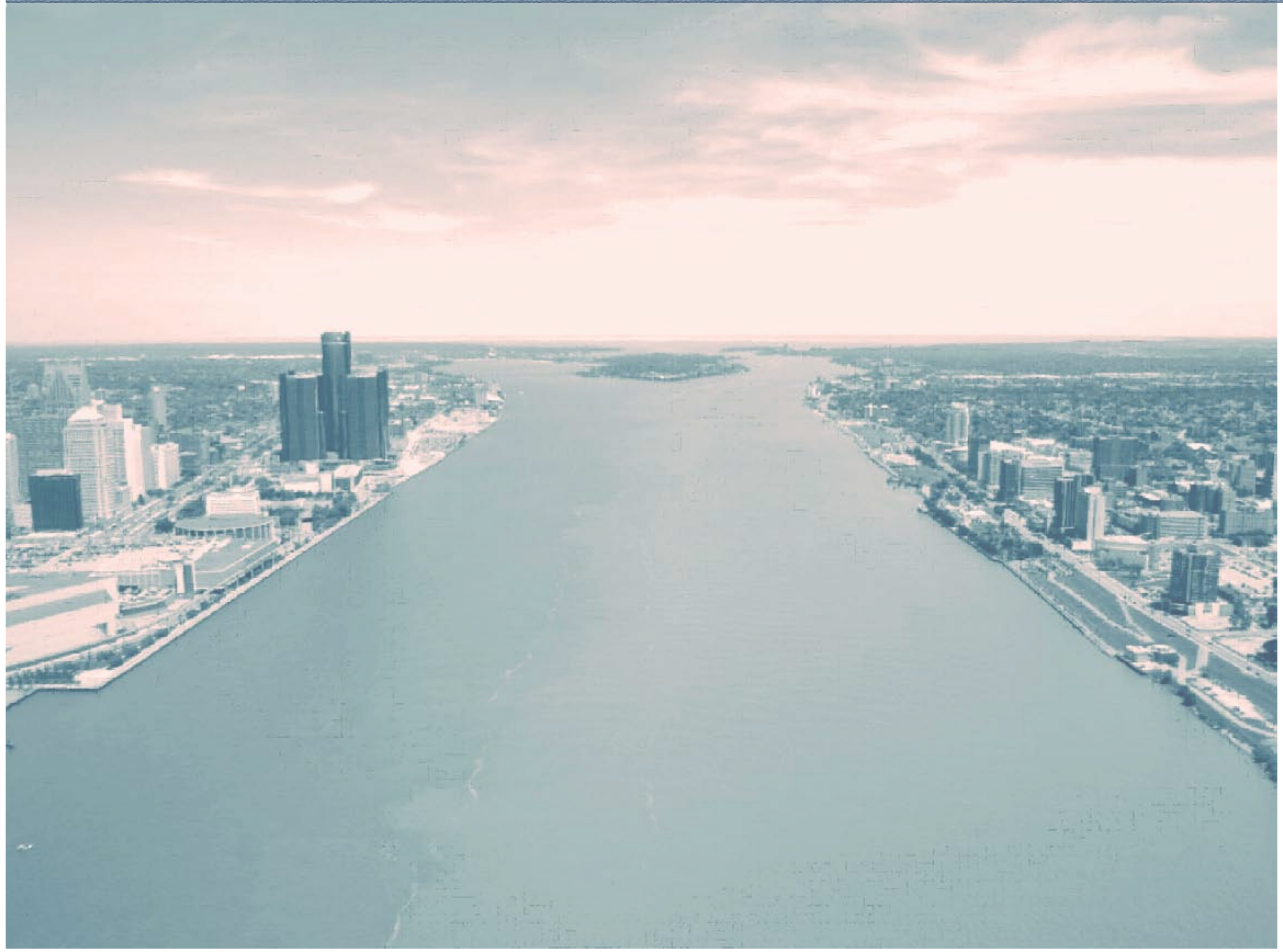


APPENDIX A: DESIGN CRITERIA

Appendix A DESIGN CRITERIA

The following design criteria were used as part of the alternatives development process for this project. The criteria are from the following reference manuals:

- AASHTO = American Association of State Highway and Transportation Officials: A Policy on Geometric Design of Highways and Streets, 2001
- AASHTO RDG = AASHTO Roadside Design Guide
- MDM = Michigan Metric Road Design Manual
- GDG = Michigan Geometric Design Guide
- BDM = Michigan Metric Bridge Design Manual
- BDG = Michigan Metric Bridge Design Guide
- Std Plan = MDOT Metric Standard Plans
- MMUTCD = Michigan Manual of Uniform Traffic Control Devices

Highway Connection Geometric Design Criteria

Highway connections for the Illustrative and Practical Alternatives were developed and evaluated using current MDOT, FHWA, and AASHTO geometric guidelines, policies, and standards as listed in Table A-1. The recommended highway connection design criteria on the U.S. side reflect the urban areas within which alternatives are to be developed and the volume of heavy truck traffic that is forecasted to use the facilities. Design criteria to be used on the Canadian side may utilize urban or rural criteria, depending on the location of the alternative.

Table A-1
U.S. Highway Connection Geometric Design Criteria (metric)

Item	Reference	6-Lane Urban Freeway
Roadway Classification	AASHTO	Urban Freeway
Design Level of Service	AASHTO Exhibit 2-32 (p 85) MDOT Practice	LOS C LOS D minimum
Design Speed (km/h)	MDM 3.06.01	100 km/h
ADT for Year of Completion 2013	Traffic Report	Not yet available
ADT for Design Year 2035	Traffic Report	Not yet available
Horizontal Alignment		
Minimum Radius (desirable)	MDM 3.03.01A, Standard Plan R-107-D1	463 m (800 m)
Minimum Length of Curve	MDM 3.03.01B	300 m (600 m)
Minimum Radius Not Requiring a Spiral	AASHTO Exhibit 3-33 (p 179)	592 m
Maximum Super elevation	MDM 3.04	5%
Maximum Rollover (shoulder)	Standard Plan R-107-D1	6.0%
Vertical Alignment		
Maximum Percent of Grade	MDM 2.02.01	3.0%
Minimum Percent of Grade	MDM 2.02.01	0.3% to 0.5% for curbed roadways
Minimum Stopping Sight Distance	AASHTO Exhibit 3-1 (p 112)	185 m
Minimum Passing Sight Distance and Zone Length	NA	NA
Minimum K-Value for Crest VC	AASHTO Exhibit 3-76 (p 274)	52
Minimum K-Value for Sag VC	AASHTO Exhibit 3-79 (p 280)	45
Bridge Width	AASHTO Chapter 8 (p 510) BDG Section 6	Approach Roadway
Minimum Vertical Clearance For Bridges (desirable)	BDM 7.01.08 Desired for New Freeways Minimum in Highly Urbanized Areas	4900 mm (5000 mm) 4400 mm (4500 mm)
Bridge Structural Capacity	BDM 7.01.04.A	MS-23
Minimum Railroad Vertical Clearance	BDM 13.04.04	7010 mm
Minimum Railroad Horizontal Clearance	BDM 13.04.03 BDM 13.04.09	6100 mm Crash Barrier required for piers < 7620 mm from track centerline
Cross Section Elements		
Total Number of Lanes	Design Report & Studies	3-lanes each direction (min for new freeway in Metro Detroit)
Lane Width	MDM 3.07A, Standard Plan R-110-A	3.6 m
Left Shoulder Width	MDM 3.09, 6.05.04 E, Standard Plan R-110-A	3.6 m
Right Shoulder Width	MDM 3.09, 6.05.04 E, Standard Plan R-110-A	2.4 m w/ Valley Gutter
Curb and Gutter Drainage	Design Report & Studies	Yes
Maximum Fore Slope (desirable)	MDM 2.03.01	1 on 4 (1 on 6)
Maximum Back Slope (desirable)	MDM 2.03.01	1 on 3 (1 on 4)
Minimum Ditch Width (desirable)	MDM 4.04.02 AASHTO RDG	1.2 m (1.8 m) (w/ open drainage)
Minimum Ditch Grade (desirable)	MDM 4.04.01	0.2% (0.3%) (w/ open drainage)
Pavement Cross Slope	Standard Plans R-107-D1 and R-110-A	2%
Shoulder Cross Slope	MDM 6.05.05A and R-110-A	4%
Clear Zone	AASHTO RDG Table 3.1	13.5 m

System Interchange Geometric Design Criteria

System interchanges for the Illustrative and Practical Alternatives were developed and evaluated using current MDOT, FHWA, and AASHTO geometric guidelines, policies, and standards as listed in Table A-2. The recommended criteria for the U.S. side reflect the urban areas within which alternatives are to be developed and the volume of heavy truck traffic that is forecasted to use the facilities. Design criteria to be used on the Canadian side may utilize urban or rural criteria, depending on the location of the alternative.

