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# Module 10

## Bridges

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## Section 1

### Overview

The TxDOT District Office project development staff is the primary contact point for the Local Government (LG) on bridge projects. If the LG is required to submit plans, specifications and estimates (PS&E) for TxDOT review and approval, the LG will transmit the PS&E to the TxDOT District Office staff and the District will send the PS&E to the Design Division in Austin for final review. In Austin, the Bridge Division coordinates internally with the Design Division for PS&E review and approval. For this reason, the LG will not usually work directly with the Bridge Division, unless specific technical issues need to be resolved.

The Bridge Division develops policy, standards, manuals, and guidelines for the design, construction, maintenance, and inspection of the state bridge system. The Division oversees and manages the federal bridge inspection program for approximately 49,000 on-system and off-system bridges in Texas, and the federal Highway Bridge Program (HBP) for on-system and off-system bridges in Texas. Division personnel provide TxDOT districts with in-house expertise in all aspects of bridge project development, programming, design (structural and geotechnical), PS&E review, construction, maintenance, and inspection. The [Bridge Project Development Manual](#) provides information pertaining to policies and guidelines for development of bridge projects.

The Bridge Division administers the HBP, which is funded through categories 6-ON and 6-OFF. For projects funded under the HBP, the LG must work through the TxDOT District Office to obtain approval from the Bridge Division for the scope of the project prior to further development of the layout. Once approved and the layout is developed, the LG must submit the project through the district office to the Bridge Division for preliminary layout review. The Bridge Division will verify that the guidelines have been met and determine if the entire project, or a portion of the project, is eligible for HBP funds. At this point discrepancies between the scope of the project and the guidelines for HBP funding will be identified and corrected, or obligation for additional funds will be required of the LG and the agreement amended to indicate the revised estimate. The development of the project may then proceed for submission and final PS&E review.

TxDOT inspects all publicly owned vehicular bridges a minimum of once every two years or as required by federal law. Additional inspections are required for fracture-critical structures and bridges with substructure elements that are under water. If the structure is owned by a LG, it is the responsibility of the LG to provide traffic control during bridge inspection operations. TxDOT will provide all equipment and engineering expertise necessary for performing bridge inspections.

The following sections contain information on how TxDOT expects bridge issues will be addressed by the LG and how TxDOT will monitor the LGs performance.

## Section 2

### Bridge Design

**General** Bridge design is defined as the steps used to develop a project in compliance with both geometric design criteria and construction quality standards. State and Federal regulations, regardless of the funding source state or federal, require that TxDOT manuals, procedures, standards, and guidelines be followed for all bridges designed and subsequently built on the state highway system and National Highway System (NHS). FHWA has accepted TxDOT's *Roadway Design Manual* and TxDOT's *LRFD Bridge Design Manual* as complying with federal regulations.

Bridges off the state highway system built with no state or federal funds may be designed in accordance with standards adopted by the local public agency.

#### Federal Regulation

- a. 23 CFR 625.4 – Prescribes standards, policies, and specifications to be used for all projects on the National Highway System. Section (b) lists specific references for bridges and structures.

#### State Regulation

- a. Texas Administrative Code, Title 43 – Projects must be designed in accordance with TxDOT manuals, procedures, standards, and guidelines.

#### Required Practices

- a. For all projects with state or federal funds and all projects on the state highway system (or National Highway System) regardless of funding source, the LG must:
  - i. Follow the provisions of TxDOT's *LRFD Bridge Design Manual* and *Bridge Detailing Manual*.
  - ii. If the project is on the National Highway System but off the state highway system, alternate criteria may be proposed for FHWA approval. The criteria must meet minimum AASHTO standards.
  - iii. Incorporate TxDOT Bridge Standard Drawings to the maximum extent practical.
  - iv. Use TxDOT standard specifications and material requirements, including required special provisions. The LG may request TxDOT approval of alternate specifications.
- b. For concession projects, the LG must follow the design standards and other provisions of the Project Development Agreement with TxDOT.
- c. For projects off the state highway system with no state or federal funds, the LG is encouraged to use the same practices as on TxDOT projects, but may follow LG procedures

**LG Responsibilities**

- a. For projects with state or federal funds and all projects on the state highway system (or National Highway System) regardless of funding source:
  - i. Develop bridge designs in accordance with applicable TxDOT manuals and approved bridge layout.
  - ii. Propose alternate criteria meeting AASHTO if desired for projects on the National Highway System and off the state highway system.
  - iii. Submit final bridge plans to TxDOT with the PS&E.
  - iv. Design standards and other potential requirements for concession projects may be listed in the Project Development Agreement with TxDOT.
- b. For projects with no state or federal funds off the state highway system, follow normal LG practices.

