

## **PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST**

The following listing of design items is intended to serve as a general pre-submittal review tool for the consultant's convenience to identify typical MoDOT review items. This list is not intended to be all-inclusive. When this checklist is used, it is requested that a copy of the "checked" list be included with the submittals to MoDOT to assist in the reduction of review time required.

Preliminary submittals shall provide information to such an extent that all relevant design issues are identified prior to the beginning of the detailed final design phase. (See the documentation in **Section VIII** for additional information regarding general requirements). Preliminary Design Bridge Submittals shall consist of a Project Summary Report and Preliminary Design Drawings.

Please note that an extended listing of design items that are to be indicated with the Final Design Submittals is provided in the "Final Design – Bridge Submittals Checklist" (**Figure IX-3**). As much clarity as possible regarding the scope of design at the Preliminary design stage is recommended; therefore, the consultant may choose to show some of the additional items listed in the Final Design checklist at the Preliminary Submittals stage. As a minimum, however, the following information should be provided:

### **THE PROJECT SUMMARY REPORT**

The Project Summary Report shall provide information pertaining to the following categories:

- a) General project information
- b) Design variance issues
- c) The Hydraulic Report
- d) The Geotechnical Investigation Report
- e) Preliminary cost estimate (encouraged at this stage – see Page 3 of this Figure - but required at this stage if the estimated bridge cost is in excess of \$500,000)

#### **General Project Information**

A brief general description of the project and summary of appropriate design issues is to be provided.

#### **Design Variance Issues**

A summary of issues for which a design variance is requested is to be provided. The Design Variance Request form should be provided as a separate attachment to allow for relay between appropriate MoDOT divisions for approval. Variances on some LPA Manual design criteria may be allowed, if provided appropriate justification in the Design Variance Request. Contact appropriate MoDOT personnel if in question.

#### **The Hydraulic Report**

For stream-crossing projects, the hydraulic portion of the summary report shall address those items critical to the hydraulic design and analysis of the proposed structure for the required design criteria as well as issues regarding the performance of the structure under design flooding conditions; such as the amount of freeboard to allow passage of drift material, frequency and depth of approach roadway overtopping, considerations of potential property damage during design conditions that might justify stricter design criteria, etc. It is intended that the information in this summary should also serve as a reference to the Local Agency for their future use. The following is a checklist of items to be provided in the Hydraulic Report at the Preliminary submittals stage:

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## Design and Analysis

- \_\_\_ The Hydraulic Summary Data Table (**Figure VIII-6**)
- \_\_\_ Summary of hydraulic design criteria used in determining the bridge or culvert opening requirements
- \_\_\_ Summary of investigations into applicable FEMA requirements
- \_\_\_ Summary of field investigations, observation of existing scouring conditions and reported historical flooding observations
- \_\_\_ Floodplain cross sections used in the hydraulic analysis
- \_\_\_ Plan view locations of the floodplain cross sections used in the hydraulic analysis
- \_\_\_ 2000 foot streambed profile (1000 feet upstream and downstream of the bridge)
- \_\_\_ The method used to determine the peak discharges
- \_\_\_ The drainage area and “valley slope”
- \_\_\_ The “streambed slope” used in the hydraulic analysis as well as the method in which the streambed slope was determined
- \_\_\_ Hydraulic analysis (Both data input and output from the computer analysis shall be provided.)
- \_\_\_ Backwater determination calculations
- \_\_\_ Scour analysis
- \_\_\_ Discussion regarding any hydraulic design criteria other than that listed in the LPA Manual which was considered in the hydraulic analysis; such as for:
  - \_\_\_ Requirements to satisfy the FEMA National Flood Insurance Program regulations
    - \_\_\_ Maximum backwater limitations
    - \_\_\_ “No-rise” in 100-year water surface elevation for “floodway” crossings
    - \_\_\_ High water elevation given in FEMA Flood Insurance Study due to backwater from nearby river (such as Missouri or Mississippi Rivers)
    - \_\_\_ Copy of FEMA FIS information used for the hydraulic design
  - \_\_\_ Other controlling hydraulic design criteria adopted by the Local Public Agency