Table A-2
U.S. System Interchange Ramp Geometric Design Criteria (metric)

Item	Reference	Urban Ramp
Roadway Classification	AASHTO	Urban Ramp
Design Level of Service	AASHTO Exhibit 2-32 (p 85) MDOT Practice	LOS C LOS D minimum
Design Speed (km/h)	MDM 3.06.01	
Loop Ramps	Standard Plan R-107-D1	50 km/h
Direct Ramps	AASHTO Exhibit 10-56 (p 830)	80 km/h
Horizontal Alignment		
Minimum Radius	Standard Plan R-107-D1	86 m Loop Ramp (7% max super) 240 m Direct Ramp
Minimum Length of Curve	MDM 3.03.01B	150 m Loop Ramp (50 km/h) 240 m Direct Ramp (80 km/h)
Minimum Radius Not Requiring a Spiral	AASHTO Exhibit 3-33 (p 179)	148 m Loop Ramp (50 km/h) 379 m Direct Ramp (80 km/h)
Maximum Super elevation	MDM 3.04, Standard Plan R-107-D1	7% Loop Ramp 5% Direct Ramp
Maximum Rollover (shoulder)	Standard Plan R-107-D1	6.0%
Maximum Gore Cross Slope	GDG G-200 Series	8.0%
Vertical Alignment		
Maximum Percent of Grade	MDOT	5% max up or down
Minimum Percent of Grade	MDM 2.02.01	0.3% to 0.5% for curbed roadways
Minimum Stopping Sight Distance	AASHTO Exhibit 3-1 (p 112) AASHTO Exhibit 3-2 (p 115) AASHTO Exhibit 3-76 (p 274) AASHTO Exhibit 3-79 (p 280)	65 m Loop Ramp 130 m Direct Ramp
Minimum Passing Sight Distance	NA	NA
Minimum Passing Zone Length	NA	NA
Minimum K-Value for Crest VC	AASHTO Exhibit 3-76 (p. 274)	Loop Ramp: 7 Direct Ramp: 26
Minimum K-Value for Sag VC	AASHTO Exhibit 3-79 (p. 280) Comfort criteria may be used.	Loop Ramp: 13 Direct Ramp: 30
Bridge Width	AASHTO Chapter 8 (p. 510) BDG Section 6	Approach Roadway
Minimum Vertical Clearance for Bridges (desirable)	BDM 7.01.08 Desired for New Freeways Minimum in Highly Urbanized Areas	4900 mm (5000 mm) 4400 mm (4500 mm)
Bridge Structural Capacity	BDM 7.01.04.A	MS-23
Minimum Railroad Vertical Clearance	BDM 13.04.04	7010 mm
Minimum Railroad Horizontal Clearance	BDM 13.04.03 BDM 13.04.09	6100 mm Crash Barrier required for piers < 7620 mm from track centerline
Cross Section Elements		
Total Number of Lanes	Design Report & Studies	2-lanes each direction
Lane Width	MDM 3.07A, Standard Plan R-110-A	7.2 m – Two Lanes 4.8 m – One Lane
Left Shoulder Width	Standard Plan R-110-A	1.8 m
Right Shoulder Width	Standard Plan R-110-A	2.4 m
Curb and Gutter Drainage	Design Report & Studies	Yes
Maximum Fore Slope (desirable)	AASHTO RDG MDM 2.03.01	1 on 4 (1 on 6)
Maximum Back Slope (desirable)	MDM 2.03.01	1 on 3 (1 on 4)
Minimum Ditch Width (desirable)	MDM 4.04.02	1.2 m (1.8 m)
Minimum Ditch Grade (desirable)	MDM 4.04.01	0.2% (0.3%)
Pavement Cross Slope	Standard Plans R-107-D1 and R-110-A	2%
Shoulder Cross Slope	MDM 6.05.05A & R-110-A	4%
Clear Zone	AASHTO RDG Table 3.1	5.5 m Loop Ramp 8.5 m Direct Ramp

Service Drive Geometric Design Criteria

Service drives for the Illustrative and Practical Alternatives were developed and evaluated using current MDOT, FHWA, and AASHTO geometric guidelines, policies, and standards as listed in Table A-3. The recommended criteria for the U.S. side reflect the urban areas within which alternatives are to be developed and the volume of heavy truck traffic that is forecasted to use the facilities. Design criteria to be used on the Canadian side may utilize urban or rural criteria, depending on the location of the alternative.

Table A-3
U.S. Service Drive Geometric Design Criteria (metric)

Item	Reference	Service Drives
Roadway Classification	AASHTO	Urban Collector
Design Level of Service	AASHTO Exhibit 2-32 (p 85) MDOT Practice	LOS C LOS D minimum
Design Speed (km/h)	MDM 3.06.01	50 km/h
ADT for Year of Completion 2013	Traffic Report	Not yet available
ADT for Design Year 2035	Traffic Report	Not yet available
Horizontal Alignment		
Minimum Radius	Standard Plan R-107-D1	86 m
Minimum Length of Curve	MDM 3.03.01B	150 m
Minimum Radius Not Requiring a Spiral	AASHTO Exhibit 3-33 (p 179)	148 m
Maximum Super elevation	MDM 3.04	5%
Maximum Rollover (shoulder)	Standard Plan R-107-D1	6.0%
Vertical Alignment		
Maximum Percent of Grade	MDOT	5% max up or down
Minimum Percent of Grade	AASHTO Chapter 6 (p 435)	0.3% (0.5% desirable)
Minimum Stopping Sight Distance	AASHTO Exhibit 3-1 (p 112)	65 m
Minimum Passing Sight Distance	NA	NA
Minimum Passing Zone Length	NA	NA
Minimum K-Value For Crest VC	AASHTO Exhibit 6-2 (p 426)	7
Minimum K-Value For Sag VC	AASHTO Exhibit 6-2 (p 426)	13 (Comfort criteria may be used)
Bridge Width	AASHTO Chapter 8 (p 510)	Approach Roadway
Minimum Vertical Clearance for Bridges (desirable)	BDM 7.01.08 AASHTO Chapter 6 (p 440)	4400 mm (4500 mm)
Bridge Structural Capacity	BDM 7.01.04.B	MS-18
Minimum Railroad Vertical Clearance	BDM 13.04.04	7010 mm
Minimum Railroad Horizontal Clearance	BDM 13.04.03 BDM 13.04.09	6100 mm Crash Barrier required for piers < 7620 mm from track centerline
Cross Section Elements		
Total Number of Lanes	Design Report & Studies	2-lanes, 1-lane each direction
Lane Width	AASHTO Chapter 6 (p 437)	3.6 m
Median/Left Shoulder Width	NA	0.0 m
Right Shoulder Width	AASHTO Exhibit 6-5 (p 429)	2.4 m (ADT>2000)
Curb and Gutter Drainage	Design Report & Studies	Yes
Maximum Fore Slope (desirable)	AASHTO RDG MDM 2.03.01	1 on 4 (1 on 6)
Maximum Back Slope (desirable)	MDM 2.03.01	1 on 3 (1 on 4)
Minimum Ditch Width (desirable)	MDM 4.04.02	1.2 m (1.8 m)
Minimum Ditch Grade (desirable)	MDM 4.04.01	0.2% (0.3%)
Pavement Cross Slope	Standard Plans R-107-D1 and R-110-A	2%
Shoulder Cross Slope	MDM 6.05.05A & R-110-A	4%
Clear Zone	AASHTO RDG Table 3.1	5.5 m

River Bridge Geometric Design Criteria

Bridge options for the Illustrative and Practical Alternatives were developed and evaluated using current MDOT, FHWA, and AASHTO geometric guidelines, policies, and standards for bridges as listed in Table A-4. The geometric design criteria recommended for the DRIC reflects the assumption that it will function as a connection between the U.S. and Canadian Plazas, both of which are secure facilities, with traffic entrances and exits to functional areas very close to the ends of the bridge. Traffic entering and exiting the plazas need to be traveling at low speeds to protect the safety of bridge traffic operators and government inspectors working on the plazas. Other traffic crossings in Michigan have posted speed limits of 50 km/h (30 mph). The recommended design speed of 60 km/h enables the use of slightly increased profile grades, and shorter vertical curves than the approach highways, which will substantially reduce the length of bridge approaches needed to cross the shipping channels on the Detroit River.

