Comments by the author of the introductory report

Comments by the Author of the Introductory Report
Remarques de l'auteur du rapport introductif
Bemerkungen des Verfassers des Einführungsberichtes

LEO FINZI
Professor at the Polytechnic University
of Milan, F.A.S.C.E.
Italy

The ten Reports that have been presented concern four major items on the subject of the Interaction of different Structural Elements:

a - Bracing systems for tall buildings
b - Bracing effects of sheeting in factory buildings
c - Interaction between main and secondary structural members in bridges
d - Soil-structure interaction.

A lot of experimental reseach has been done on items -a- and -b- and this seems to underline the difficulty of a purely theoretical approach. Nevertheless a useful body of concrete experience for the designer has been accumulated.

Yura and Lu have shown that even in buildings using diagonal bracing the amount of total shear carried by frames can rise to 30% of the total. On the other hand under unsymmetrical vertical loads or in the final elastic-plastic phase the bracing may have to help in situations not allowed for by ordinary calculation methods.

The theoretical study by Talwar and Cohn attempts to reach a synthesis by defining those critical loads of the structural system which automatically bring about a limitation, in the maximum drift, the P-Δ effect and the "price for tallness" of the frames. To me it seems better suited to delineating rather than solving the problems, but no less interesting for that.

Wakabayashi, Kawamura, Band and Yamada have shown that the design philosophy of the bracing system in tall buildings must be quite different for, on the one hand, wind effects or the stability of the building as a whole, and on the other hand the seismic effects.

High tensile steel diagonals allow large deflections in the elastic range, leading to a better structural response and a reduced cyclic plasticity.

The report by Faltus, which stresses the importance of shear effects in interaction problems, is interesting because it shows how the same basic approach can be used for both a tall building and an arched bridge.

As a whole I feel that the Reports concerning item -a- demon-

strate that interaction between diagonal bracings and frames is a question of considerable importance presenting both favourable and unfavourable aspects that are not easy to evaluate. It might therefore seem that a clearer vision of structural behaviour would be obtained by avoiding rigid frames and relying only on diagonal bracings or on bracing walls. Besides, this makes it easier to take advantage of the flexural interaction between beams and sheeting.

The interaction between portal frames and sheeting is discussed in the Report of Bryan and Mohsin, a very exhaustive and interesting study. To have the sheeting act as a structural element is not new (see for instance the Behlen roofs) but the advantage of taking into account the sheeting as horizontal bracing appears to be very profitable, as a 25% reduction on the weight of structural steel can be achieved. An economical analysis of the cost for extra rivets would nevertheless be welcome. Vogel has worked on a problem in a more limited area of the same field: the interaction between purlins and corrugated sheets in factory roofs, and he described interesting experimental work on this subject.

Only two Reports refer to item -c-, by Sakai and Okumura and by Fukumoto and Kuto, though a lot has been written about it in the past. Moreover the above mentioned papers seem to me to verge on the limits of the field covered by Theme II b as practically they have more to do with the stiffening of a single bridge beam through appropriate secondary elements than to a real interaction between elements acting in parallel.

M. Soretz and S. Soretz, as a conclusion, gave us a survey of the problems that arise on the topic of soil-structure interaction.

In the free discussion which is about to start we will hear further contributions and ideas: D.R. Green on the influence of diaphragms in the behaviour of box girders with deformable cross section; A. Holmberg on the design of steel buildings taking account of the sheeting; J. Pechar on a unconventional bridge in Czechoslovakia; H. Mathieu on the interaction between soil and portal frames of underground passages.

Quite soon moreover a notable amount of information on structural interaction in bracing systems for tall buildings is certainly going to appear in the Monographs edited by the I.A.B.S.E.-A.S.C.E. Joint venture.