Oregon Department of Transportation

SECTION 1.4
Structural Analysis

Revisions for the current edition are highlighted yellow. Deleted text is not marked.

Past editions of the Bridge Design Manual are available through our website.

1.4 Structural Analysis

1.4.1 Live Load Distribution Factors

1.4.2 3D Modeling

1.4 Structural Analysis

See BDM 1.3.1 for Ductility, Redundancy and Operational Importance factors.

1.4.1 Live Load Distribution Factors

C1.4.1

Use the live load distribution factors and procedures provided in the *AASHTO LRFD Bridge Design Specifications* to determine load effects on bridge members for new, replacement, and strengthening bridge designs.

Higher level techniques such as finite element analysis or grillage analysis are not acceptable basis for adjustment of live load distribution factors in *LRFD 4.6.2.2.2* and *4.6.2.2.3* for design of new bridges.

Use the following information to support a design deviation for using refined method of analysis per *LRFD 4.6.3*:

The required information will aid future load rating and structural evaluation for these bridges.

- Name, version, and release date of design software used to perform refined method of analysis.

  Proposed table of live load distribution factors for controlling moment and shear at critical locations in each span. This aids in permit issuance and load rating of the bridge for all standard load rating trucks listed in *ODOT LRFR Manual Section 1.5* and report rating factors using *ODOT LRFR Section 11 Load Rating Summary Workbook* (excel).
- Apply an additional 1.10 factor to the distribution factor obtained from the refined method of analysis.

The 1.10 factor is conservatively included to determine a distribution factor using the refined method of analysis.

- Include in the calculation book a comparison of the moment and shear for an equivalent single girder line with AASHTO distribution factors vs refined method of analysis (with lower distribution factors and lower demands) for both the live load and dead load.

1.4.2 3D Modeling

Use of 3D modeling requires a design deviation. Design deviations must be approved prior to charging design hours to a 3D modeling task.

The Engineer of Record is responsible for all engineering content in the 3D model. CAD staff are responsible for the development and maintenance of the model in accordance with EOR's direction. Model content must be reviewed and approved by the EOR.

C 1.4.2

A design deviation is not meant to discourage 3D modeling but to ensure that use of 3D modeling is limited to projects that can show benefit from its use. A 3D analysis, and the associated increase in design costs, is often not warranted for the initial design of a bridge. For the analysis of Major Bridges (*BDM 1.2.3.7*) or for the investigation of a problematic bridge, a 3D analysis could be warranted.

Ideally, identify use of 3D modeling early in the project development process. Include direction in the BDWO.

See *BCM Part 400.*

The 3D model may become part of the sealed plan set, which the EOR is responsible for. The EOR is responsible for the model, even if they did not develop it.
See *BCM Part 400* for process related to plan development and appropriate referencing methods.