LETTER TO THE EDITOR:

Dear Sir,

Re: "Hollow Core Floors – A Regulator's Perspective", a paper presented at the NZSEE Conference, Palmerston North, March 2007.

A week prior to the conference I sent comments to the first named writer of the paper noted above. I questioned some of the comments, conclusions and implications which might be drawn from the paper. I had hoped the presenter would address the points that I had raised, or at least be prepared to answer questions on these points immediately following the presentation. Unfortunately there was no time was available for detailed questions.

I, and a number of other engineers who have been involved with either research on floor diaphragms, or in assessing research on floors containing precast units, are concerned that this paper could mislead structural engineers assessing the safety of buildings containing hollow core units. The points made below should be noted by those concerned with the safety of such buildings.

1. It was indicated in the paper that buildings designed to comply with the 1982 Loadings Standard would sustain lower drift levels than those designed to the 1992 Standard and hence could be expected to have superior performance than buildings designer to the later Standard. This is not correct as the analysis on which it was based (see reference 7 in the paper) did not allow for differences in the different standards in the way in which;
   - The effective stiffness of reinforced concrete sections was assessed (For beams the effective stiffness in 1976 was taken as $0.75I_g$, in 1984 and 1995 the corresponding values were $0.5I_g$ and $0.35I_g$ respectively.);
   - The way in which P-delta actions were included in analysis;
   - Changes in the way inter-storey drifts were assessed;
   - Differences in strength reduction factors.

   If rational allowance is made for all these changes it is found that buildings designed to comply with the minimum requirements of the 1992 Standard will in general sustain significantly smaller drifts in the ultimate limit state than the corresponding structures designed to earlier Standards.

2 There are a number of comments in the paper on the applicability of the test results to floors containing 200 mm hollow core units and to structures in which the hollow core units spanned only one bay of an external frame. (In the floor tests at both Canterbury and Auckland the precast units spanned 2 bays.) From a study of experimental results it may be noted that;
   - Limited test results indicate that 200 mm hollow core units behave in a similar manner to 300 mm units and they are subject to the same brittle failure modes;
   - Failure of the hollow core units in the tests occurred as a result of rotation between the unit and supporting structure and elongation of beams. Whether the units span past an intermediate column in an external frame or not makes no difference to the critical actions causing failure.
   - In the first test at Canterbury the intermediate column was not tied into the floor, as required in the 1995 Standard. This provision was not required in previous standards. The implication in the paper that the failure to add this reinforcement contributed to the premature failure is not correct. In multi-storey buildings this reinforcement is essential to prevent separation of the column from the floors over several storeys leading to a buckling failure. However, in the test the columns had a height of only one storey and hence there was no possibility of buckling failure. Furthermore an examination of the observed failure mechanism shows that the addition of such reinforcement would not have improved the performance of the hollow core and it is likely to have decreased its performance.

I hope that in future conferences a session will be scheduled in which presenters will be required to answer written questions on the content of their papers.

Yours faithfully
Richard Fenwick
(A retired engineer who has had some involvement with research into precast concrete floors)