Arizona Department of Transportation
Guidelines for Highways on Bureau of Land Management and U.S. Forest Service Lands 2008

Chapter Overview Presentations

Twelve Chapter Overview presentations supplement the Guidelines document. Chapters 1-11 each have a Chapter Overview and an additional one summarizes appendices A-O.

These self-paced presentations are designed for individual use or for small group presentations where discussion can be accommodated. It is helpful to have the Guidelines document as a reference when viewing the presentations.

The Chapter Overview presentations are available on the ADOT Roadside Development Section website.
http://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands

Navigate the Chapter Overview by scrolling through the pages.

Arizona Department of Transportation

Guidelines for Highways

on

Bureau of Land Management and

U.S. Forest Service Lands

2008

Chapter 5: Major Structure Design and Construction



Acknowledgments:

Arizona Department of Transportation

Guidelines for Highways
on
Bureau of Land Management and
U.S. Forest Service Lands

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Guidelines Contents

1 Introduction

2 ADOT Development Process on BLM and USFS Lands

3 Habitat Connectivity

4 Roadway Design and Construction

5 Major Structure Design and Construction

6 Drainage Design and Construction

7 Landscape Restoration

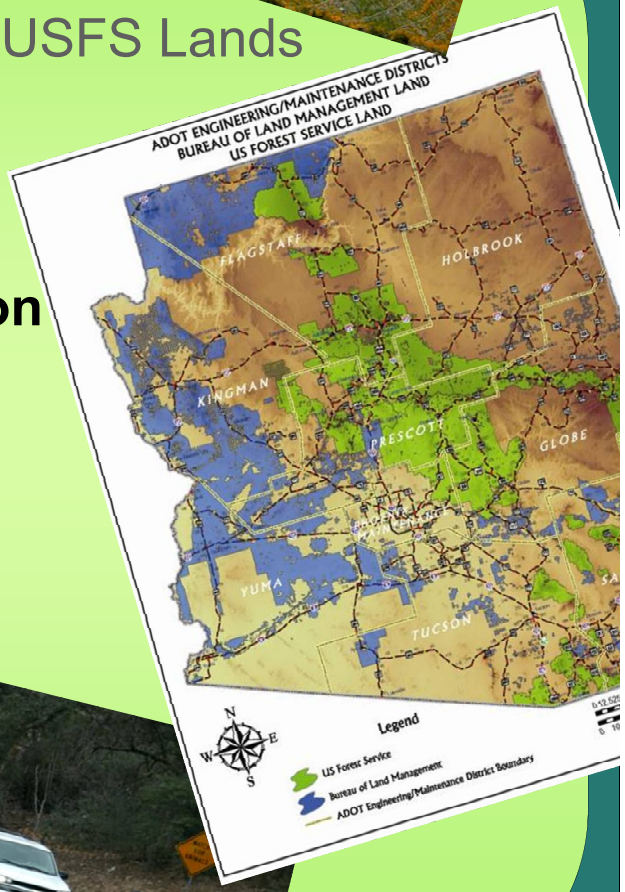
8 Storm Water and Pollution Control

9 Material Sites

10 Construction

11 Maintenance Operations

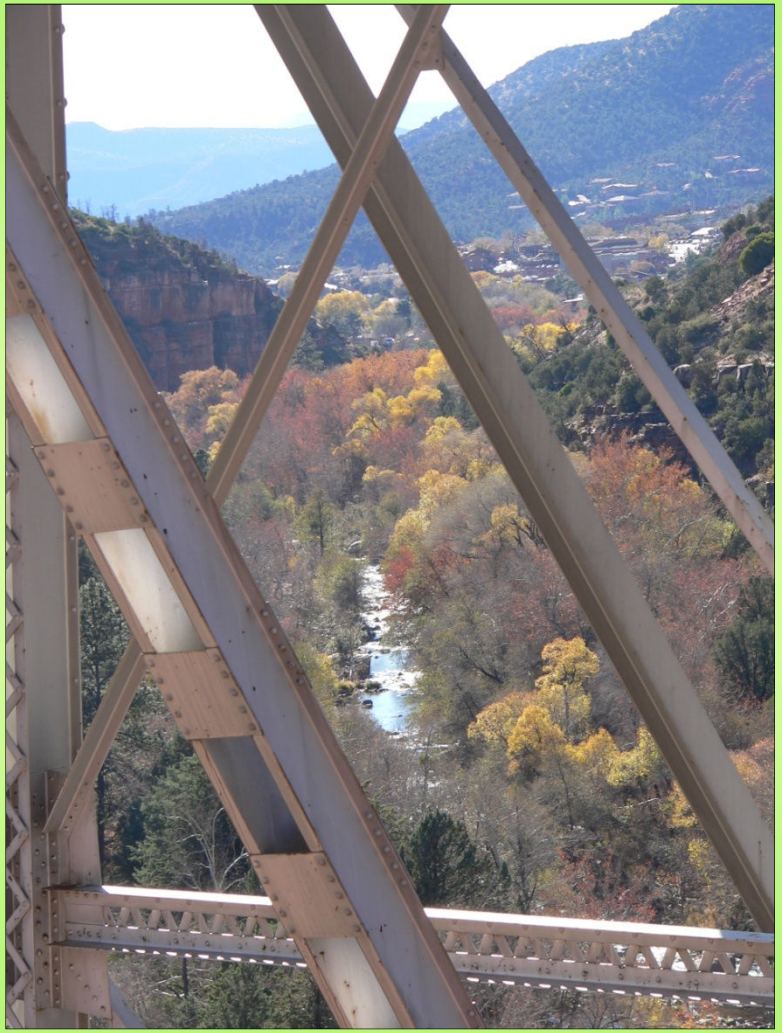
Appendices A - O



After reviewing the Chapter 5 Tutorial you should…

- Be able to identify methods to use to protect riparian areas and the habitats associated with them during the design/construction/maintenance process.
- Understand how to minimize the impact of bridges on riparian areas.
- Know when a 404 permit is required.
- Have a basic understanding of bridge types and their construction characteristics.
