**Zeitschrift:** IABSE congress report = Rapport du congrès AIPC = IVBH Kongressbericht

**Band:** 8 (1968)

**Artikel:** Comments by the author of the introductory report

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**DOI:** https://doi.org/10.5169/seals-8861

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**Remarques de l'auteur du rapport introductif**
**Bemerkungen des Verfassers des Einführungsberichtes**
**Comments by the author of the introductory report**

A. PAUW

The application of lightweight aggregate concrete in the construction of such structures as No. 1 Shell Plaza in Houston, Texas is evidence that lightweight concrete has "come of age" as an acceptable and, for many applications, superior structural material. The successful use of lightweight concrete in the columns of the above structure as described in the contribution by D. W. Pfeifer and E. Hognestad is especially noteworthy. While the success in this application was due, in part, to extreme care in the proportioning and placing of a specially developed sanded lightweight aggregate mix, this report demonstrates that the creep and shrinkage characteristics of lightweight aggregate concrete columns differ little from those of columns containing normal weight concrete. In both cases, elastic and time-dependent column shortening are governed primarily by the reinforcing steel percentage. Two factors contribute to this result, namely the shrinkage and creep characteristics of the concrete.

Shrinkage causes an internal stress balance which increases the compressive stress in the reinforcement and reduces the net compressive stress in the concrete. Creep causes an internal redistribution of stress which also increases the stress in the reinforcement and decreases the stress in the concrete. Because lightweight aggregate concrete has a lower elastic modulus, the instantaneous or elastic stress in the reinforcement of a lightweight concrete column (with equal reinforcement and subjected to the same load) will be considerably higher and the concrete stress correspondingly lower, than the corresponding stresses in a normal weight concrete column. As a result, for highly reinforced columns, while the instantaneous or elastic strain is larger for the lightweight concrete column, the time-dependent strain may actually be smaller, with the total elastic and time-dependent strain being only slightly greater than that for the normal weight concrete column. Both instantaneous and time-dependent strains are markedly affected by the age of the concrete at time of loading and hence these deformations are significantly smaller if the column is loaded incrementally over a prolonged period of time.

The contribution of Dr. Shu-t'ien Li opens up the possibility of even greater reduction of elastic and time-dependent strains through the application of gap grading. The advantages to be gained by gap grading are probably economically more justifiable for lightweight aggregate because aggregate gradation and shape can be more readily controlled in a manufactured aggregate. The potential advantages of gap grading have also been investigated by Dr. F. Leonhardt.

The contribution of Prof. Y. Tachibana confirms the fact that lightweight aggregate concrete can be substituted for normal weight concrete in composite concrete slab and steel stringer construction with no appreciable change in strength or behavior.

His test results show that in push-out specimens stud shear connectors actually develop a somewhat greater useful capacity (based on residual slip) in lightweight concrete and that the ultimate load capacity of composite beams is essentially the same for either type concrete.

While the load deflection of the lightweight concrete composite beams, in the elastic range, was about ten to fifteen percent greater, the natural frequencies obtained in the dynamic tests were slightly higher. This result indicates that the reduction in structural stiffness was more than compensated for by the reduced weight.

These contributions confirm the fact that with proper design and field control the primary requirements of structural safety and behavior can be assured. The comparative cost analysis in the contribution by Mr. A. A. Yee further demonstrates that considerable overall economy can be achieved in spite of a considerable premium on the lightweight aggregate concrete.