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REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

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DEPARTMENT ORDER)
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SUBJECT: DPWH ADVISORY FOR SEISMIC DESIGN OF BRIDGES

The threat of major earthquakes occuring in the Philippines can no longer be discounted. Past and recent events have shown devastating effects of earthquakes not only on buildings but also on highways and bridges. In addition to the loss of lives, the recent Cabanatuan and Baguio earthquakes caused the closure of many highways and the collapse of many bridges which were designed based on older AASHTO Standard Specifications resulting in millions of pesos in repair and/or replacements.

Considering that highways and bridges are the main arteries in bringing relief to victims of earthquakes and other calamities, they should be serviceable at all times especially during emergencies.

In modern seismic design of bridges, the basic philosophy is for the bridge to resist small to moderate earthquakes in the elastic range without significant damage. In case of large earthquakes, a bridge may suffer damage but this should not cause collapse of all or any of its parts and such damage should readily be detectable and accessible for inspection and repair.

Therefore, to mitigate, if not prevent damage/s to bridges due to earthquakes, and for the guidance of engineering professionals and DPWH engineers particularly those undertaking the design of bridges, the DPWH is issuing this ADVISORY:

1. As minimum requirement, the design of bridges shall conform with current AASHTO Standard Specifications for Highway Bridges, Fourteenth Edition, and the Guide Specifications for Seismic Design (1989 or latest edition) or the 1991 AASHTO Standard Specifications adopting the Guide Specifications for Seismic Design (AASHTO Interim Specification-Bridge).

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2, Design Concept to be adopted shall be as follows:

a. Continuous bridges with monolithic multi-column bents have a high degree of redundancy and are the preferred type of bridge structure to resist seismic shaking. Deck discontinuities such as expansion joints and hinges should be kept to an absolute minimum. Suspended spans, brackets, rockers, etc. are not recommended.

b. Where multi-span simple span bridges are justified, decks should be continuous.

c. Restrainers (horizontal linkage device between adjacent spans) are required at all joints in accordance with the AASHTO Guide Specifications for Seismic Design and generous seat-widths at piers and abutments should be provided to prevent loss-of-span type failures.

d. Transverse reinforcement in the zones of yielding is essential to the successful performance of reinforced concrete columns during earthquakes. Transverse reinforcement serves to confine the main longitudinal reinforcement and the concrete within the core of the column, thus preventing buckling of the main reinforcement.

e. Plastic hinging should be forced to occur in ductile column regions of the pier rather than in the foundation unit. A scheme to protect the abutment piles from failure is often accomplished by designing the backwall to shear off when subjected to the design seismic lateral force that would otherwise fail the abutment piles.

f. The stiffness of the bridge as a whole should be considered in the analysis. In irregular structures, as defined previously, it is particularly important to include the soil-structure interaction.

This Advisory amends the existing DPWH Guidelines on the Seismic Design of Bridges and shall take effect immediately.

JOSE P. DE JESUS
Secretary

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