Table A-4
Detroit River Bridge Geometric Design Criteria (metric)

Item	Reference	6-Lane Urban Arterial
Roadway Classification	AASHTO Chapter 1 (p 10-11)	Urban Principal Arterial
Design Level of Service	AASHTO Exhibit 2-32 (p 85) MDOT Practice	LOS C LOS D minimum
Design Speed (km/h)	AASHTO Chapter 2 (p 67-72)	60 km/h
ADT for Year of Completion 2013	Traffic Report	Not yet available
ADT for Design Year 2035	Traffic Report	Not yet available
Horizontal Alignment		
Minimum Radius	Std. Plan R-107-D1	162 m (5% max super)
Minimum Length of Curve		NA
Minimum Radius Not Requiring a Spiral		NA
Maximum Super elevation	Std. Plan R-107-D1	5%
Maximum Rollover (shoulder)	Std. Plan R-107-D1	6%
Vertical Alignment		
Maximum Percent of Grade	AASHTO Chapter 3 (p 239)	5.0%
Minimum Percent of Grade	AASHTO Chapter 3 (p 242)	0.3%
Minimum Stopping Sight Distance	AASHTO Exhibit 3-1 (p 112)	85 m
Minimum Passing Sight Distance	NA	NA
Minimum Passing Zone Length	NA	NA
Minimum K-Value for Crest VC	AASHTO Exhibit 3-76 (p 274)	11
Minimum K-Value For Sag VC	AASHTO Exhibit 3-79 (p 280)	18
Minimum Vertical Clearance over Detroit River	US Coast Guard	47.5 m x 30.5 m wide at river center 40.5 m to river's edge
Minimum Vertical Clearance To Roadways (desirable)	BDM 7.01.08 Desired for New Freeways Minimum in Highly Urbanized Areas	4900 mm (5000 mm) 4400 mm (4500 mm)
Minimum Railroad Vertical Clearance	BDM 13.04.04	7010 mm
Minimum Railroad Horizontal Clearance	BDM 13.04.03 BDM 13.04.09	6100 mmCrash Barrier required for piers < 7620 mm from track centerline
Cross Section Elements		
Total Number of Lanes	Design Report & Studies	3-lanes each direction
Lane Width	AASHTO Chapter 4 (p 315)	3.6 m
Left Shoulder Width	AASHTO Chapter 4 (p 318-319)	1.2 m
Right Shoulder Width	AASHTO Chapter 4 (p 318-319)	2.4 m
Curb and Gutter Drainage	Design Report & Studies	Yes
Pavement Cross Slope	BDG 6.05.01	2.0% (English BDG)
Shoulder Cross Slope	BDG 6.05.01	2.0% (English BDG)

See Figures A-1, A-2, and A-3 on the following page.

Figure A-1
Navigation Envelope

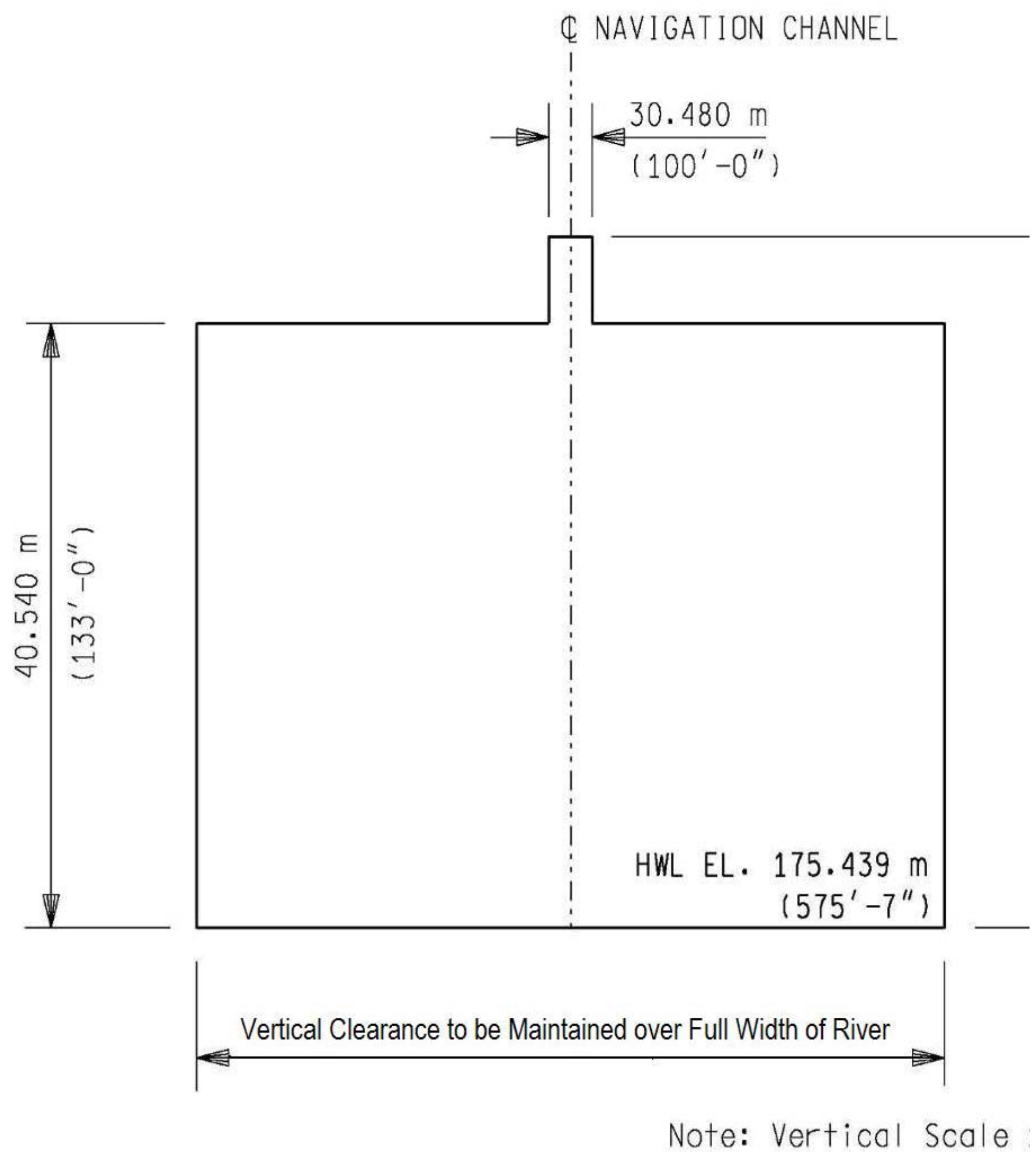


Figure A-2
Proposed Cross-Section

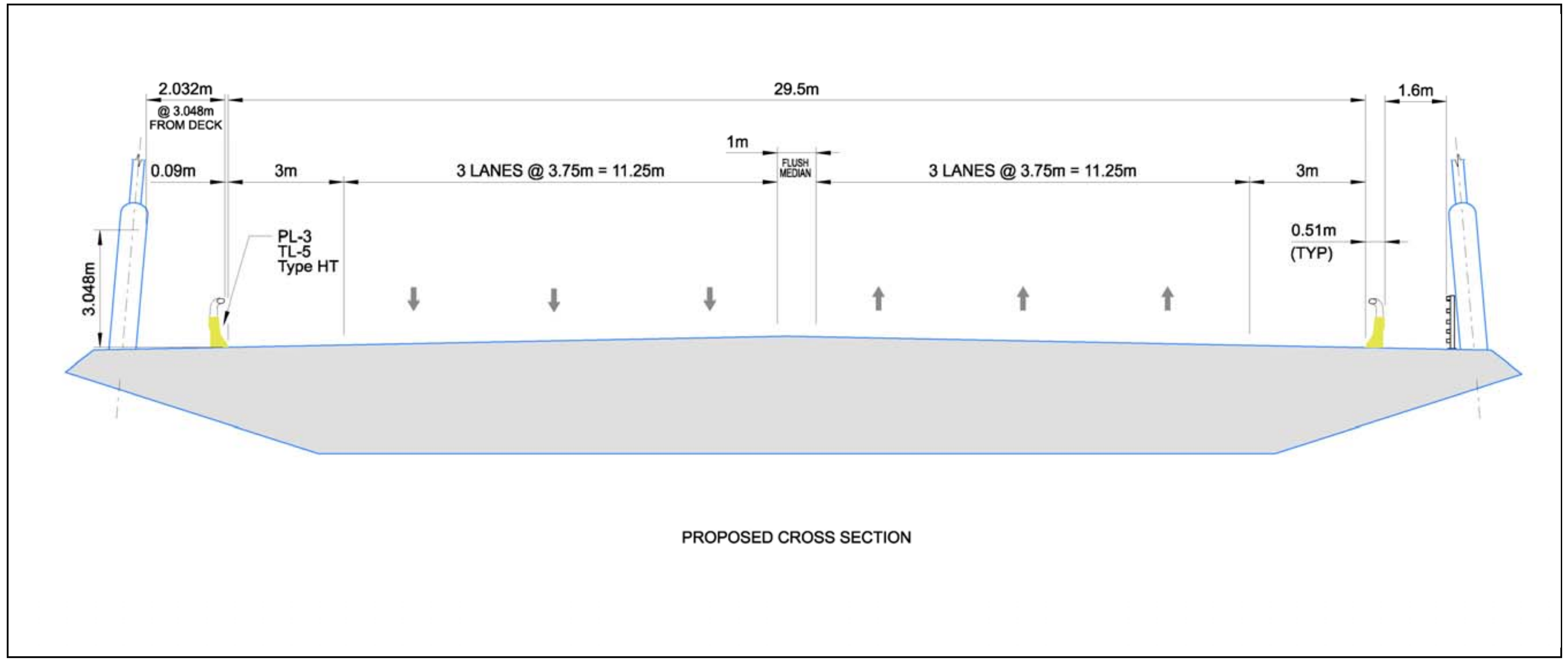
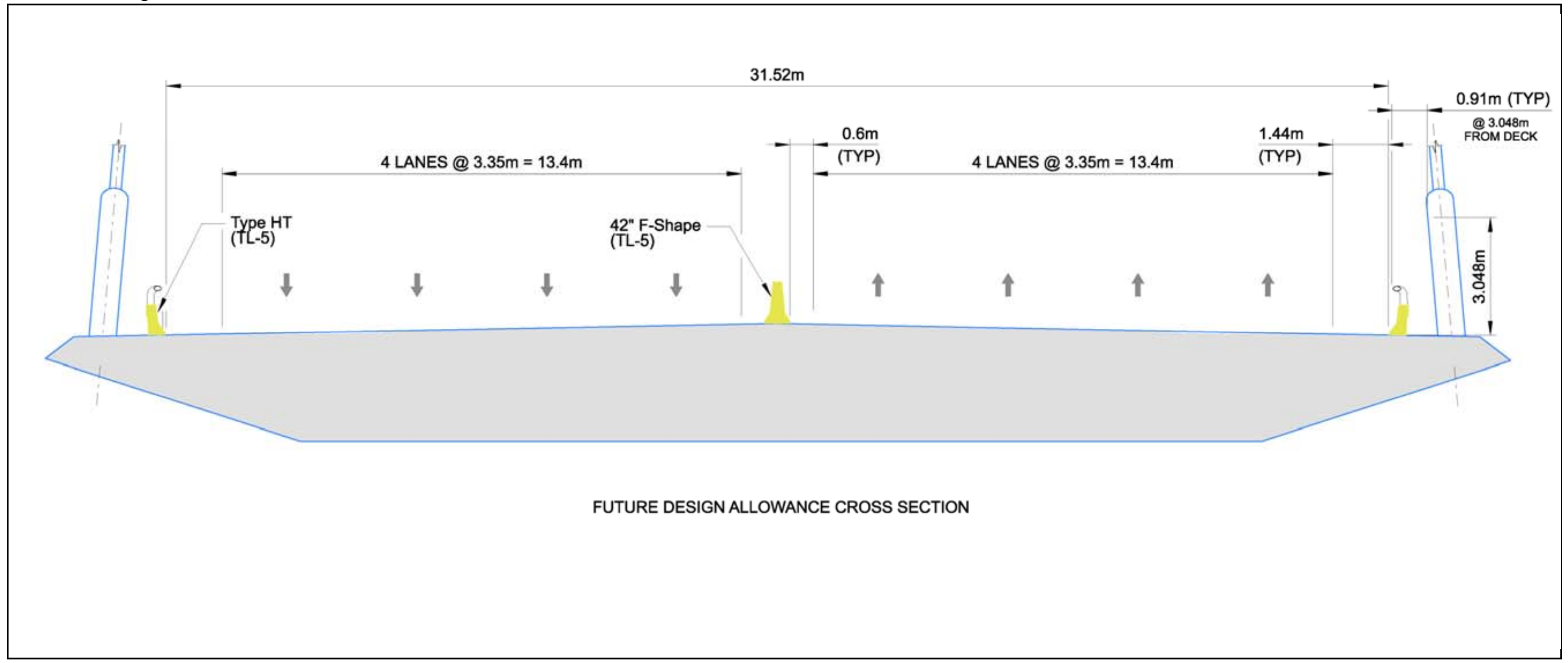


