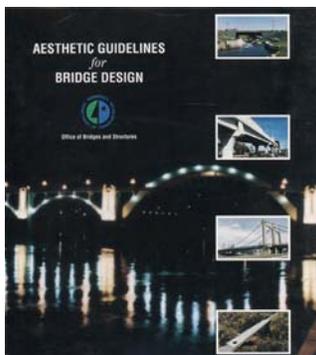


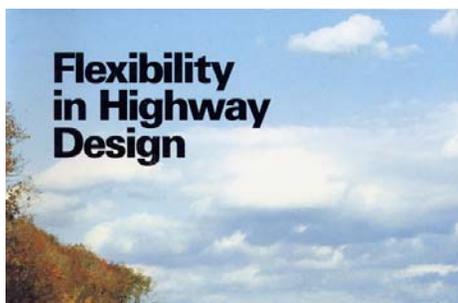
AESTHETIC BRIDGES USERS GUIDE



Maryland Department of Transportation, State Highway Administration, Office of Bridge Development (1993). *Aesthetic Bridges Users Guide*. Baltimore, Maryland.

ABSTRACT

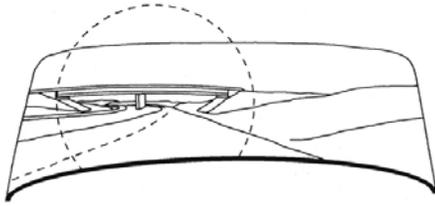
Maryland's *Aesthetic Bridges Users Guide* was assembled with content from several sources. In 1988 *Maryland Bridgescape: The Solomon's Conference* was held. The conference, a joint effort between the State Highway Administration and the Governor's Office of Art and Culture, brought together experts from several disciplines to discuss bridge aesthetics. Subsequent to the conference a series of bridge aesthetic seminars were held, led by Princeton University Professor David Billington. The content in the users guide was assembled with material from the conference and seminars.



The guide is produced in a three-ring binder with tabbed sections. Introductory material describing aesthetics and bridge design in broad terms is presented in Chapter 1. The aesthetics of particular bridge elements are discussed in Chapters 2 through 6. This is followed with aesthetic guidance for particular types of bridges in specific settings in Chapters 7 through 13. The document concludes with content on rehabilitation and reconstruction, award winning bridges in Maryland, bridge competitions, and a bibliography.

The format of the document reflects the manner in which the content was obtained. It is less formal than a standard textbook. It contains numerous color photographs and black and white sketches. The figures are used to present ideas and pose questions to the reader. The text for each chapter is a mixture of guidelines and commentary. While not prescribing a one-size-fits-all set of geometrical relationships for aesthetic design, engineers who are comfortable with numbers will find many suggestions for geometrical relationships to proportion elements.

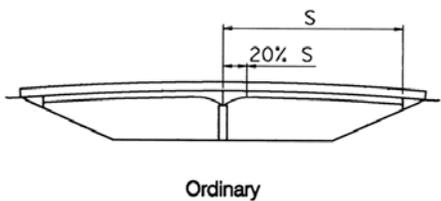
Chapter 1: Introduction. The guide begins by discussing a wide range of introductory material related to aesthetics ranging from: Bridge Designers and Aesthetics, Aesthetics and Cost, Determinants of Appearance, The Keys to Success, Analyzing the Appearance of Bridges, and The Place of Standards.



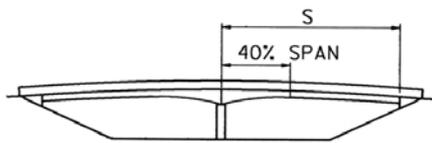
Chapter 2: Geometry, Layout and Concept provides recommendations for span to depth ratios, the width of single column piers and the width of multi-column piers in relation to span length. Within the guide “Concept” refers to tying the different elements of a project together in a consistent manner or theme.

Chapter 3: Superstructure. As a primary aesthetic component of a bridge, significant content on the aesthetic design of superstructures is presented in Chapter 3. Topics discussed include: Superstructure type, Superstructure Depth/Shape, Overhang Details, and Superstructure Elements such as bearings, wind bracing, parapets, pedestrian screens, and railings.

Chapter 4: Substructure provides guidance and commentary on the design of piers, abutments, and walls. Minimizing the impact of pier caps on a structure receives significant attention, as do pier tapers, and hammerhead pier “ear” dimensions. Preferred ratios for pier width relative to the depth of the superstructure are also provided ($1/2$ to $1/4$ of the superstructure depth). There is a preference to reduce the number of columns and that a single pier type be used for the entire structure. In other words, refrain from mixing multi-column piers with hammer head piers, etc. Abutments and retaining walls should be designed to tie in well with adjoining elements in their environment. Elements in abutments that can be used to enhance the “slenderness” of a bridge include considering how parapets and shadows from overhangs are carried off the bridge. At times the inclination of the abutment breastwall may be varied to achieve different effects.