- Be familiar with the submittal requirements of Stages I – III of the ADOT Project Development Process regarding Major Structures.
- Understand Major Structure Selection Considerations.
- Be familiar with Bridge Design Considerations.

Chapter 5 Contents

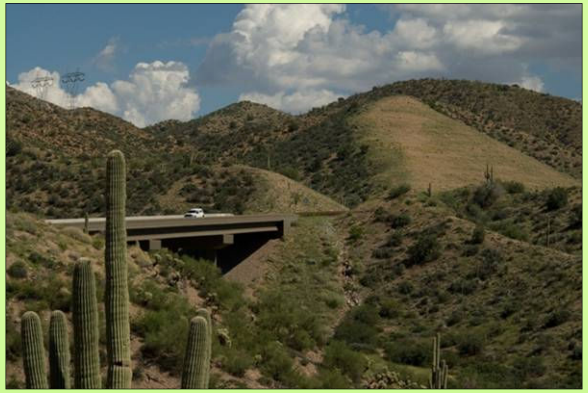


5.1 Chapter Goals

- Describe opportunities and concerns for the design, construction and maintenance of bridges and box culverts to best integrate them into the existing landscape.

5.2 Scoping and NEPA Processes

- Protect Riparian Areas
- Visual Impacts
  - Bridges are more dramatic and usually more attractive than large slopes.
- Geotechnical Investigations
  - Limit disturbance and obtain necessary clearances.
- Right of Way
  - Easement acquisition should not be a limiting factor in the design of major structures.



5.3 Design

- NEPA Documents should be reviewed regularly to ensure recommendations are considered and included in the construction documents.
- Sections 404 and 401 of the Clean Water Act
  - Section 404 regulates the discharge of fill or dredged materials into the waters of the United States.
    - Any proposed work in washes, rivers, streams, lakes and wetlands requires ADOT's Office of Environmental Services to obtain a 404 permit from the U.S Army Corps of Engineers.
  - Section 401 enables the State to certify that the draft 404 permit is in compliance with State law regarding water quality standards.

Section 404 Program

- Adminstered jointly by Army Corps of Engineers and EPA (except delegated states or tribes)

Section 401

Section 401

State Certification of Federal Permits & Licenses

5.3 Design

- Riparian Areas should be protected in all cases.
  - Minimize changes to natural stream channel dynamics.
  - Avoid or minimize armored bank protection.
  - Seek input from wildlife experts regarding species impacted and preventative measures to minimize impacts.
  - Anticipate requirements for construction and maintenance access.
  - Minimize sediment transport into riparian areas through use of proper temporary and permanent erosion and sediment control BMPs.

