the top-down or spot lighting outlining the rim of the structure. Potential for soffit lighting at the operator house

**Structural Considerations:**

- Baseline Infrastructure
- Bascule is already mostly in place → Will need to run conduit exposed within the cavity

**Construction and Maintenance Considerations:**

- Lights will be located along the side of the bridge deck → Installation may be possible from above, or may need to utilize a barge
- Need to consider glare in operator room windows

**Cost Estimate:**

- Baseline Infrastructure & Controls → Drawbridge Only = \$50K
- Product Procurement, Additional Infrastructure & Construction = \$30K
- **Construction Estimate = \$80K**



Example Structure: Wilson St Bridge – Green Bay, WI



Potential Products - Bascule

	Infrastructure Requirements	Construction / Maintenance Difficulty	Light Pollution	Neighboring Light Trespass	Energy Use	Total Cost
Column Lighting	+	+++	+	+	+	+
Girder Lighting	+	++	++	++	++	++
Edge of Deck Lighting	++	++	+++	+++	+++	++
<b>Bascule Lighting</b>	+	+++	+	++	+	++
<b>Operator House Lighting</b>	++	+++	++	++	++	++
River Underdeck Lighting	+	+++	+	+	+	+
City Sign Lighting	+	+	+++	++	+	+

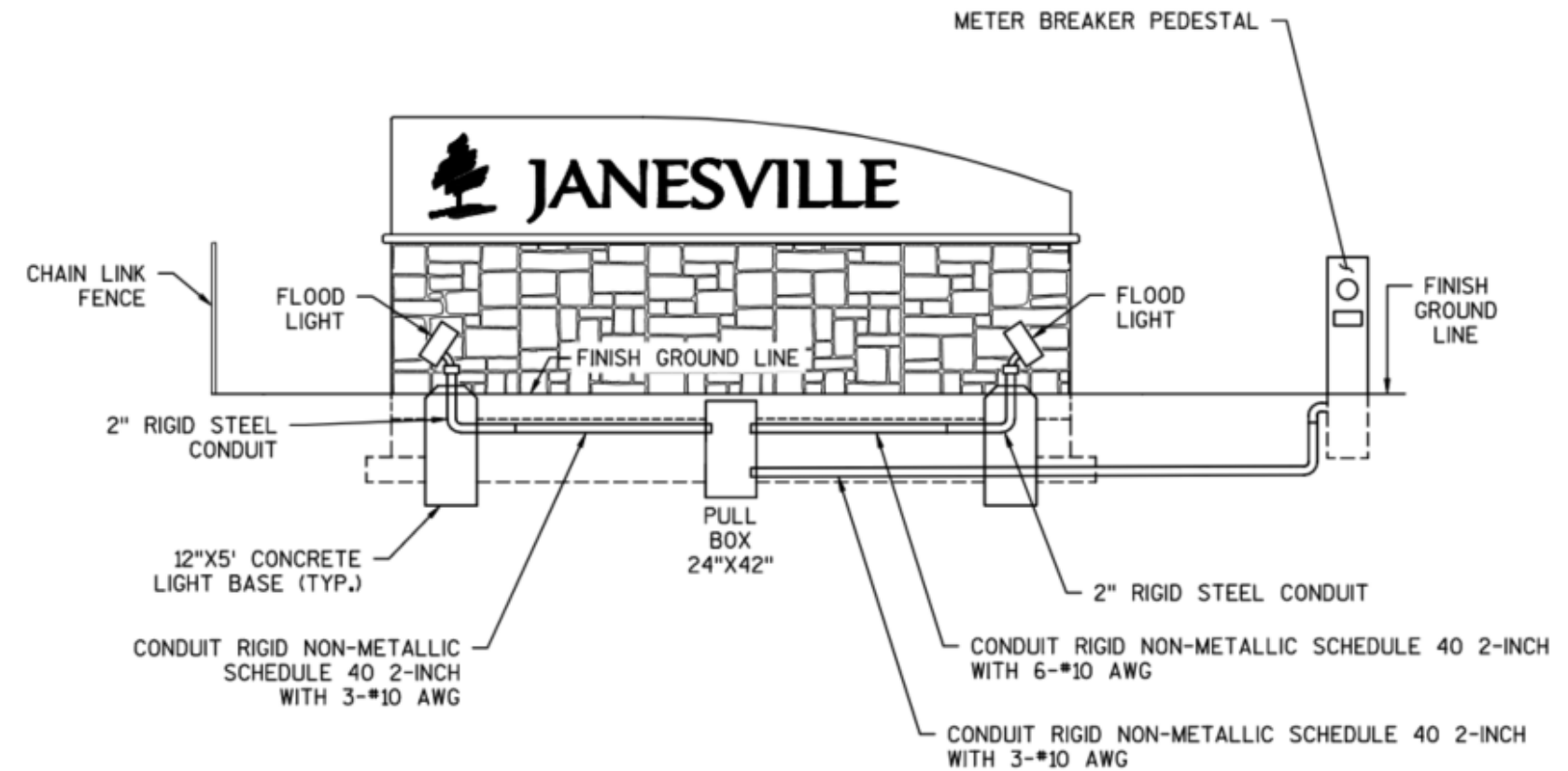


# River Underdeck Lighting



Structure Rendering

# City Sign Lighting



Similar Example – IH 39 through Janesville



Example Structure: Titanic Bridge - Liverpool, UK



Example Structure: Indian Creek Neighborhood

## AESTHETIC STRUCTURE LIGHTING

RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT

# River Underdeck Lighting

**Description:**

- Flood Lights washing the underside of the structure

**Structural Considerations:**

- Will need to drop down from bascule

**Construction and Maintenance Considerations:**

- Only option for maintenance is via boat
- Infrastructure must be exposed because bascule is already in place

**Cost Estimate:**

- Baseline Infrastructure & Controls → Drawbridge Only = \$50K
- Product Procurement, Additional Infrastructure & Construction = \$20K
- **Construction Estimate = \$70K**



Potential Products – River Underdeck

# City Sign Lighting

**Description:**

- Flood Lights directed for sign illumination

**Performance Considerations:**

- Assumes lighting is not color changing

**Construction and Maintenance Considerations:**

- Assumes Installation is in ground and does not integrate with structure

**Cost Estimate:**

- Baseline Infrastructure & Controls = N/A → Not required for this option
- **Construction Estimate = \$10K**

