



# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois/62764

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Seismic Design for Local Agency Bridges

91-5

COUNTY SUPERINTENDENTS OF HIGHWAYS  
MUNICIPAL ENGINEERS  
CONSULTING ENGINEERS

Just 48 hours after the October 17th earthquake in California, Governor Thompson created a special task force to determine the readiness of Illinois should a major earthquake strike. Task force members represent almost every state agency as well as individuals from the private sector in the fields of medicine, communications and engineering. In addition, the Illinois Department of Transportation's Bureau of Bridges and Structures immediately began to evaluate their existing seismic design procedures. Recently, they decided that the 1983 AASHTO Guide Specifications for Seismic Design of Highway Bridges must be followed for all new bridges under the jurisdiction of the Department. Local agencies will be required to use the guide specifications for all projects with a design approval date of April 1, 1991 or later and a letting date on or after July 1, 1991.

The concept of designing bridges for earthquake forces has been around since 1961. The current design procedures found in Articles 3.21 thru 3.21.4 of the 1989 AASHTO Standard Specifications for Highway Bridges was introduced into the specifications in 1975. These specifications state that, "In regions where earthquakes may be anticipated, structures shall be designed to resist earthquake motions...". Since that 1975 introduction, much research and analysis has led to the 1983 guide mentioned in the above paragraph. This 1983 guide represents current state-of-the-art seismic design procedures.

Based on our discussions with the Bureau of Bridges and Structures, we understand that AASHTO will eventually adopt the 1983 guide into its standard specifications for bridges. Accordingly, new designs for local agency bridges that are not approved prior to April 1, 1991 must follow the 1983 guide. For existing bridges being rehabilitated, seismic retrofitting considerations should be made during that rehabilitation. Federal Highway Administration Report No. FHWA/RD-83/007, titled Seismic Retrofitting Guidelines for Highway Bridges, contains recommendations for retrofitting existing bridges. This publication is available as Manual PB-84201664 for \$28.95 plus \$3.00 postage through the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

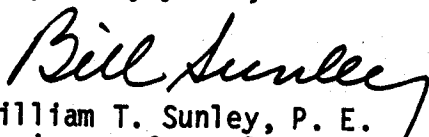
The primary goal of seismic retrofitting is to minimize the risk of partial/total bridge collapse and the loss of vital transportation routes. The decision of when and how to retrofit a bridge depends on a number of factors involving engineering judgement and economic considerations. Since not all bridges can be retrofitted simultaneously, local agencies should prioritize and rank their bridges in accordance with their need for seismic retrofitting. Special considerations should be given to those bridges that carry a large amount of traffic where in the event of collapse, the loss of life on or under the bridges would likely be high, and to those bridges that provide access to essential facilities used during emergency situations.

The Federal Highway Administration (FHWA) has recently determined that bridges in high earthquake potential areas (the southern half of the State of Illinois) not provided with earthquake protection have a major safety defect. This seismic safety defect is considered a structural deficiency eligible for correction using HBRRP funding. Only bridges designed prior to the issuance of the 1983 guide are eligible. Seismic retrofitting should be included as part of the overall bridge rehabilitation project for bridges already identified by FHWA on the current selection list of deficient bridges. Although seismic retrofitting on otherwise non-deficient bridges is eligible for funding, the cost of such retrofitting will not be included in the computation of bridge needs for purposes of future apportionments.

Applying the 1983 guidelines to local agency bridge designs will likely result in increased design and construction costs. The increased cost will be minimal for many bridges.

Preliminary earthquake analyses show that single span bridges included in the Precast Prestressed Concrete Deck Beams (PPCDB) of the Illinois DOT Standard Bridge Plans Volume I, meet the minimum requirements of the AASHTO Guide Specifications for earthquake, and no further analysis is required. "Volume 1" multiple span PPCDB bridges can be used without additional analysis only in the upper parts of the state that are within the Seismic Performance Category "A" (see attachment). For multiple span bridges located in Seismic Performance Categories B and C, the seismic compliancy should be evaluated on a project-by-project basis. This will also include the evaluation of the soil conditions and foundation treatment.

Very truly yours,



William T. Sunley, P. E.  
Engineer of Local Roads and Streets

Attachment

cc-  
District Engineers