Figure A-3
Future Design Allowance Cross-Section



Guidelines for the DRIC Bridge Aesthetics





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Design Guidelines: Approach to Design

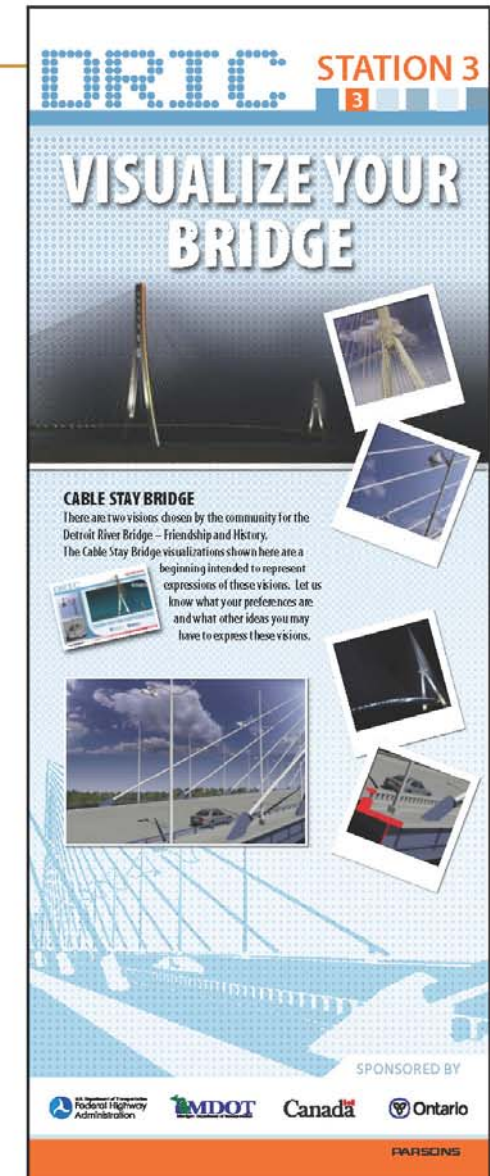
Design Guidelines: Approach to Design

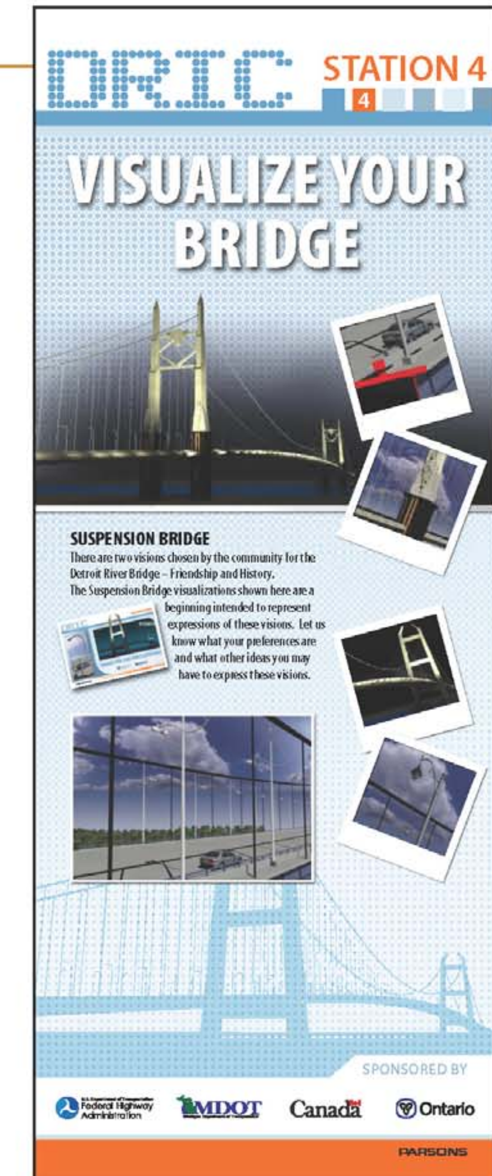
Purpose of this Narrative

A great deal of effort has been put forth during the public consultation process to solicit input from the communities surrounding the bridge location. This narrative is intended to describe the final alternatives that have been selected by the public. These alternatives do not represent a final solution for the bridge. Rather, they are a starting point for future design phases which will build on these efforts. Therefore, this document should serve as a guide for the integration of public input to-date during future stages of project development.

Suspension and Cable Stayed bridges are the two types bridges that are technically appropriate for this crossing configuration. This narrative describes the preferred architectural styles and details that have been selected by the public for both Cable-Stayed and Suspension bridges.

Field trip to Toledo, Ohio, with community members





Displays from public consultation process

Design Guidelines: Suspension Bridge

Design Guidelines: Suspension Bridge

Suspension bridges are one of the oldest long span bridge types and yet they there is still no type of bridge that can match the their spanning potential. Suspension bridges have become one of the most significant landmark images in the united states dating back to the Brooklyn Bridge. Their graceful lines and ornate towers become a physical expression of the style of the era in which they were built.

The community determined that it would be appropriate to utilize an architectural theme for a suspension bridge that references the history of the bridge type and the history of the surrounding area.

The Art Deco style was chosen for the suspension bridge. This style has been used extensively on suspension bridges, including the Golden Gate Bridge. In addition, the Art Deco movement was dominate during one of the largest growth periods in the history of Detroit. The Art Deco style can be seen today on many of the historic buildings of Detroit.


Macomb County Building[1]

1 Photo Credit: Art Deco in Detroit by Rebecca Binno Savage and Greg Kowalski (2004)





Historic Suspension Bridges

Detroit River International Crossing Architectural Narrative 5

Design Guidelines: Suspension Bridge

Implementation: Towers

The towers of any suspension bridge are the most dominate visual element. For the DRIC, the towers also serve as the gateway elements, establishing entry and exit for the main span of the bridge. This gateway feature of the pylons is expanded on this project to include a gateway between the United States and Canada.

