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Dynamic investigations of the Mohaka River bridge

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One finds seldom in the technical journals descriptions of in situ dynamic investigations of bridges. Often, results of similar measurements remain in official files. Thus, the Authors' publication is welcome.

35. Concerning damping, expressed as a percentage of critical, measurements that I have made on several reinforced and prestressed concrete bridges have shown that the damping in actual structures is also dependent on the magnitude of the displacements; i.e., it does increase with increasing deflexion.

36. Concerning vehicle–bridge interaction, I have observed that, for a specific bridge, all crossings by the same loaded vehicle moving in the same direction and at the same speed do not yield the same value for the deflexion dynamic impact factor. This means that at least one parameter has not been recorded. A loaded vehicle is a dynamic system, made of a frame suspended on tyres and a load (mass) which rests on the frame through elastic springs with high damping. A missing parameter is the relative position of the suspended mass with respect to the frame (phase angle) as the vehicle enters the bridge. Would the Authors indicate which parameters they measured to establish the dynamic characteristics of the suspension, as noted in §8?

37. I have also found that the magnitude of the impact factor is influenced by the smoothness (evenness) of the transition between road and bridge: any unevenness causes further oscillations of the suspended mass with respect to the frame. This corroborates the findings (§30) of the Authors.

Dr Shepherd, Mr Brown and Dr Wood

We accept that damping is usually amplitude-dependent within the normal range of movements of civil engineering structures. However, when measurements are made at displacement levels appropriate to the response under normal service conditions the results are clearly representative.

39. It is agreed that the impact response is very sensitive to the initial conditions of motion of the load vehicle. Insufficient evidence was available to establish the multi-degree of freedom motions of the load vehicles as they approached or crossed the bridge in the tests described. In the case of one unloaded logging truck an attempt was made to establish its dynamic characteristics by a series of forced vibration tests undertaken with the dynamic exciter secured to the vehicle

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chassis. This investigation was not entirely successful because of control problems experienced with the shaker which restricted the lowest forcing frequency to about 4 Hz, and also because the excitation forces developed were too small to produce significant movement in the vehicle springs. Most of the vehicle body movement generated by the shaker resulted from tyre flexibility. Bounce and pitch frequencies measured were approximately 3·5 Hz and 4·3 Hz respectively.