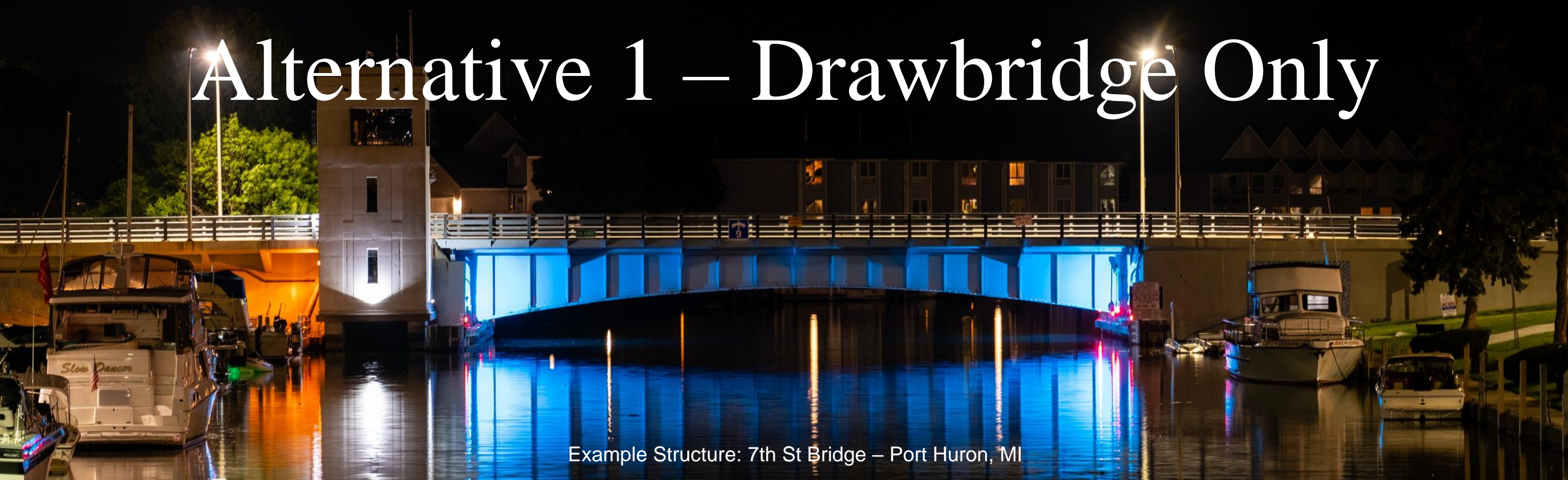


Potential Products – City Sign

	Infrastructure Requirements	Construction / Maintenance Difficulty	Light Pollution	Neighboring Light Trespass	Energy Use	Total Cost
Column Lighting	+	+++	+	+	+	+
Girder Lighting	+	++	++	++	++	++
Edge of Deck Lighting	++	++	+++	+++	+++	++
Bascule Lighting	+	+++	+	++	+	++
Operator House Lighting	++	+++	++	++	++	++
River Underdeck Lighting	+	+++	+	+	+	+
City Sign Lighting	+	+	+++	++	+	+



# Alternative 1 – Drawbridge Only



Example Structure: 7th St Bridge – Port Huron, MI

## Features:

- Drawbridge Edge of Deck Lighting
- Drawbridge Girder Flood Lighting
- City Sign Lighting

## Considerations:

- Not as much infrastructure to incorporate with current construction
- Ability for multiple scenes is limited
- Maintenance will likely be required from the river

## Cost Estimate:

- Baseline Infrastructure – Drawbridge Only = \$50K
- Lighting Options
  - Girder Lighting with Floods = \$25K
  - Edge of Deck Lighting with Spots = \$30K
  - City Sign Lighting = \$10K
- Total Estimated Cost to City = \$115K

AESTHETIC STRUCTURE LIGHTING  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT



# Alternative 2 – Recommended



Example Structure: Jackson St Bridge – Oshkosh, WI

## Features:

- Flood Lighting across girders

## Considerations:

- (1) type of light to stock and maintain
- Consistent across the entire structure
- Ability for multiple scenes
- Maintenance will likely be required from the river
- Tried and true – Oshkosh & Green Bay both use similar techniques

## Cost Estimate:

- Baseline Infrastructure = \$135K
- Lighting Options
  - Girder Lighting with Floods = \$100K
  - City Sign Lighting = \$10K
- Total Estimated Cost to City = \$245K



AESTHETIC STRUCTURE LIGHTING  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT





# Alternative 3 – Full Build



Example Structure: Wilson St Bridge – Green Bay, WI

## Features:

- Column Lighting
- Flood Lighting across girders
- Spot Lighting along Edge of Deck
- Bascule and Operator House Lighting
- River Underpass Lighting

## Considerations:

- Full build – Endless possibilities for color scenes
- Maintenance will be difficult and complex → multiple luminaire types with a range of accessibility
- Visitors will love it – Neighbors may not

## Cost Estimate:

- Baseline Infrastructure = \$135k
- Lighting Options
  - Column Lighting = \$40K
  - Girder Lighting with Floods = \$100K
  - Edge of Deck Lighting with Spots = \$100K
  - Bascule & Operator House Lighting = \$30K
  - River Underpass Lighting = \$20K
  - City Sign Lighting = \$10K
- Total Estimated Cost to City = \$435K

AESTHETIC STRUCTURE LIGHTING  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT





# Next Steps



Example Structure: Hoan Bridge – Milwaukee, WI

## Approval

- With concept approval, design can be completed to determine luminaire quantities and locations
- Determine City bidding requirements for purchasing and installing materials
- WisDOT will need to approve change-order infrastructure quantities and possible updates to agreements with the City

## Construction

- Bridge deck expected to be poured in April
- Need to get infrastructure additions approved by WisDOT Bureau of Structures – ASAP
  - BOS may require a fair amount of discussions and revised structure details (i.e. rebar) depending on the design impact
- Will need to determine whether all lighting will be procured and installed with this construction project, or just the embedded infrastructure → Wire can be pulled and luminaires can be mounted at a later date

**AESTHETIC STRUCTURE LIGHTING**  
RACINE STREET BRIDGE – MENASHA, WI  
ALTERNATIVES DOCUMENT