The suspension bridge should utilize variable depth tower legs with stylistic details applied to the edges of the tower leg and the cross braces. The result will be a bridge with elegant and subtle references to the historic art deco style. It is important that the form of the bridge be used for the stylistic expression instead of applied colors or ornamentation. The goal is a low maintenance enduring solution.

Art Deco Suspension Bridge 1

Art Deco Suspension Bridge 1- Tower

Design Guidelines: Suspension Bridge

Implementation: Towers (cont.)

Another approach for the suspension bridge utilizes a stepped tower leg with stylistic details applied to the corners of the tower legs. It is important that the design of the bridge provides details at a variety of scales so that the user's experience is not one dimensional. The result is a bridge with references to other historic bridges such as the Golden Gate Bridge.

In both options, the superstructure for the bridge is a slender ribbon that spans the river. Efforts should be made to preserve the visual slenderness of the deck to minimize the visual impact of the bridge on the surrounding environment.

Art Deco Suspension Bridge 1

Art Deco Suspension Bridge 1- Tower

Design Guidelines: Suspension Bridge

Implementation: Suspension Bridge Anchorage

Due to the length of the bridge, the suspension bridge anchorage for the proposed crossing will be quite large. This element will play a major role in the visual composition of the bridge and should not be ignored.

The art deco style offers many opportunities to create interesting compositions on the faces of the anchorages. In addition, the anchorages can become a platform for vertical ornamental elements such as large sculptures (see figure 2).

The introduction of a vertical element at the anchorages will provide an opportunity to reinforce the gateway experience of the bridge. These elements can be treated differently on each end of the bridge, making it possible to create direct references to the two communities and countries served by the bridge.

Art Deco Suspension Bridge Anchorage - Figure 1

Art Deco Suspension Bridge Anchorage - Figure 2

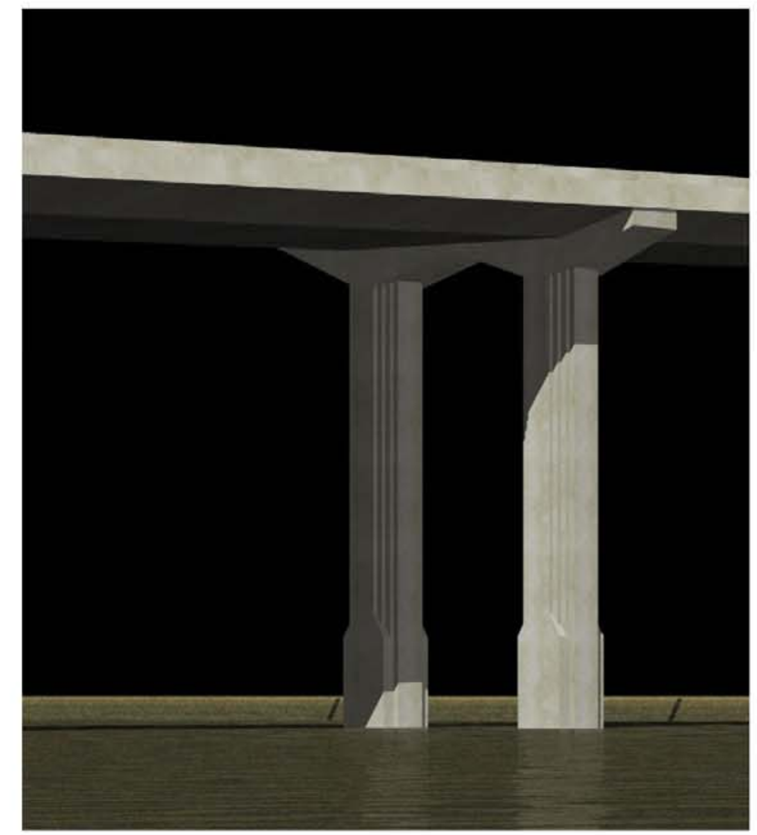
Design Guidelines: Suspension Bridge

Implementation: Approach Piers

A large portion of the user's experience will be defined the approach piers. These elements will be seen up close from a variety of different vantage points. The design of the piers should blend harmoniously with the bridge design and the surrounding built environment.

The approach pier should create a visual connection between the design of the bridge towers. People will be driving and walking adjacent to these piers. They will also be located in a variety of landscape settings. Therefore, the scale of the details on the piers should be developed to respond to a variety of project conditions.

The piers should be visually logical for when viewed from a distance. In addition, the piers should have a level of details that are appropriate for up-close interaction.



Approach Pier Design

Design Guidelines: Suspension Bridge

Implementation: Aesthetic Lighting

The lighting should respond to the historical aspects of the surrounding area while melding with the new amenities on the waterfront. The lighting should reveal the bridge structure in a pleasing and aesthetic way, creating a night time experience that is completely different from the day time experience.

Current concepts have focused on enhancing the horizontal line of the bridge across the water with a kinetic lighting solution, an effect that creates a visual connection between the two sides of the river. LED panels will be mounted to the outer surface of edge girder. These color-changing LED panels are controlled by a highly flexible and sophisticated lighting control system that allows for the display of infinite numbers of lighting shows across the length of the bridge, from simple one-color panels to complex, color-changing events. (see Figure 1)

The colors and lighting events can be coordinated with seasonal changes and with special events taking place in the community. This active lighting system will serve as a major element of communication and will involve the bridge in the community at a social level.

At night, the simple form of the towers is transformed into a dramatic statement, expressing the spirit of the Detroit River International Crossing. The sculptural lighting of these elements celebrates environmental responsibility, respects the surrounding area, creates a nighttime image while minimizing light pollution. The result is a lighting solution that is controlled architecturally, staying within the confines of the pylon and cable stays. This creates an image that expresses the strength and grandeur of the structure within a context that is meaningful - and beautiful - to the community.

More nostalgic approaches to lighting are also appropriate including the utilization of necklace lights. When mounted to the main suspension cable, these lights accentuate the parabolic curve of the cable as it stretches across the river and evoke images of historical suspension bridges. (see Figure 2)

Lighting Concept - Figure 1

Lighting Concept - Figure 2

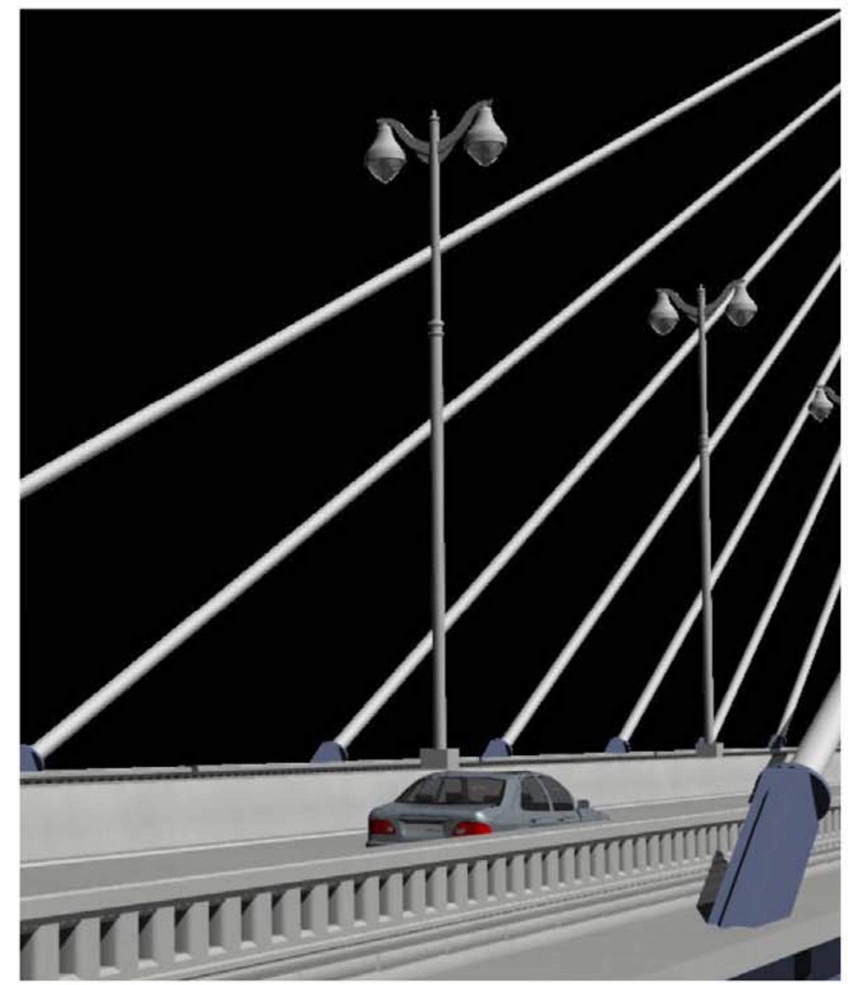
Design Guidelines: Suspension Bridge

Implementation: Roadway Lighting and Barriers

For the bridge to be visually successful, every detail should be developed to follow the theme of the bridge. Two major elements that will effect the way people experience the structure are the light poles and the barrier curbs.

