

Concrete Research

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Editorial comment

THE MAGAZINE OF CONCRETE RESEARCH was originally designed primarily as a service to British research workers and the British concrete industry but research is seldom, if ever, purely national in its application and engineers everywhere obtain some benefit from research done abroad. The Magazine has a small but significant and growing circulation outside Britain and it is hoped that the service it can give will be of value to concrete research wherever it is done.

From time to time, it is hoped to include in the Magazine of Concrete Research accounts of work being done abroad, and to describe the general organization as well as the chief centres of concrete research in various countries.

For several reasons, the most important of which is perhaps one of language, American research has more influence in Britain than that of other countries.

Members of the Cement and Concrete Association

have recently had an opportunity of seeing at first hand some of the research laboratories in the United States of America, of enjoying their hospitality and of studying the general background of thought and experience without a knowledge of which a full appreciation of the research done cannot be made.

The United States of America produces and consumes more Portland cement than any other country in the world and its great resources for research into cement and concrete are used lavishly in the service of improving the technique of building construction.

The principal agents responsible for research on concrete are the Federal and State Governments, the cement and concrete industry and the universities. There is no Government research station concerned solely with building materials, as in Britain and some other European countries, but research on a large scale is carried out by the specialized Government Departments responsible for certain fields of construction. The nearest approach to an establishment equivalent to the British Department of Scientific and Industrial Research is the National Bureau of Standards at Washington, D.C., which undertakes research both on its own initiative and in co-operation with industry. The work of the Bureau covers a wide range of subjects, concrete research being only a part of its functions. Generally speaking, its own research on concrete is of a fundamental nature and, in addition, the Portland Cement Association Fellowship, which operates as a separate unit within the Bureau, does fundamental research on the composition of Portland cement.

Research on concrete is undertaken also by the Bureau of Public Roads, the Bureau of Reclamation and the U.S. Army Engineer Corps, the last two being concerned chiefly with methods of constructing dams and other works required for irrigation and river control.

The Bureau of Reclamation laboratories at Denver have resources for concrete research on a scale unequalled

anywhere in the world. Current American practice in the construction of large concrete dams includes the use of coarse aggregates up to six or nine inches in diameter. These large particles are not used as "plums", as was sometimes done in the past in heavy construction in this country, but as integral parts of the aggregate, the grading of which has to be suitably adjusted. In order to test concrete made with aggregates of this size, it is necessary to use very large specimens and, consequently, very large testing machines. The main testing machine at the Bureau of Reclamation is capable of crushing a concrete cylinder up to three feet in diameter with a maximum load of five million pounds. It will also accommodate a column about thirty feet high. The normal test specimen is eighteen inches in diameter and three feet high, but larger ones are tested as required.

Another notable machine at Denver is a tri-axial compression machine for testing rock or concrete specimens in the form of cylinders six inches in diameter by twelve inches high. This machine operates in the same way as the small tri-axial machines used for soil testing, but it can apply a vertical force of one hundred tons and a circumferential pressure of 150,000 lb per sq.in.

In addition to the Federal Government, many State Governments sponsor research, often in co-operation with the universities, but sometimes independently, particularly if required in connexion with highway construction where full-scale experiments are so valuable. The research on roads is co-ordinated and encouraged by the Highway Research Board—a Federal Government sponsored organization forming a part of the National Academy of Sciences.

Many American universities also do research on concrete, usually on a small scale compared with that

done by the Government and by industry but large enough to give valuable results. The work done at Yale, Illinois, Berkeley (California), Kansas, Maryland and Purdue is particularly noteworthy.

Naturally the American cement-making industry undertakes the largest part of the research for the concrete industry, but useful work is also done by the aggregate producers and the ready-mixed concrete makers. The Portland Cement Association's new laboratories at Skokie, near Chicago, which were officially opened during 1950, are the most complete and up-to-date establishment for cement and concrete research in the U.S.A. and promise to be one of the most important research centres in the world. The laboratories are equipped for fundamental research on the structure and composition of cement both before and after it has combined with water, and special rooms are available for research on concrete under a wide range of temperatures and degrees of humidity.

In a country as large as the United States of America and with as many independent research organizations, it is not surprising that some overlapping of work occurs, but the overlapping that does occur seems to be intentional rather than accidental. The co-ordinating organizations, societies such as the American Concrete Institute, and the American habit of holding conventions, keep most research workers in close contact with each other even though they work 3,000 miles apart. Apparently the overlapping arises mainly through local patriotism and a desire to make sure that local conditions are adequately covered by the results of investigation. It might also be that research workers are not unaffected by fashion or the desire to be expert on the problem most in the news.