**TxDOT District Responsibilities**

- a. For all projects with state or federal funds and all projects on the state highway system regardless of funding source, the District must review the final PS&E for compliance with the approved bridge layout, LRFD Bridge Design Manual, standard drawings and specifications.
  - i. The final PS&E will be sent to the Design Division for approval.
  - ii. For projects with a Pass-through financing arrangement, the District has approval authority but may request assistance from BRG as needed.
  - iii. For concession projects, monitor project development as specified in the Project Development Agreement with TxDOT.
- b. There is no monitoring for projects off the state highway system and no state or federal funds.

## Section 3

### Bridge Layouts

**General** Bridge layouts depict proposed features of a structure and are used to obtain early approval before beginning detailed bridge design. A checklist of information to be shown on bridge layouts and samples of bridge layouts are contained in TxDOT's *Bridge Detailing Manual*.

#### Federal Regulation

- a. There are no federal statutes that require development or submission of bridge layouts.

#### State Regulation

- a. Texas Administrative Code, Title 43 – For RMA, toll and pass-through financed projects, preliminary design information must be sent to TxDOT for review and approval when the design is approximately 30% complete.

#### Required Practices

- a. For all projects with state or federal funds and all projects on the state system regardless of funding source, the LG must develop and submit preliminary bridge layouts to TxDOT for approval before detailed design (approximately 30% design completion). Bridge layouts must comply with TxDOT's *Bridge Detailing Manual and LRFD Bridge Design Manual*.
- b. For projects off the state highway system but connecting to, or crossing the state highway system, a RMA must develop and submit preliminary bridge layouts to TxDOT for approval before detailed design (approximately 30% design completion). Bridge layouts must comply with TxDOT's *Bridge Detailing Manual*.
- c. For projects off the state highway system and not crossing the state highway system and not using state or federal funds, the LG may follow their own process.

#### LG Responsibilities

- a. For projects with state or federal funds, all projects on the state highway system regardless of funding source, and all projects off the state highway system but connecting to or crossing a state highway, the LG must:
  - i. Submit bridge layouts to TxDOT for approval. Subsequent changes to the bridge layout must also be submitted for TxDOT approval.
  - ii. Submit final bridge plans to TxDOT with the PS&E.
  - iii. For concession projects, the LG must meet other conditions as specified in the Project Development Agreement with TxDOT.
- b. For projects with no state or federal funds off the state highway system, follow normal LG practices.

**TxDOT District Responsibilities**

- a. For projects requiring the LG to submit bridge layouts, review the layout for compliance with TxDOT policy. Transmit acceptable bridge layout to BRG for approval. For projects with a Pass-through Financing arrangement, the District approves the bridge layouts, but may contact BRG for assistance as needed.
  - i. For concession projects, monitor project development as specified in the Project Development Agreement with TxDOT.
- b. There is no monitoring for projects that do not require bridge layouts.

## Section 4

### Geotechnical

**General** Geotechnical studies are performed primarily for structures (i.e., bridges, retaining walls, etc.) and pavement design, and for excavation / embankment stability evaluation. TxDOT practices are contained in TxDOT's [Geotechnical Manual](#).

#### Federal Regulation

- a. There are no federal statutes for geotechnical matters.

#### State Regulation

- a. Texas Administrative Code, Title 43 – Projects must be designed in accordance with TxDOT manuals, procedures, standards, and guidelines.
- b. Texas Administrative Code, Title 43 – For RMA, toll and pass-through financed projects, preliminary design information must be sent to TxDOT for review and approval when the design is approximately 30% complete.