## Certifications and Design Variances

- \_\_\_ Completion of the Certification in **Figure VIII-8** regarding investigations into potential FEMA National Flood Insurance Program regulations applicable to the project (also see **Section VIII "FEMA and Required Certifications"**)
- \_\_\_ Completion of the “No-Rise” certificate (signed and sealed) only when a FEMA-defined “**floodway**” is being crossed (or affected) by the proposed structure (see **Fig. VIII-5**)
- \_\_\_ If appropriate, a completed hydraulic design variance request with adequate justification (include as a separate attachment)

## Performance/Community Issues

- \_\_\_ A summary of the freeboard risk analysis - considerations of historical drift problems at the site and determination of appropriate freeboard
- \_\_\_ Summary of any investigation into potential property damage during design flooding conditions
- \_\_\_ Summary of any safety-related hydraulic design issues and proposed methods of mitigating those concerns
- \_\_\_ Summary of information obtained from public hearings regarding the project, particularly for projects involving a new low water crossing or low water bridge.

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## Geotechnical Investigation Report

See [Section VIII](#), “Geotechnical Investigations” for required information.

## Preliminary Cost Estimate

An estimated bridge cost in excess of \$500,000 requires that a cost estimate of various types of structures be provided with the Preliminary submittals to show appropriate economical comparisons have been considered. It is also beneficial that a preliminary cost estimate (and cost comparison of structural alternates, when appropriate) be provided with the Preliminary submittals on a general basis.

## PRELIMINARY DRAWINGS (half-size drawings, 11" x 17" to be submitted to MoDOT)

### The Title Sheet

- The federal project number
- County
- Route
- The **NEW** Structure number
- Name of Local Public Agency (if different from the County)
- Name of stream, roadway or RR being crossed
- Brief description of work to be performed (i.e.; bridge replacement or rehabilitation)
- Functional classification of the route (as will also be reported on the SI&A Sheet)
- Project location map (preferably shown on a county map) with North arrow
- The section, township and range of the project site
- Current and design year ADT (also indicate design year)
- Percentage of truck traffic (design year)
- Current and design speed limits
- Directional distribution of traffic, if appropriate
- A legend to identify abbreviations and symbols used in the drawings
- The name, address and phone number of the consultant
- The date of the drawings (should also be shown on each sheet in case of revisions)

### General Notes, Foundation and Soil Boring Data

- General notes regarding:
  - Design specifications
    - 2002** AASHTO *Standard Specifications for Highway Bridges*, 17<sup>th</sup> Edition
  - Design loading
    - Design vehicle loading
    - Seismic Performance Category and Acceleration Coefficient
  - Construction and Materials specifications
    - Missouri Standard Specifications for Highway Construction, ~~1999 (or latest edition) and current Supplemental Specification revisions~~ **2004 Edition**
- Pile data table (at Preliminary stage, show type, number and estimated length of pile)
- Design bearing table for footings with preliminary data
- Soil boring log data and elevations of adequate hard rock as obtained from the geotechnical investigation

### Plans and Profiles Sheets

## **PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST**

Drawing requirements at the Preliminary Submittals stage vary depending upon the type of structure. Likewise, some variations may also exist in the Project Summary Report requirements. A separate checklist is provided for each of the following project types.

- a) New bridge over stream, **see Fig. VIII-7-5**
- b) New culvert, **see Fig. VIII-7-6**
- c) New bridge over road, **see Fig. VIII-7-7**
- d) New bridge over railroad, **see Fig. VIII-7-8**
- e) Rehabilitated bridge, **see Fig. VIII-7-9**
- f) New low water crossing, **see Fig. VIII-7-9**
- g) Structural retaining wall, **see Fig. VIII-7-10**
- h) Pedestrian bridge, **see Fig. VIII-7-10**

