

tropical storms, particularly with regard to the intensity of distribution and the intensity within the storm. This study would take about five years.

It was proposed to undertake a survey to identify the problems most suitable for research on bridges in developing countries. This applied particularly to submersible bridges and the conditions under which they could be used. This might be coupled with the question of ferries and whether, in certain circumstances, a ferry might be more economical than a bridge.

In soils and earthworks the work was concerned primarily with the study of landform patterns and the development of systematic methods of developing landforms and attaching engineering information to them.

Research into construction methods and maintenance was concerned with the effort to reconcile the designer with the structure and to get specifications which could be applied easily in the field. A great deal of work had been completed in East Africa and there was also a team in Malaysia.

Road system studies related to road planning, and research in this would be undertaken in collaboration with teams in the United Kingdom. The Laboratory was concerned also to determine public transport needs in cities overseas.

The Chairman thanked all present for attending and taking part in the discussions. It was agreed that these had been most useful and that the informal character of the Conference should be continued in future. The Conference closed with votes of thanks to the Chairman, and to the Institution of Civil Engineers for permitting the Conference to take place in its building and for the facilities made available.

CORRESPONDENCE

The Secretary,
The Institution of Civil Engineers
Dear Sir,

Computers in civil engineering

I have read with great interest Dr Heyman's letter on the use of computers in civil engineering (News, October 1966, p. N15). He makes what I feel must be an extremely important point at this time when the reputation of our profession is endangered by a series of unfortunate accidents.

Dr Heyman suggests that there is a growing tendency for the engineer to overlook the idealizations and assumptions on which all methods of design are based, and to assume that any particular problem is solved once the mathematical expressions have been formulated.

As it will always be necessary to adopt certain idealizations in order to gain an insight into most engineering problems, I would like to suggest for discussion the following, which I feel would provide the engineer with a greater insight into the behaviour of complex structures, and which would possibly lead to less (and better) idealizations or to greater understanding of the limitations of existing idealizations.

Would it not be possible to build into all future complex structures, sections whose behaviour under loading could be scientifically observed at all times during the working life of the structure? If this information could be collected and correlated by some central research body then I feel that the design engineer would be in a far better position to predict the behaviour of a complex structure and realize the limitations of his design assumptions.

Yours faithfully,

Paul A. O'Leary, Sc.M., B.A.
(Graduate).

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Dr Heyman writes: Mr O'Leary makes a request of considerable importance. The Institution has sought in the past for such information, and the response has always been disappointing. Apart from the Conference sponsored by the Institution in 1965 on the *Correlation between calculated and observed stresses and displacements in structures* (Preliminary Volume 1955, Final Volume 1966), the references to actual site measurements of the behaviour of structures are very few. I should be pleased to learn of the measurements that are being taken on any of our recent major engineering works, for example, the Forth Road Bridge or the Severn Bridge.

The Secretary,
The Institution of Civil Engineers
Dear Sir,

Flow through partly-lined conduits

We should like to bring to the notice of the profession some research into flow through partly-lined conduits which has just started at this college with the support of the Civil Engineering Research Association. This work forms part of a long-term investigation into the hydraulic design of unlined and partly-lined rock tunnels, undertaken because we believe that, in view of the often preponderant cost of tunnels in water projects, any refinement that can be made to their design will be of considerable economic importance. By the research in hand we hope to determine the effective friction of conduits which have a full-length longitudinal strip smoother than the rest of the circumference. We anticipate that the results will find application in the design of rock tunnels with lined inverts or pipes which have been scraped in service.

Owing to our as yet incomplete understanding of the effect of random surface roughness on flow, it is important to assess laboratory results in the light of data obtained from site tests on completed tunnels (unlined and partly lined). The tests we have in mind would include measurements of flow and head over as wide a range as possible; it would also be necessary to have details of the cross-sectional size and shape of the excavated tunnel. We think that this data is not difficult to collect up to the time works are commissioned, but would be hard, if not impossible, to obtain later on. As such