Pengaruh penambahan lebar dek jembatan pada struktur jembatan gantung sederhana : studi kasus jembatan gantung sederhana Kliwonan Butuh, Sragen

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Abstrak

One of the consequences of regional autonomy is that many regional governments are anthusiastic to improve their transportaion infrastructures, such as constructing simple suspension bridges. Direktorat Jenderal Bina Marga Depertemen Pekerjaan Umum has published standards and compiled information of suspension bridges in various areas in Indonesia. The bridge-span is generally between 20 to80 m, some are 120 m, and about 1.7 m in width of deck. Based on the standards, some regional governments want to have the simple suspension bridge, but need larger span. Kabupaten Sragen is one of the regional governments planning to construct the suspension bridge connecting Kliwonan to Butuh. However, it is important to notice that such a type of bridge is light, thin, limited in width and in length, sensitive to bending, torsion and vibrations, which are due to the asymetric life-load and wind loads.

The objective of this study is to identify the influence of the deck-width augmentation to the behaviour of 40 m to 130 m span suspension bridge by reviewing the natural frequency of structure (bending and torsion behavior) caused by asymmetric life-loads and dynamic wind loads.

Greater length of the bridge-span results in lower natural bending frequency (fb). For a bridge with more than 90 m span length, fb is significantly low (less than 0.6 Hz). Augmenting the deck-width from 1.5 m to 1.7 m and 1.9 increases the frequency ratio (torsional frequency/fb).

Greater length of the bridge-span will also result in larger vertical and horizontal bending. However, horizontal bending declines when the bridge deck is widened. As for a bridge with more than 100 m in span and 1.5 m in width, the bending value exceeds the allowable limit. The declining percentage of the horizontal bending value due to the 0.2m width augmentation ranges between 1 to 10%. Greater span result in gretaer angle of rotation. On the other hand, wider deck shows lessening angle of rotation. It is shown that augmenting the bridge width from 1.5 m to 1.7 m and 1.5 m to 1.9 m decrease the angle of rotation to 10% and 20%, respectively. The maximum torsion response due to dynamic wind load increases in conjunction to the bridge-span augmentation. However, augmenting the bridge deck from 1.7 m to 1.9 m reduces the maximum torsion response from 1.5% to 13.4%.

For simple suspension bridge, it is suggested to limit the span length to 100 m, and deck-width augmentation from 1.5 m to 1.9 m at maximum. Greater span requires steel stiffening reinforcement on the bridge deck.