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## New Bridge Over Stream

**Preliminary drawings** shall contain the following information:

- Existing and proposed roadway alignments
- Location of existing bridge and other structures
- Significant topographic features
- Existing utilities
- Stream alignment and direction of flow
- Proposed channel realignment (if needed)
- Roadway typical sections and pavement type
- Indication of the vertical datum
- Guardrail layout (and identification of end terminals, as appropriate)
- Roadway width transitions
- Superelevation transition requirements, if applicable
- Proposed roadway and bridge grades
- The fill face stations of the proposed bridge ends
- Identification of bridge "skew" to stream alignment
- Superstructure type and spans
- Bridge cross section showing:
  - C/L of roadway
  - Location of profile grade
  - Crown location and cross slopes on bridge deck
  - Girder spacing
  - Type of barrier railing system
    - Does the barrier railing system satisfy the required crash test "TL" criteria?
    - Show width, height and "TL" capacity of barrier railing
  - Clear width on bridge roadway and on sidewalk or pedestrian/bike path
  - Pedestrian railing/fencing, when applicable
- Existing ground line profile elevations at C/L of roadway and parallel to and approximately 30' offset from the centerline of roadway
- Plan view location of soil borings
- Foundation types and locations of bottom of footings and piles
- Extents of rock blanket embankment protection
- Indication of berm elevations, when applicable
- Hydraulic Summary Data Table (See **Fig. VIII-6**) shown on drawing
- Design high water elevation shown on bridge profile drawing
- Approximate low water elevation shown on bridge profile drawing (water surface elevation for 2-Year flood recommended)

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## New Culvert

**Preliminary drawings** shall contain the following information:

- \_\_\_ Existing and proposed roadway alignments
- \_\_\_ Location of existing bridge and other structures
- \_\_\_ Significant topographic features
- \_\_\_ Existing utilities
- \_\_\_ Stream alignment and direction of flow
- \_\_\_ Proposed channel realignment (if needed)
- \_\_\_ Roadway typical sections and pavement type (and driveways, if applicable)
- \_\_\_ Indication of the vertical datum
- \_\_\_ Guardrail layout (and identification of end terminals, as appropriate)
- \_\_\_ Roadway width transitions
- \_\_\_ Superelevation transition requirements, if applicable
- \_\_\_ Proposed roadway grades
- \_\_\_ The fill face stations of the proposed culvert along C/L of roadway
- \_\_\_ Identification of C/L of culvert "skew" to roadway alignment
- \_\_\_ Culvert cross section showing number and size of cell openings
- \_\_\_ Roadway cross section at culvert showing:
  - \_\_\_ C/L of roadway
  - \_\_\_ Location of profile grade
  - \_\_\_ Crown location and cross slopes on roadway
  - \_\_\_ Location of headwalls with respect to C/L of roadway
  - \_\_\_ Type of barrier railing system, when appropriate
    - \_\_\_ Are the headwalls of the culvert located beyond the clear zone?
    - \_\_\_ Does the barrier railing system (if required) satisfy the required crash test "TL" criteria?
    - \_\_\_ Show width, height and "TL" capacity of barrier railing (if applicable)
  - \_\_\_ Clear width on roadway above culvert
  - \_\_\_ Pedestrian railing/fencing, when applicable
- \_\_\_ Existing ground line profile elevations at C/L roadway and parallel to and approximately 30' offset from the centerline of roadway
- \_\_\_ Plan view location of soil borings (when appropriate)
- \_\_\_ Bottom elevation of culvert walls when keyed into rock
- \_\_\_ Extents of rock blanket embankment protection, when appropriate
- \_\_\_ Hydraulic Summary Data Table (See [Fig. VIII-6](#)) shown on drawing
- \_\_\_ Design high water elevation shown on the culvert cross section
- \_\_\_ Approximate low water elevation shown on the culvert cross section (water surface elevation for 2-Year flood recommended)
- \_\_\_ Flow line elevations at each end of the culvert shown on the culvert cross section

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## New Bridge Over Road

**Preliminary drawings** shall contain the following information:

- Existing and proposed roadway alignments
- Location of existing bridge and other structures
- Significant topographic features
- Existing utilities
- Roadway typical sections and pavement type (and driveways, if applicable)
- Indication of the vertical datum
- Guardrail layout (and identification of end terminals, as appropriate)
- Roadway width transitions
- Superelevation transition requirements, if applicable
- Proposed roadway and bridge grades
- The fill face stations of the proposed bridge ends
- Identification of bridge "skew" to roadway alignment
- Superstructure type and spans
- Bridge cross section showing:
  - C/L of roadway
  - Location of profile grade
  - Crown location and cross slopes on bridge deck
  - Girder spacing
  - Type of barrier railing system
    - Does the barrier railing system satisfy the required crash test "TL" criteria?
    - Show width, height and "TL" capacity of barrier railing
  - Clear width on bridge roadway and on sidewalk or pedestrian/bike path
  - Pedestrian railing/fencing, when applicable
- Existing ground line profile elevations at C/L roadway and parallel to and approximately 30' offset from the centerline of roadway
- Horizontal and vertical clearances
- Plan view location of soil borings
- Foundation types and locations of bottom of footings and piles
- Type of embankment protection, if needed

