Dynamic Analysis of RAMA IX Cable-Stayed Bridge

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Recently, finite element methods are useful in areas of structural dynamic analysis. In our research, we develop a mathematical model of the RAMA IX Bridge by employing a finite element method based on 3-D analysis. The bridge experiences several load excitations leading to problems of structural integrity. Specifically, a traffic characteristic induces bridge oscillation. In theory, we can extract modal properties from real vibration data of the bridge such as frequency and mode shape by using power spectral methods. We use this method to calculate real response of bridge due to ambient load excitations. In addition, these results can be compared with ones computed from our finite element model.

Figure 1 shows a finite element model of the RAMA IX Bridge and some of its fundamental modes. This calculated dynamic behavior is based on free vibration analysis. The real vibration data from accelerometers, placed on various locations of the bridge is illustrated in Figure 2. Such data is transformed to frequency domain with respected to traffic induced. These experimental results will be used to ensure results from the bridge model and confirm the accuracy of our constructed model.

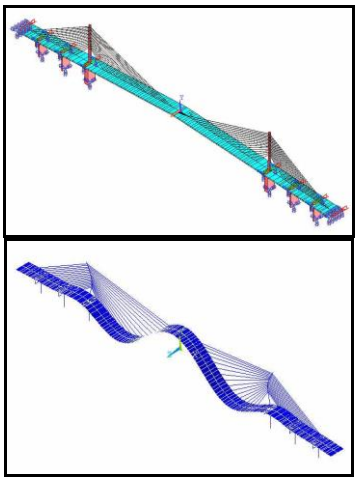

Figure 1. A 3-D Finite Element Model and the corresponding mode shape.

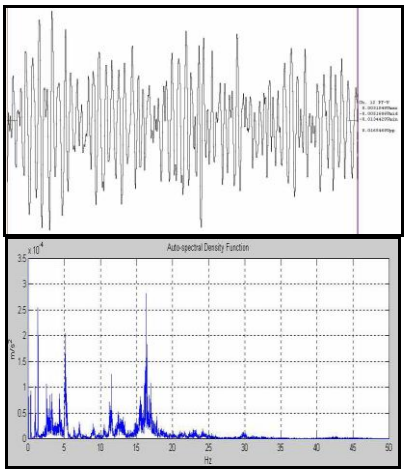

Figure 2. The bridge vibration data and its calculated frequency domain.

Our model, once fully developed, will be used to estimate stress, critical deformation and its natural frequency. This model is also employed for investigating a way to reduce bridge vibration. Several dampers were installed at main span, both of pylons top and each cable. Finally, we need to verify their effectiveness and adequacy. This research is made possible by assistance from the Expressway and Rapid Transit Authority of Thailand (E.T.A).

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