5.3 Design

- Structure Selection Considerations
  - Cost
  - Conveyance of off-site runoff flows
  - Continued natural stream conditions
  - Impact on natural resources and wildlife movement
  - NEPA documents' recommendations
  - Structure design aesthetics

5.3 Design

- Bridge Design Considerations
  - Location of supports and bridge abutments outside of drainages
  - Embankment slope materials
  - Geotechnical investigations
  - Storm Water runoff control
  - Aesthetics
  - Transparent barriers
  - Staging area location and reclamation
  - Maintenance access

5.3 Design

- Bridge Types

Roosevelt Lake Bridge (SR88)
Steel Arch w/ Concrete Deck

First Water Creek Bridge (SR88)
Steel Through Truss

Whiskey Spring Bridge (SR87)
Cast-in-Place Post-Tension Box
Girder Design

Lower Screwtail Bridge (SR87)
Cast-in-Place Segmental Box Design

5.3 Design

- Bridge Types
  - Concrete I-Beam Construction

Wash Bridge
SR188

Poison Spring Bridge
(SR288)

Sugar Loaf Mountain Bridge (SR93)

5.3 Design

- Construction and Access Requirements
  - Separate plans documenting construction access, access restrictions, mitigation and reclamation of access may be required in the contract documents.
- ADOT Structure Design and Review Process
  - Project Scoping should include
    - Identification of proposed structures
  - Stage II should include
    - Preliminary selection of bridge types
    - Preliminary geotechnical report
    - Preliminary foundation investigation
  - Stage III should include
    - Final foundation investigation
    - Complete bridge design

Refer to pages 64-65 of the Guidelines for a detailed description of major structure considerations and requirements for these stages.

5.4 Construction

- Maintain strict controls over contractor access.
- Wash earth-moving equipment prior to operation on BLM/USFS lands.
- Remove temporary access and restore disturbed areas per project plans and specifications.

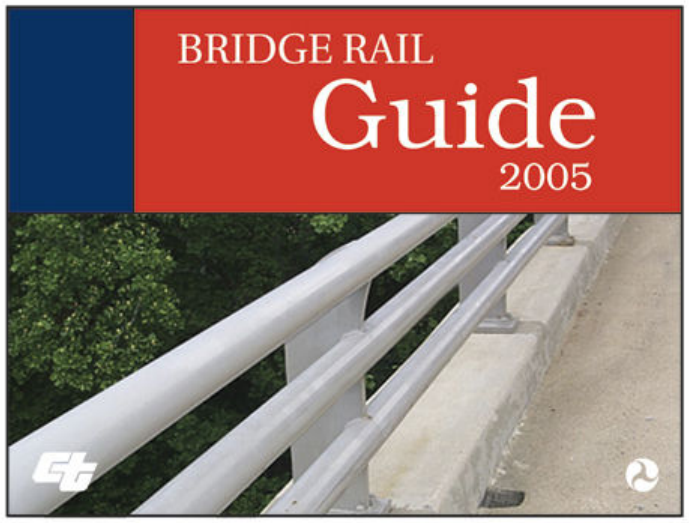
5.5 Additional Resources

- Illustrations of Barrier Options

  http://www.fhwa.dot.gov/bridge/bridgerail/

- ADOT Intermodal Transportation Division: Bridge Design Service

  http://www.azdot.gov/business/engineering-and-construction/bridge



Arizona Department of Transportation
Intermodal Transportation Division

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Assistant State Bridge Engineer - Design Service

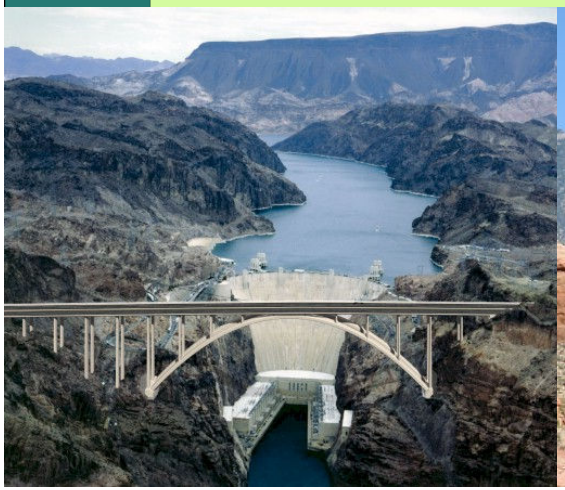
The Bridge Design Service consists of three Design Sections. These Sections are responsible for the design and development of construction documents for major highway structures on the Arizona State Highway System. The Bridge Design Sections also review and approve all structural plans for State or Federally funded highway projects submitted by consultants; maintain a publication of Standard Drawings for highway structures and compile and disseminate information on bridge design, detailing practice and structure cost. The Sections review and approve shop drawings, arrange for inspection of structural steel fabrication, and provide post-design services to the Districts on construction projects.