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## New Bridge Over Railroad

In addition to other items indicated above, the **Project Summary Report** shall also contain the following information:

- \_\_\_ Vertical and horizontal clearances requirements by the railroad company
- \_\_\_ Other design requirements established by the railroad company
- \_\_\_ **Railroad review comments regarding preliminary drawings (RR company approval of the preliminary layout is required prior to MoDOT approval of Preliminary bridge submittals)**

**Preliminary drawings** shall contain the following information:

- \_\_\_ Existing and proposed roadway alignments
- \_\_\_ Location of existing bridge and other structures
- \_\_\_ Significant topographic features
- \_\_\_ Existing utilities
- \_\_\_ Alignment of the railroad
- \_\_\_ Profile showing top of rail elevations along RR track
- \_\_\_ Roadway typical sections and pavement type (and driveways, if applicable)
- \_\_\_ Indication of the vertical datum
- \_\_\_ Guardrail layout (and identification of end terminals, as appropriate)
- \_\_\_ Roadway width transitions
- \_\_\_ Superelevation transition requirements, if applicable
- \_\_\_ Proposed roadway and bridge grades
- \_\_\_ The fill face stations of the proposed bridge ends
- \_\_\_ Identification of bridge "skew" to railroad alignment
- \_\_\_ Superstructure type and spans
- \_\_\_ Bridge cross section showing:
  - \_\_\_ C/L of roadway
  - \_\_\_ Location of profile grade
  - \_\_\_ Crown location and cross slopes on bridge deck
  - \_\_\_ Girder spacing
  - \_\_\_ Type of barrier railing system
    - \_\_\_ Does the barrier railing system satisfy the required crash test "TL" criteria?
    - \_\_\_ Show width, height and "TL" capacity of barrier railing
  - \_\_\_ Clear width on bridge roadway and on sidewalk or pedestrian/bike path
  - \_\_\_ Pedestrian railing/fencing, when applicable
- \_\_\_ Existing ground line profile elevations at C/L roadway and parallel to and approximately 30' offset from the centerline of roadway
- \_\_\_ Horizontal and vertical clearances
- \_\_\_ Plan view location of soil borings
- \_\_\_ Foundation types and locations of bottom of footings and piles
- \_\_\_ Type of embankment protection, if needed

# PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

## **Rehabilitated Bridge**

In addition to the appropriate items identified above, the **Project Summary Report** shall contain the following information (also needed when the structure is to be replaced – but eligible only for rehabilitation, or “partial”, funding):

- \_\_\_ Define all deficiencies for existing bridge
- \_\_\_ Describe locations for improvements
- \_\_\_ Describe level of improvement
- \_\_\_ Conceptual estimation of load capacity improvement
- \_\_\_ Results of the hydraulic and scour investigations
- \_\_\_ Estimated cost of improvements

**Preliminary drawings** shall contain the following information:

- \_\_\_ Bridge superstructure type
- \_\_\_ Bridge foundation repair concept, as appropriate
- \_\_\_ Type of barrier railing system (must be upgraded to current “TL” requirements)
  - \_\_\_ Show width, height and “TL” capacity of barrier railing