Ordinary



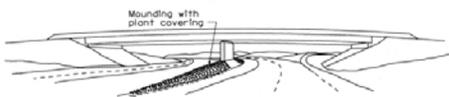
Better

Chapter 5: Colors and Textures discusses the secondary aesthetic design elements of color and texture. Painted steel provides the most color flexibility. Concrete can be stained earth tone colors. With discretion, concrete can readily be adapted to incorporate patterns and textures to enhance a concept or theme for the structure. However, ornamentation should be kept to an absolute minimum.

Chapter 6: Signing, Lighting and Landscaping. If appurtenances are necessary try to size and position them such that they align with the primary or dominant structural lines of the bridge. When coordinated, landscaping may be able to enhance the appearance of a bridge.

Chapter 7: Highway Bridges over Highways. Typically these bridges are in the observer’s field of vision for a relatively short period of time while traveling at a rapid speed. As a result, an observer will not be able to see intricate detail on various components of the bridge.

Chapter 8: Bridges over Valleys and/or Deep Highway Cuts. These bridges often have primary vantage points that are located on approach roadways located miles away from the bridge. Consequently, only the dominant lines of the bridge have significant impact to the observer. Those which have trails or other pedestrian facilities nearby will require more attention to additional elements.



Chapter 9: Bridges over Waterways. Typically the most important vantage point is from shore with an oblique view. For large structures one of the aesthetic design objectives is to use a consistent type of pier throughout. Short span bridges over waterways have many of the same constraints as highway bridges over highway bridges.



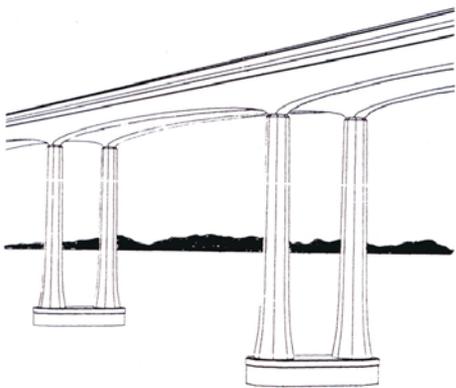
Chapter 10: Viaducts and Long Interchange Ramps. Viaducts and long interchange ramps are often viewed from different levels and perspectives. It is difficult to identify a single primary vantage point. Consequently, transitions between elements should be smooth. Try to minimize the number of piers and the number of columns in each pier.

Chapter 11: Highway Bridges over Railroads. Unless situated in an urban setting, the primary vantage point for the bridge will be for those traveling across the bridge. As a result, in many cases less attention to detail needs to be provided for below bridge deck elements.

Chapter 12: Railroad Bridges over Highways. The railroad industry's preference for deep simple span structures with fascia stiffeners and pier mask walls to hide bearings are not aligned with preferred practices for highway structures. If possible avoid mixing short side spans with long center spans. Consider using turn-back wing walls to give the appearance of a longer, more slender structure.

Chapter 13: Pedestrian Bridges. Try to design these bridges as slender, smooth flowing structures. Consider ADA requirements. Consider placing lighting at the walkway level and using as small a parapet as possible.

Chapter 14: Rehabilitation and Reconstruction, Mixing Old and New Structures and Structural Elements. Use color to blend old and new. If appropriate try to carry themes from the old structure in to the new.



Chapter 15: Prize-Winning Bridges: Recognition Hall. Summaries of eight prize-winning bridges in the Maryland bridge inventory.

Chapter 16: Competitions. Design competitions encouraged for major structures. Top five or six proposals typically granted seed money to flesh out the design. A specially selected jury selects the winning proposal to be designed and constructed. Much smaller processes can be used for “workhorse” bridges that don't warrant a full design competition but could benefit from the input of more than a couple designers.

Chapter 17: Bibliography. Seven references with dates ranging from 1958 through 1983.

Chapter 18: Appendix. Notes concerning estimating additional costs for aesthetic features.

SUMMARY

This document includes information from a conference in which experts from several disciplines discussed bridge aesthetics. The manual contains many suggestions on how to aesthetically proportion the design elements that compose a bridge.

KEY WORDS *Applicable Project Delivery Stages:* Administration, Planning, Design

Applicable Transportation Professionals: Structural Engineers, Planners, Urban Designers, Landscape Architects, Architects

Applicable Transportation Modes: Vehicular, Bicycle, Pedestrian

Transportation Topics: Bridges, Aesthetics, Aesthetic Design Process, Superstructure, Substructure, Visual Design Elements, Aesthetic Hierarchy, Aesthetic Qualities, Aesthetic Design Objectives, Walls, Piers, Abutments, Beams, Spans, Deck, Parapet