The common diaphragms of the Foce Moesa Viaduct in Switzerland

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The Author has highlighted some intricate problems which cause other designers to defer from this type of construction. I am not sure that these problems can be argued away so easily and I should like to raise some further issues.

23. With reference to § 11 of the Paper, the tops of the columns are expected to move in the longitudinal direction to relieve the horizontal displacements of the ends of the cross-beams. If the bearings are effectively pinned bearings ('fixed point support' is referred to in § 4) how are the individual columns able to move in relation to one another when it appears that at the same time they are tied longitudinally to other columns by the deck itself? The position of the column tops will surely be determined only by the thermal movements occurring in the deck.

24. In § 9 the Author warns against problems due to the 0·4 m clear space between the diaphragm slices. This clear space results in the beams having an eccentricity about the supports and this leads to vertical displacements of the beam ends under differential rotation of the boxes; this is studied in § 10. Were there other problems created by this spacing? Could not the spacing have been reduced in order to limit the vertical displacements?

25. The skew of the cross-beams at the Foce Moesa causes a further serious problem which is not accounted for in the Paper. Under differential rotation of the boxes, considering the viaduct in elevation, the 'slices' on one side of the bearings' centre line will tend to lengthen while those on the other side will tend to shorten. This action will upset substantially the calculated working flexural stresses in the common diaphragms and will surely affect the design.

Dr Lampert

I should like to reassure Mr Soubry about the solution that was chosen. The fixed point supports were Neotopf bearings with the usual slip. Indeed, taking into account the loading arrangement which is critical for maximum rotation at the bearings, the two bridges will move with respect to each other, pulling all six columns with them. Thus, the other common diaphragm will also be affected by this movement, in theory. For the loading cases occurring in practice it is certainly correct that the position of the column tops is governed by thermal movements.

27. More critical would be the second objection raised by Mr Soubry—that a rotation at the bearings produces tension on one side and compression on the other side of the bearings' centre line. I might have misunderstood Mr Soubry but in my opinion both slices on either side of the bearing will tend to shorten or to lengthen, depending on the sign of the differential rotation (see Fig. 6), which is a decisive difference. In this case the column top can move out of the bridge centre line and reduce these stresses. Furthermore, the loading case producing maximum rotation at the bearings does not occur simultaneously with the one producing the bending moments of § 5(*a*). Nevertheless, I do not guarantee any calculated working stresses in these diaphragms which will be upset by many other factors as well. I am satisfied that the safety against collapse is guaranteed and that measures are taken to limit or to avoid cracks occurring at most extreme loading arrangements (prestressing of the diaphragms).

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28. With reference to the spacing of the slices, a spacing of 6 cm only was considered first. However, there were two reasons for enlarging the spacing to 40 cm. First, one bridge was constructed first together with half of the diaphragm, which was tentatively anchored to the footing. The length required for splicing the other half of the diaphragm had to be reduced by means of steel bars, welded in the transverse direction. In order that welding could be done properly the greater spacing was chosen. Second, the greater spacing allowed a permanent inspection of all faces of the slices. By Spring 1973 this bridge had been open to traffic for two years and no damage of any kind has been observed yet.