

## **IN-HOUSE DESIGN & CHECKING PROCEDURES**

The primary aim in both designing and checking is to produce a structure that will safely carry the anticipated loads.

The design team, consisting of the designers, checkers, and structural detailers, is responsible for developing a set of practical, clear, and concise design notes, plans, and specifications by the assigned due date with the allotted manpower.

The *BDM* provides standard details that are workable, serviceable, and reasonably economical. In addition, these details have been approved by FHWA for general use. Departure from these standards may result in delays caused by obtaining approval.

### **Design Calculations**

The design calculations shall be prepared on 8½"x11" sheets. The cover sheet for the final design notes of record shall be stamped by the designer & checker, and shall be indexed with numbered pages. The design calculations of record and check calculations shall be microfilmed and returned to the designer/checker.

A sample form for stamping the design calculations is shown on page A0.1. An electronic copy is available on the X:drive in the Bridge Design Aids folder.

### **Designer**

The designer's primary responsibilities include:

- Design concept and layout
- Structural design
- Preparing complete and legible calculations
- Producing a complete set of plans and specifications
- Resolving construction problems
- Load rating new/replacement bridges using VIRTIS in accordance with the latest version of the AASHTO *Manual for Condition Evaluation and Load and Resistance Factor Rating (LRFR) of Highway Bridges*.

The designer should advise and get concurrence from the Group Leader whenever deviating from approved office standards and practices.

The initial Virtis load rating may be based upon the details shown in the contract plans for the PS&E submittal. The final load rating shall reflect the changes made during construction (fabrication change, field adjustment, contractor change, etc.).

The designer should inform the Group Leader of any areas of the design that should receive special attention during checking and review.

The designer's responsibilities also include the following project planning activities:

- Preparing a Design Time Estimate CPM Chart
  - Identifying tasks and planning order of work
  - Preparing design criteria for inclusion in the front of the design calculations
  - Determining the number and titles of plan sheets
  - Coordinating plan sheet detailing
  - Coordinating computation of quantities
  - Preparing the Cost Estimate, Construction Schedule CPM Chart, and Special Provisions
- Any new or significantly modified Special Provisions shall be added to the X:drive SPB folder.

### **Design Checker**

The primary purpose of a design check is to insure that the designer has not, through an error in mathematics, misunderstanding of the specifications, or other cause, produced an unsafe design.

The design checker's primary responsibilities include:

- Verifying the design theory and correct interpretation of the design code
- Accuracy and completeness of the design calculations to confirm the structural adequacy of the components
- Independent check of major controlling geometry

The design calculations should not be checked until the Situation Layout check is completed and any differences are resolved with the designer. If revisions are necessary, the designer should revise the design and details before the design checker proceeds.

The design checker may perform an independent analysis by using a methodology different from the original design. The check notes shall be stamped and shall be returned to the designer who will coordinate changes.

For designs checked by an experienced engineer, the original calculation sheets may be initialed by the checker.

For special designs or those done by inexperienced designers, the Group Leader may require a more complete design check by the design checker.

### **Plan Checker**

The primary purpose of a plan check is to insure plans are constructible, consistent, clear, and complete. The checker's responsibilities should include, but not be limited to, the following items:

#### **Situation and Layout**

- Make a complete check of the geometric layout
- Check the Typical Section for conformance to the roadway width and bridge railing curb-curb requirements
- Check the girder spacing and type, and slab thickness for conformance to the Typical Section and office standards

#### **Major Component Details**

- Verify that the details are in agreement with the approved design calculations

### **Structural Detailer**

The structural detailer's primary responsibilities include:

- Preparing neat, correct, and easy to follow plan sheets conforming to current detailing standards
- Drawing details to scale
- Determining dimensions and elevations as required by the designer/checker
- Calculating quantities as directed

### **Group Leader**

The Group Leader should work closely with the designer, design checker, and structural detailer during the design and plan preparation phases to help avoid major changes late in the design process.

The Group Leader's primary responsibilities include:

- Compatibility of design and details within the project
- Determining the level of checking required by considering the complexity of the structure and the skill of the designer
- Approving the design criteria prepared by the designer before start of design
- Monitoring the design and detailing process and providing guidance and assistance as required
- Reviewing the design calculations for completeness and for agreement with office criteria and practices
- Reviewing the plans for completeness, constructibility, and agreement with office criteria and practices
- Reviewing the PS&E data for completeness and for agreement with office criteria and practices

### **Bridge Engineer**

The Bridge Engineer provides leadership and support to assure bridge design quality for structural designs.

The Bridge Engineer's primary responsibilities include:

- Reviewing and approving the Situation Layout to assure that the most cost-effective and appropriate structure type is selected for a particular bridge site.
- Facilitating resolution of major project design issues.

- Performing a structural/constructability review of the plans.
- Reviewing the project special provisions and Supplemental Specifications

**Revisions:**

June 2006	Added paragraph for Design Calculations. Added preparation of design criteria in Designer's Responsibilities. Added paragraph for duties of Bridge Engineer.
April 2008	Added load rating responsibility for Designer
July 2009	Added requirement for microfilming check calculations.