Each design section has been assigned the responsibility to handle all structural issues for their assigned geographic regions within the state as indicated on the **map of Arizona**. Each design section is responsible for corridor planning, local government projects, and policy issues. Each project will have a Bridge Project Engineer assigned to it who will be responsible for issues pertaining to their assigned projects. Design Sections are assigned to various technical committees of the AASHTO Subcommittee on Bridges and Structures

Highlights



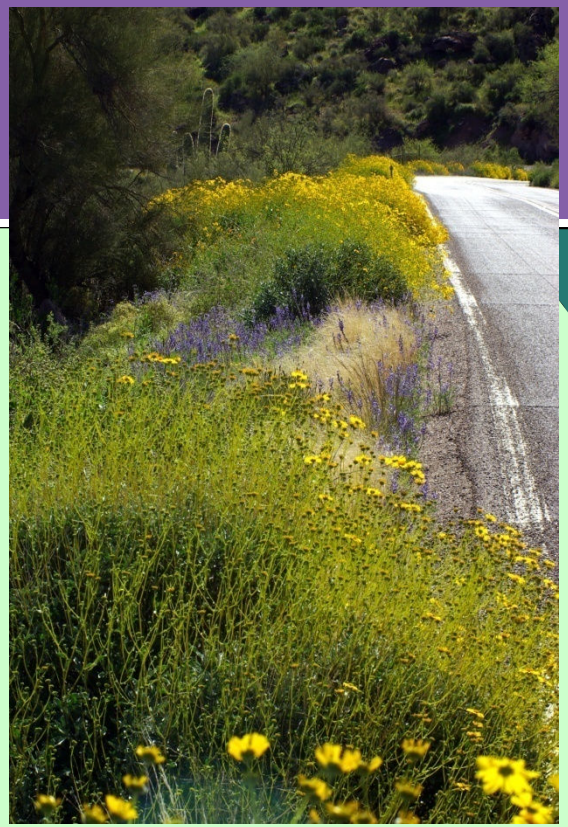
- Read Chapter 5……
  - To understand design, construction and maintenance opportunities, and concerns for bridges and box culverts.
  - To understand how bridges may impact riparian areas and mitigation measures that may be required.
  - For an overview of submittal requirements for Major Structures at Stages I-III of the ADOT Project Development Process.
  - For an overview of bridge types.



Knowledge Check: Do you……

- ✓ Understand methods to use to protect riparian areas and habitats associated with them during the design/construction/maintenance process?
- ✓ Know how to minimize the impact of bridges on riparian areas?
- ✓ Know when a 404 permit is required?
- ✓ Have a basic understanding of bridge types and their construction characteristics?
- ✓ Understand the submittal requirements of Stages I – III of the ADOT Project Development Process regarding Major Structures?
- ✓ Know Major Structure Selection Considerations?
- ✓ Understand Bridge Design Considerations?

Guidelines Appendices



- Acronyms and Abbreviations
- Glossary of Terms
- ADOT-FHWA-USFS MOU
- ADOT-FHWA-BLM MOU
- Slope Design Details
- Easement Development
- Section 106 Process on Forest Service Lands
- Typical Blasting Plan Content
- Comparison of Permit Processes for Material Sites
- Signing
- Project Reference Fact Sheet
- Native Plant Salvage & Replanting Evaluation Guidelines
- References and Photography Credits
- Additional Photos (online appendix)
- Document Revision History

Document Availability

Purchase from:
ADOT Engineering Records Section
1655 W. Jackson Room 175
Mail Drop 112F
Phoenix, Arizona 85007-3217
Telephone: 602-712-8216 or 712-7498
Fax: 602-712-3235

For availability and cost:
http://www.azdot.gov/business/ContractsandSpecifications

Download from:
http://www.azdot.gov/business/engineering-and-construction/roadway-engineering/roadway-design-standards-and-guidelines/guidelines-for-highways-on-bureau-of-land-management-and-us-forest-service-lands