Discussion

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Contribution by G. Tedbury

Valerio *et al.* (2011) make reference to the strength of the beams (for example to 'significant enhancement to the beam capacity' in the second conclusion), whereas as far as one can tell there is no increase in beam strength at all. The structure is made stronger by the lateral prestressing, but that is dependent on two things: first there has to be load transfer from the loaded beam to adjacent beams and second the adjacent beams must be capable of taking that load. If all the beams in a deck were loaded, then as this contributor understands it, there would be no increase in the strength of the structure; if the loaded beam were an edge beam then the increase in carrying capacity would be much less. It seems these conditions would not normally occur (although there would normally be more than one beam loaded), but nevertheless it would be better to refer to the strength of the structure rather than the beams in order to avoid misunderstanding.

Authors' reply

The contributor is correct in pointing out that the lateral prestressing increases the strength of the structure as a whole, by permitting redistribution of the load from the loaded beam to the adjacent ones through friction. However, the assessed capacity of a structure is generally defined in terms of the ultimate capacity of its critical element, which here is the directly loaded (or most loaded) beam; therefore, the terminology in the paper is used to facilitate comparison between the ultimate capacity that would be assessed, respectively, with and without taking into account the beneficial effect of the lateral prestressing from the point of view of the critical element of the structure.

It seems plausible that, if the critical beam is an edge beam, the increase in capacity owing to lateral prestressing would be less than for an internal beam, because the transfer of lateral load would be possible on one side face only. Although this situation has not been tested and cannot be fully quantified, it would be possible to take it into account in the analytical model by assuming a reduced frictional restraint for the edge beams. If all beams were loaded uniformly to failure there would be no beneficial effect from the lateral prestressing, but this condition does not occur in practice, which is also pointed

out by the contributor. A discrete number of internal beams laterally confined and in similar conditions to those tested would be the situation normally encountered in practice.

REFERENCE

Valerio P, Ibell TJ and Darby AP (2011) Shear assessment of prestressed concrete bridges. *Proceedings of the Institution of Civil Engineers – Bridge Engineering* **164**(4): 195–210, <http://dx.doi.org/10.1680/bren.2011.164.4.195>.

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