The light poles ultimately selected for the project should reflect the historical theme of the bridge. A wide variety of poles are now available that reference historic themes and forms, while providing state-of-the-art photometric qualities. The pole shown in the illustration is a standard fixture that meets these requirements.

Likewise, barriers play a significant role in shaping the driver's experience. A strong desire was expressed by the public to create barrier that does not obstruct views off of the bridge. There are a number barriers that meet crash testing requirements while providing openness and an historic design. The "Texas Classic" barrier shown in the illustration is one such example.



Light Poles and Barriers

Design Guidelines: Cable Stayed Bridge

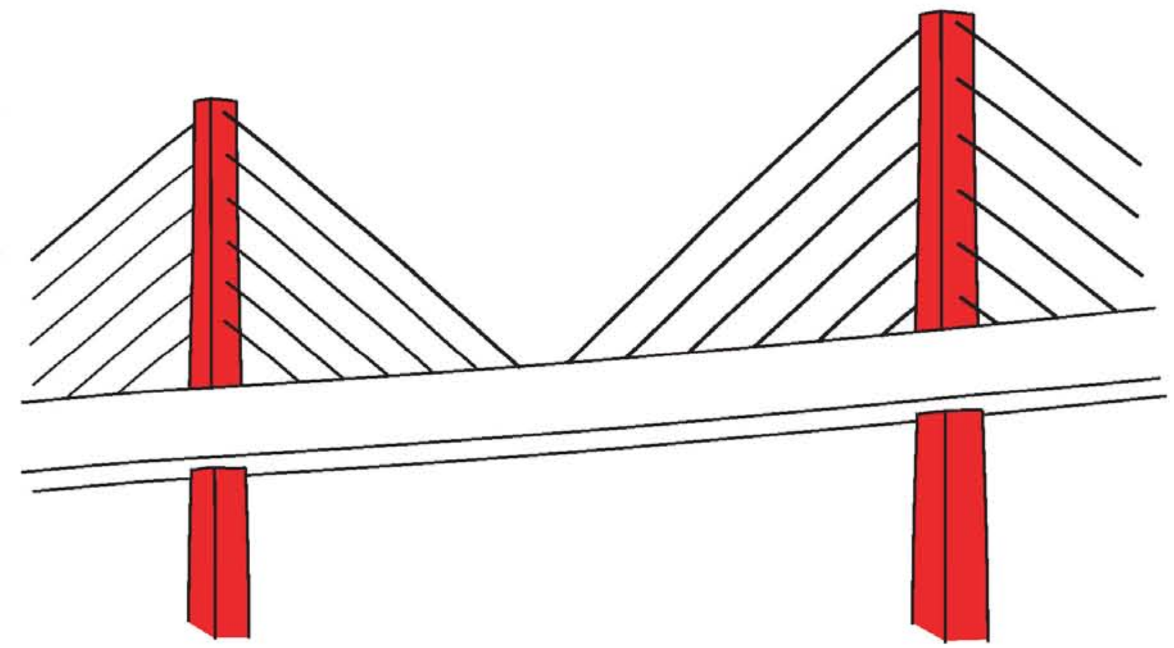
Design Guidelines: Cable Stayed Bridge

A typical cable stayed bridge is a continuous girder with one or more towers erected above piers in the middle of the span. From these towers, cables stretch down diagonally (usually to both sides) and support the girder.

Cable Stayed bridges are a relatively new style of bridge, representing the latest in bridge design technology. Because they are new, there are no historic applications of cable stayed bridges.

The style that has been chosen for the cable stayed alternative is modern and contemporary. The bridge should create an icon for the community that embodies the technologically advanced nature of Detroit and Windsor.

Every effort should be made to utilize the structurally required elements of the bridge to create the visual signature of the project.



Cable Stayed Bridge Examples

Design Guidelines: Cable Stayed Bridge

Implementation: Pylons

The pylons for the cable stayed bridge will be one of the tallest elements on the skyline of Detroit and will therefore be the most visually significant element of the project. The towers also serve as the gateway elements, establishing entry and exit for the main span of the bridge. This gateway feature of the pylons is expanded on this project to include the gateway between the United States and Canada.

Every effort should be made to create a pylon design that is structurally efficient and visually pleasing. Given the height and configuration of the pylons, an inverted "Y" or an "A" configuration is best suited for the application.

Based on public input, the "A" configuration has been eliminated. The following examples indicate how inverted "Y" pylon forms can be developed to meet the desires expressed by the community.

The gateway feature of the pylons will be experienced multi-dimensionally:

- Horizontally, as the road connection between the U.S. and Canada.
- Vertically against the skyline and river view panorama.
- Longitudinally as the traveler passes through the legs of the pylon, climbs the arc of the suspended deck, and down again from one country to the other.

Cable Stayed Pylon Shapes

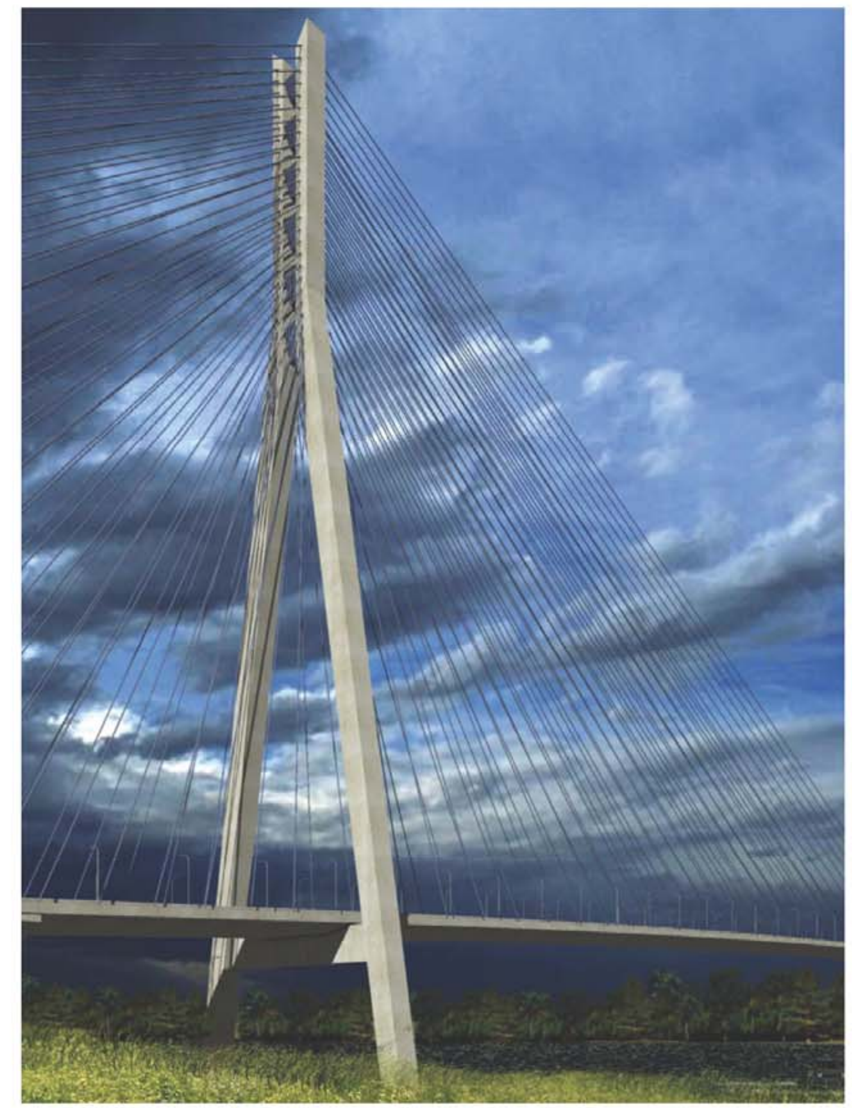
Design Guidelines: Cable Stayed Bridge

Implementation: Pylons - Inverted "Y"

An inverted "Y" pylon configuration has been determined as a feasible pylon shape by the technical review committee. This shape provides a great deal of transverse stability and can be designed with very efficient cross-sections.

The critical areas that should be studied for aesthetic opportunities are the top of the pylon and the vertical component of the shaft. The upper portion of the pylon can be split to create the perception of two separate pylon legs that are joined in the center by bridging elements. The bridging elements also provide an opportunity to introduce color and detail at relatively low cost.

The treatment of the pylon top is critical. It should reinforce the vertical height of the pylon and its slenderness.