## **New Low Water Crossing or Low Water Bridge**

~~**Preliminary drawings** shall contain the following information:~~

- ~~\_\_\_ Existing and proposed roadway alignments~~
- ~~\_\_\_ Location of existing bridge and other structures~~
- ~~\_\_\_ Significant topographic features~~
- ~~\_\_\_ Existing utilities~~
- ~~\_\_\_ Stream alignment and direction of flow~~
- ~~\_\_\_ Proposed channel realignment (if needed)~~
- ~~\_\_\_ Roadway typical sections and pavement type (and driveways, if applicable)~~
- ~~\_\_\_ Indication of the vertical datum~~
- ~~\_\_\_ Guardrail layout (and identification of end terminals, as appropriate)~~
- ~~\_\_\_ Roadway width transitions~~
- ~~\_\_\_ Superelevation transition requirements, if applicable~~
- ~~\_\_\_ Proposed roadway and bridge grades~~
- ~~\_\_\_ The fill face stations of the proposed bridge ends~~
- ~~\_\_\_ Identification of bridge "skew" to stream alignment~~
- ~~\_\_\_ Superstructure type and spans~~
- ~~\_\_\_ Traffic signing~~
- ~~\_\_\_ Bridge cross section showing:
  - ~~\_\_\_ C/L of roadway and location of profile grade~~
  - ~~\_\_\_ Crown location and cross slopes on bridge deck~~
  - ~~\_\_\_ Girder spacing, as applicable~~
  - ~~\_\_\_ Low water bridge curb~~~~
- ~~\_\_\_ Existing ground line profile elevations parallel to and approximately 30' offset from the centerline of roadway~~
- ~~\_\_\_ Plan view location of soil borings~~
- ~~\_\_\_ Foundation types and locations of bottom of footings and piles~~
- ~~\_\_\_ Extents of rock blanket embankment protection~~
- ~~\_\_\_ Hydraulic Summary Data Table (See Fig. VIII-6) shown on drawing~~
- ~~\_\_\_ Design high water elevation shown on bridge profile drawing~~
- ~~\_\_\_ Approximate low water elevation shown on bridge profile drawing (2-Year WSEL recommended)~~

## PRELIMINARY DESIGN – BRIDGE SUBMITTALS CHECKLIST

Extensive justification is required when program funds are desired for this type of structure. Please see “Low Water Stream Crossing Design Criteria” in Section VIII of the LPA Manual regarding issues that must be addressed through the **Design Variance Request** process, as well as specific submittal information that will be required with the **Project Summary Report**.

**Preliminary drawings** shall contain the information similar to that as described on page 5 of this Checklist for “New Bridge Over Stream” (or “New Culvert”, page 6, as appropriate).

### **Structural Retaining Walls**

A **Project Summary Report** will generally not be required for structural retaining wall projects, except as appropriate to summarize unusual conditions.

**Preliminary drawings** shall contain the following information:

- \_\_\_ Location of wall on plan view
- \_\_\_ Wall cross section
- \_\_\_ Cross sections of existing/proposed groundline at regular intervals along the length of the proposed wall
- \_\_\_ Top and bottom of wall elevations
- \_\_\_ Location of soil borings
- \_\_\_ Soil boring log data
- \_\_\_ MSE walls should be considered for walls over 6’ (2m) in height

### **Pedestrian Bridges**

A **Project Summary Report** for pedestrian bridge projects shall provide a brief description of the project and include hydraulic report and geotechnical investigation. (Projects in zones subject to 100-year flooding per a FEMA Flood Insurance Study will require the same considerations as described in Section VIII of the LPA Manual for other stream crossing structures).

**Preliminary drawings** shall contain the following information.

- \_\_\_ Minimum Design Criteria based on the current edition of the following publications:
  - \_\_\_ Guide for the Development of Bicycle Facilities, by AASHTO.
  - \_\_\_ Guide Specifications for the Design of Pedestrian Bridges, By AASHTO.
- \_\_\_ Type of span bridges
  - \_\_\_ Prefabricated
    - \_\_\_ A minimum of three alternate suppliers indicated in Specifications
  - \_\_\_ Built in place
- \_\_\_ Design Loads (and Maintenance Vehicular Load, if any)
- \_\_\_ Layout of the structure
- \_\_\_ The grades across the structure
  - \_\_\_ Grades shall meet the ADA requirements for wheelchairs.
- \_\_\_ Width provisions
  - \_\_\_ Pedestrian only - For normal volumes provide 5 foot clear between the pedestrian rail or fence. For sidewalks on bridges, provide 5 foot clear between the vehicular barrier and the pedestrian rail or fence. This is normally detailed as a cantilever sidewalk with no additional girder line.

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- Pedestrian/bikeway - For normal volume, provide 10 foot clear between the bike rails. For trails on bridges, provide 10 clear between the vehicular barrier and the pedestrian rail or fence.
- Pedestrian/bikeway - Provide 10 foot vertical clearance above the riding surface of the pedestrian/bikeway structure.
- Geotechnical Investigations
  - Foundation types and locations of bottom of footings and piles
  - Soil boring log
- Critical horizontal and vertical clearances to be indicated