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Autor: Okamura, H.

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SUMMARY OF DISCUSSION - SESSION 4

Due to shortage of time there were only five discussions - from G. Mehlhorn, A.M.A. Da Fonesca, T. Kawai and E. Anderheggen. The main point of discussion was on whether the current FEM can be applied to the analysis of nonlinear behaviour of reinforced concrete. G. Mehlhorn pointed out that there were many examples which had shown the applicability of FEM to these problems.

T. Kawai explained his unique idea which is described below in detail.

1. Slip is the essential source of plastic deformation

The influence of slip may be neglected if it is uniformly distributed. However, it usually appears discontinuously. Even in this case current plastic theory requires the continuity of displacement. Therefore, it should be said that the current FEM, which is based on continuum mechanics, cannot follow the non-linear behaviour of solid materials until failure.

2. Constitutive equations should be essentially investigated

It is quite easy to point out the examples which indicate that the elasto-plastic deformation field obtained from the mathematical theory of plasticity does not coincide with that obtained from the experimental result.

It may be extremely difficult to draw failure criteria from the stress strain relationship obtained from the test of materials since this represents the average. The true stress strain relationships or failure criteria can be obtained from simulative analysis based on a model such as Kawai's Model.

3. Existence of so-called Large Scale Yielding is questionable

As the plastic deformation increases, slips inevitably appear discreetly, and the rigid body movement along the slip lines becomes distinguished while the strain itself does not change substantially.

H. OKAMURA

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