#### Required Practices

- a. For Design-bid-build projects with state or federal funds and all design-bid-build projects on the state highway system regardless of funding source, the LG:
  - i. Must conduct geotechnical investigations in conformance with TxDOT's *Geotechnical Manual*.
  - ii. Must furnish sound wall and retaining wall layouts to TxDOT as part of the 30% preliminary design submission.
  - iii. Must follow the design recommendations in TxDOT's *Geotechnical Manual*.
  - iv. Must adopt TxDOT Standard Specification items related to retaining walls, including submission of working drawings.
- b. For design-build projects with state or federal funds and all design-build projects on the state highway system regardless of funding source, the LG must follow the recommendations in TxDOT's *Geotechnical Manual* except as modified by agreement with TxDOT.
- c. For concession projects, the LG must follow the requirements of the technical specifications of the Project Development Agreement with TxDOT.
- d. For projects off the state highway system with no state or federal funds, the LG may follow their own practices for design of retaining walls.

#### LG Responsibilities

- a. For projects with state or federal funds and all projects on the state highway system regardless of funding source, the LG must perform geotechnical studies in compliance with TxDOT's *Geotechnical Manual*. For concession projects, the LG must comply with the technical specifications of the Project Agreement with TxDOT.

- b. For projects with no state or federal funds off the state highway system, follow normal LG practices.

**TxDOT District Responsibilities**

- a. For projects with state or federal funds and all projects on the state highway system regardless of funding source, the District must review the LG's 30% submission for compliance with TxDOT policy. Districts may request assistance from BRG as needed. For all projects, approval authority is at the District level.
  - ii. For concession projects, monitor project development as specified in the Project Development Agreement with TxDOT.
- b. There is no monitoring for projects off the state highway system with no state or federal funds.



## Section 5

### Scour

**General** Scour is the result of the erosive action of flowing water excavating and carrying away material from the bed and banks of streams. Potential scour can be a significant factor in the analysis of a stream crossing system. The design of a crossing system involves an acceptable balance between a waterway opening that will not create undue damage by backwater or suffer undue damage from scour and a crossing profile sufficiently high to provide the required traffic service. TxDOT practices are contained in TxDOT's *Geotechnical Manual*.

#### Federal Regulation

- a. 23 CFR 650, Subpart C – Sets national standards for the proper safety inspection and evaluation of all highway bridges. Some bridges are identified as scour-critical.

#### State Regulation

- a. Texas Administrative Code, Title 43 – Projects must be designed in accordance with TxDOT manuals, procedures, standards, and guidelines. For RMA, toll and pass-through financed projects, preliminary design information must be sent to TxDOT for review and approval when the design is approximately 30% complete.

#### Required Practices

- a. For projects with state or federal funds and all projects on the state highway system regardless of funding source, the LG must perform a scour analysis for all new, replacement, or widened bridges. For design-bid-build projects, the scour analysis and report must comply with TxDOT's Geotechnical and Hydraulic Design Manuals and must be sent to TxDOT as part of the preliminary bridge layout.
- b. For concession projects, the LG may use TxDOT's Geotechnical and Bridge Project Development Manuals as a reference, but does not have to comply with the manuals. However, geotechnical reports should document the assumptions, conditions, and results of the geotechnical investigation and analysis.
- c. For projects off the state highway system with no state or federal funds, the LG is encouraged to review the latest bridge inspection report and correct any scour-related issues.

#### LG Responsibilities

- a. For design-bid-build and design-build projects with state or federal funds and all projects on the state highway system regardless of funding source, the LG must perform a scour analysis in compliance with TxDOT's *Geotechnical Manual* and submit to TxDOT for approval.

- b. For concession projects, the LG must prepare geotechnical reports to support design decisions and submit to TxDOT for review and comment.
- c. For projects with no state or federal funds off the state highway system, the LG is encouraged to receive bridge inspection data from TxDOT and consider scour-related issues.

**TxDOT District Responsibilities**

- a. For all projects, furnish the latest bridge inspection data to the LG.
- b. For all projects requiring submission of a preliminary bridge layout, the District should review the analysis and report for conformance with the applicable standard and submit to the Bridge Division for approval. For projects with a pass-through financing arrangement, the District approves the layout and report, but may contact BRG for assistance as needed
- c. There is no monitoring for projects that do not require submission of a preliminary bridge layout.