Inverted "Y" Pylon

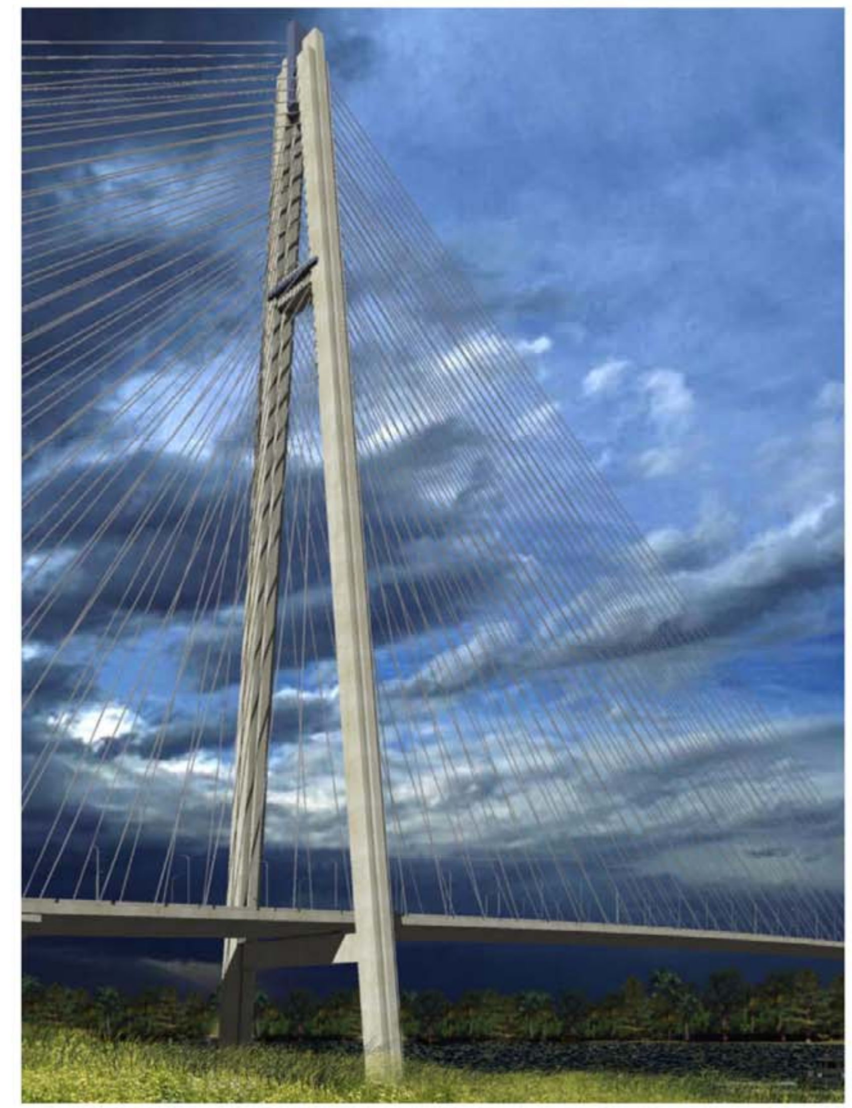
Design Guidelines: Cable Stayed Bridge

Implementation: Pylons - "A" Shape

An "A" shaped pylon configuration has been determined as a feasible pylon shape by the technical review committee. This shape provides a great deal of transverse stability and can be designed with very efficient cross-sections.

The critical areas that should be studied for aesthetic opportunities are the top of the pylon and the cross tie of the pylon. The cross tie location should be limited to the top one third of the pylon. The detailing of the cross tie is critical because it defines the top of the gateway portals experienced by the traveling public.

The treatment of the pylon top is also critical. It should reinforce the height of the pylon and its slenderness. In addition, a cleat relationship between the pylon top and cross tie should be established for the creation of a meaningful composition.



"A" Shaped Pylon

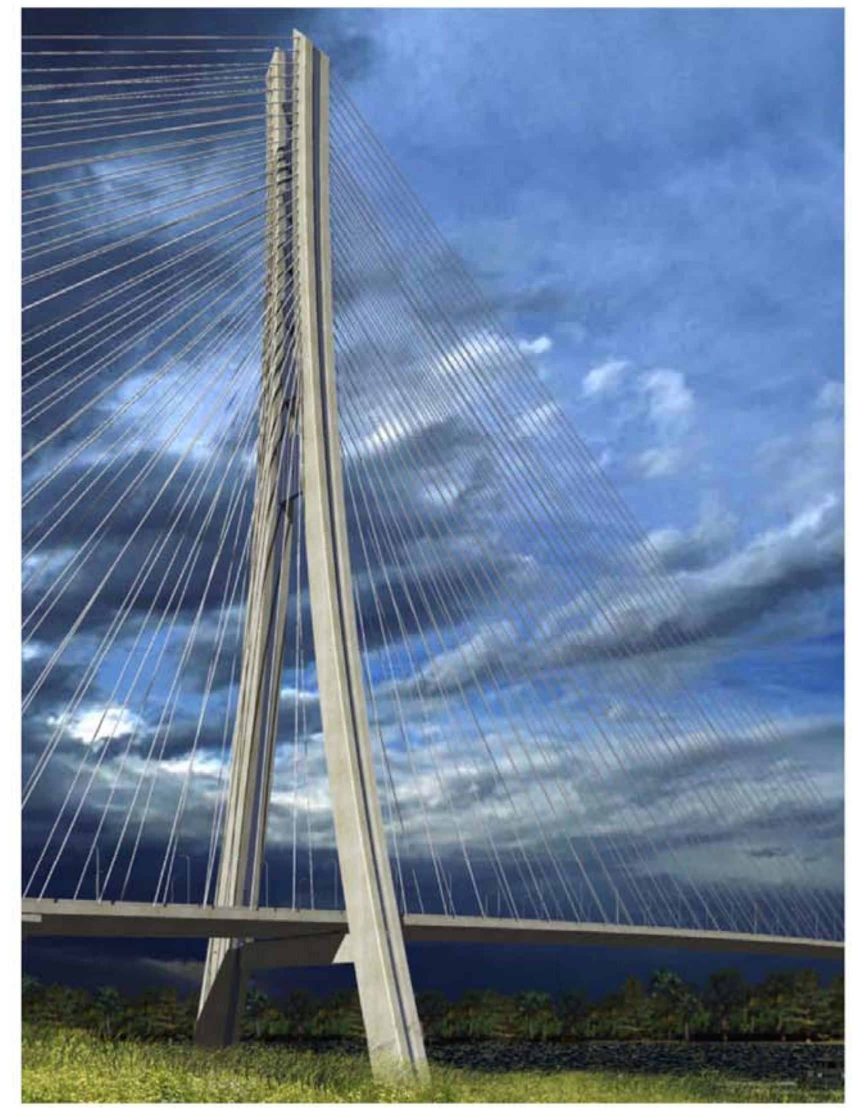
Design Guidelines: Cable Stayed Bridge

Implementation: Pylons - Curving Inverted "Y"

An inverted "Y" pylon configuration has been determined as a feasible pylon shape by the technical review committee. This shape provides a great deal of transverse stability and can be designed with very efficient cross-sections. The curved leg version of this shape will provide a very dramatic visual signature. The form of the curve should allow the upper portion of the pylon to join with cross members for a greater length of the pylon than the standard inverted "Y" configuration. In addition, the curve should flare out slightly at the top to create a more dynamic appearance.

The upper portion of the pylon can be split to create the perception of two separate pylon legs that are joined in the center by bridging elements. The bridging elements also provide an opportunity to introduce color and detail at relatively low cost.

The treatment of the pylon top is critical. It should reinforce the vertical height of the pylon and its slenderness.



Inverted "Y" Pylon

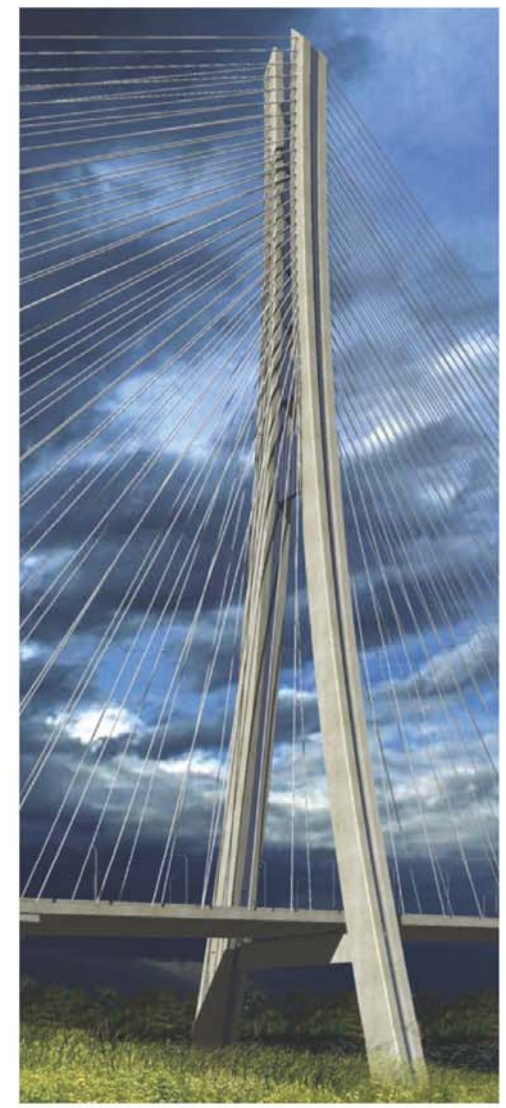
Design Guidelines: Cable Stayed Bridge

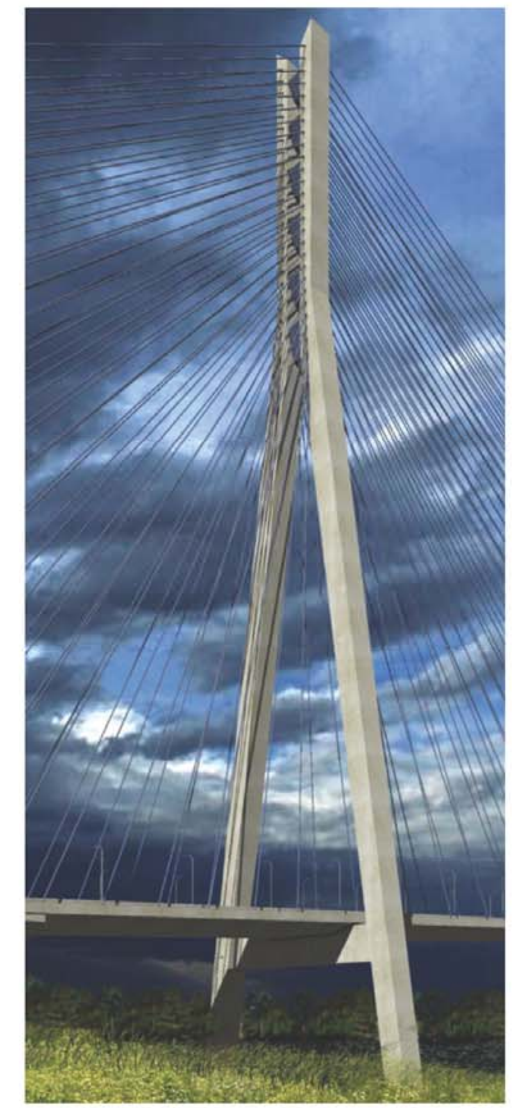
Implementation: Pylons - Colors

The colors used on the bridge will be limited due to the scale of the structure. The pylon and other concrete elements should be left a natural concrete color. Every attempt should be made to create a consistent color from one concrete pour to the next by controlling the mix designs and aggregate specifications.

There are opportunities to introduce color into the bridge at the main pylon, cable stays and steel superstructure. It is recommended that the stays be treated with a blue color unless cable lighting is anticipated as part of the aesthetic lighting package. If the cables are to be lit at night, white is the preferred color.

Accent colors on the pylon should be limited to cool blue tones to preserve the contemporary style of the bridge.





Design Guidelines: Cable Stayed Bridge

Implementation: Approach Piers

A large portion of the user's experience will be defined by the approach piers. These elements will be seen up close from a variety of different vantage points. The design of the piers should blend harmoniously with the bridge design and the surrounding built environment.

The approach pier should create a visual connection between the design of the bridge towers. People will be driving and walking adjacent to these piers. They will also be located in a variety of landscape settings. Therefore, the scale of the details on the piers should be developed to respond to a variety of project conditions.

The piers should be visually logical for when viewed from a distance. In addition, the piers should have a level of details that are appropriate for up-close interaction.

Approach Pier Design

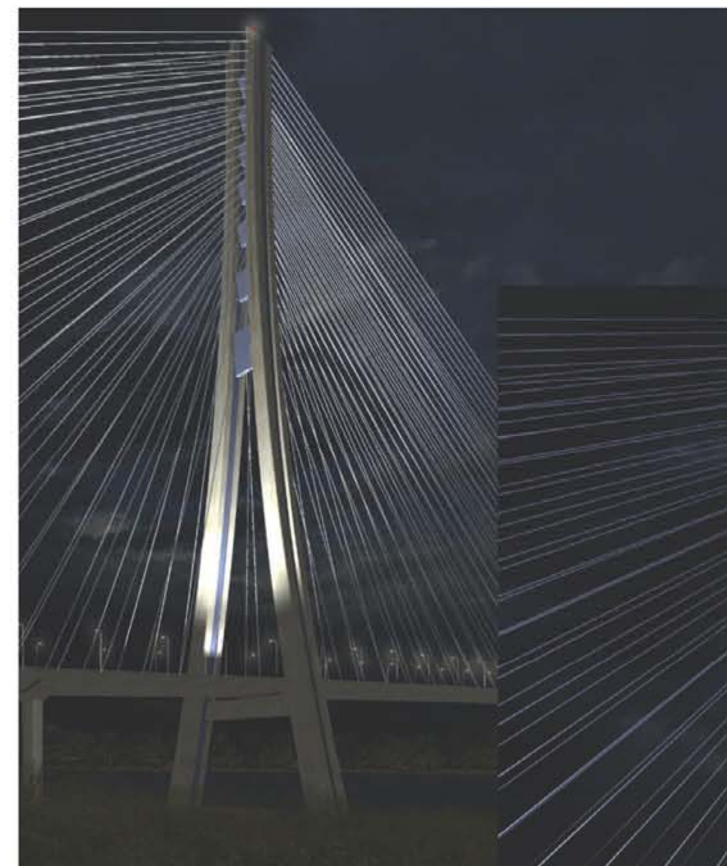
Design Guidelines: Cable Stayed Bridge

Implementation: Aesthetic Lighting

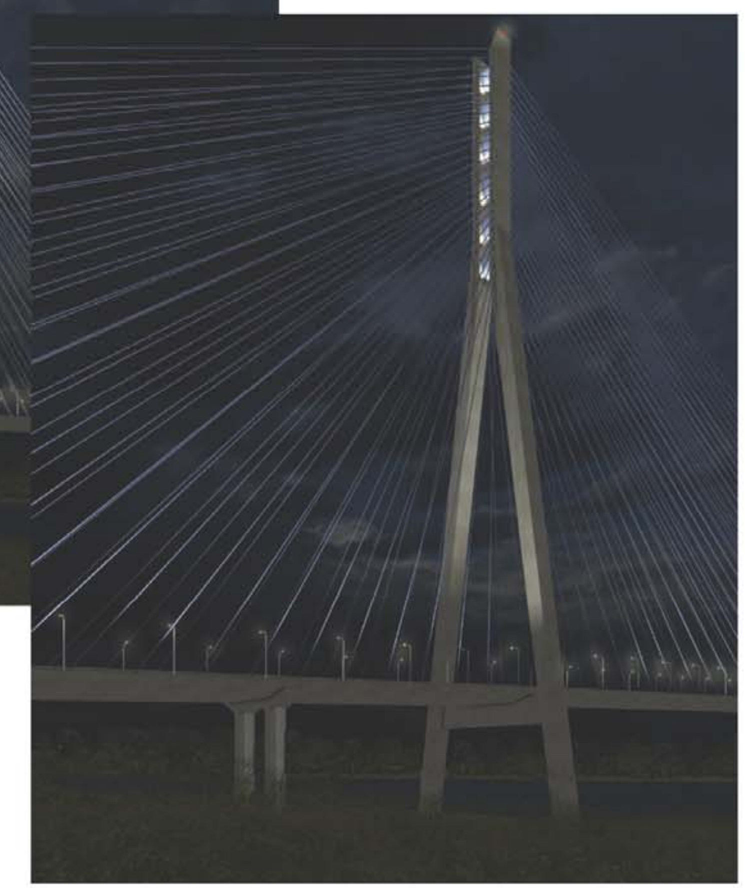
The lighting should respond to the surrounding area while melding with the new amenities on the waterfront. The lighting should reveal the bridge structure in a pleasing and aesthetic way, creating a night time experience that is completely different from the day time experience.

The colors and lighting events can be coordinated with seasonal changes and with special events taking place in the community. An active lighting system will serve as a major element of communication and will involve the bridge in the community at a social level.

At night, the simple forms of the towers is transformed into a dramatic statement, expressing the spirit of the Detroit River International Crossing. The sculptural lighting of these elements celebrates environmental responsibility, respects the surrounding area, creates a unique nighttime image while minimizing light pollution. The result is a lighting solution that is controlled architecturally, staying within the confines of the pylon and cable stays. This creates an image that expresses the strength and grandeur of the structure within a context that is meaningful and beautiful to the community.



Accented Cables



Accented Pylon Cross Members

Design Guidelines: Cable Stayed Bridge

Implementation: Roadway Lighting and Barriers

For the bridge to be visually successful, every detail should be developed to follow the theme of the bridge. Two major elements that will effect the way people experience the structure are the light poles and the barrier curbs.

The light poles ultimately selected for the project should reflect the contemporary theme of the bridge. A wide variety of poles are now available that reinforce a contemporary theme in a simple and elegant fashion, while providing state-of-the-art photometric qualities. The pole shown in the illustration is a standard fixture that meets these requirements.

Likewise, barriers play a significant role in shaping the driver's experience. A strong desire was expressed by the public to create barrier that does not obstruct views off of the bridge. There are a number barriers that meet crash testing requirements while providing openness and a contemporary design. The barrier shown in the illustration is an example of a standard crash tested barrier that meets these requirements.

Light Poles and Barriers