

## ICE PRESSURE ON DAMS

A SYMPOSIUM ON ICE PRESSURE. Privately circulated publication by the American Society of Civil Engineers, Power Division, Joint Committee on Dams, Sub-Committee on ice pressure against dams. Ottawa, Canada, August 1950. 51 pages, illustr., diagsr. (Copy in the library of the Society.)

THE publication under review was presented in summary form to a joint meeting of the American Society of Civil Engineers and the Engineering Institute of Canada held in Toronto in July 1950, with a view to subsequent publication by the American Society of Civil Engineers. The many problems of ice pressure in connection with both static and flowing water raise questions of physics as well as mechanics and, as Mr. R. F. Legget, of the National Research Council of Canada, has pointed out in this Journal,\* are not unrelated to glacial problems. It is possible, therefore, that glaciologists may be of assistance in their solution.

The Symposium is introduced by a clear and concise report from the sub-committee, which sets out the present ascertained state of knowledge, design practice and research trends in five countries. A valuable bibliography is given of eighteen publications on the subject, which is followed by three original contributions. The report stresses that, despite general appeals for information, the response was disappointing, probably indicating the dearth of factual data on the subject.

Of the five countries mentioned in the report (Switzerland, Norway, Sweden, Canada, U.S.A.) only the last three appear to have carried out serious research work. Indigenous ice problems are not sufficiently serious in the British Isles and Western Europe generally to stimulate intensive research—but one would have expected some information to have been forthcoming from the French and Italian Alps zone. Russia is not mentioned and presumably present international relations do not make it easy for research information (if such exists) to be made available.

Dr. Bertil Löfquist, the State Power Board, Sweden, describes his own laboratory (freezing chamber) experiments for the Swedish Power Board. He draws attention to certain experimental difficulties which affect proper correlation between analytical, experimental and field investigations. Among these are the formation of tension cracks in the ice during temperature drop with edge restraint and the subsequent refreezing of water in the cracks before further temperature rise occurs, which affect the accuracy of experimental results. The experiments suggest that maximum thrust might occur in ice sheets of half a metre thickness at somewhere about  $-4^{\circ}$  C. temperature.†

Mr. A. D. Hogg, Hydro-Electric Power Commission, Ontario, gives a straightforward and well-illustrated description of practical field investigations being carried out by the Hydro-Electric Power Commission of Ontario at Des Joachims and Pine Portage dams. The "equipment" comprises a completely free panel of the upstream face of the dam, about 10 ft. square, which is suspended so as to be capable of freely responding to ice expansion. Behind the free panel will be situated load compensation (*i.e.* deflection cancelling) cells which apparently keep the panel hard against the ice and record the force necessary to maintain a rigidity equal to that of the rest of the concrete dam face. Details of these cells are said to be still in the design stage.

Mr. G. E. Monfore, Bureau of Reclamation, U.S.A., describes field investigations carried out at Eleven Mile Canon Reservoir for the U.S. Bureau of Reclamation in an effort to correlate

\* See *Journal of Glaciology*, Vol. 1, No. 4, 1948, p. 202.

† Another paper by Dr. Löfquist has now been received in the Society's Library—Lifting force and bearing capacity of an ice sheet. *Canada. National Research Council*, Technical Translation TT-64, 1951, 27 pages. This is a translation from Dr. Löfquist's original paper—Lyftkraft och bärförmåga hos ett istäcke, *Teknisk Tidskrift*, No. 25, Stockholm 1944.—*Ed.*

analytical and experimental results. The scope of the work includes the development and perfection of pressure-recording gauges and measurement of solar radiation and absorption. An interesting result obtained was that strong wind gusts caused rapid variation in recorded pressures.

It is interesting to note from the report that the apparent practice in Switzerland is to draw down the reservoirs in early winter to ensure that ice (if not broken up) can only exert thrust at predetermined and non-critical levels. This seemingly simple expedient, while not helpful in advancing the study of ice thrusts, might suggest a further field of investigation, namely, means of preventing or reducing the effects of ice thrust, rather than providing for large thrusts at the upper critical levels. One wonders whether there might also be scope for the development of elastic or flexible panels, similar to the flexible fenders provided to reduce impact from berthing ships. It is noted that in Norway apparently considerable reductions in thrust have been assumed where dams have sloping upstream faces.

The interesting results which have so far been obtained will doubtless be even more valuable when the present investigations have proceeded further.

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ASSEMBLÉE GÉNÉRALE D'OSLO 19-28 août 1948. *Union géodésique et géophysique internationale; Association internationale d'Hydrologie scientifique*, Tome 2, Procès-verbaux des séances; travaux de la Commission de la Neige et des Glaciers, 1950, 403 pages. Louvain: Imprimerie Ceuterick.

VOLUME 1 of this series publishes the papers read at Oslo in 1948 before the Commissions of Potamology and Limnology. Volume 3 contains those presented to the Commission of Subterranean Waters. In the volume under review, Volume 2, there are fifty-four papers on the several glaciological subjects sponsored by the then International Commission on Snow and Glaciers, now called the International Commission on Snow and Ice.

The list is substantially that which was reported in this Journal (Vol. 1, No. 5, 1949, p. 290-92) but there are a few papers missing from those read at Oslo. There are also a few now included which were not read there and which have probably been submitted since.

The collection and editing of the great bulk of material must have been a formidable task and great credit must be given to the Editors for producing this valuable record of contemporary work—even though the, no doubt unavoidable, delay in publication to some extent reduces the value.

The papers are conveniently classified under the following headings: Icebergs, physical characteristics of the snow cover, the glacier grain, glacier measurements (and fluctuations), glacier research, ice on lakes and rivers. These groupings differ to some extent from the questions set for the meeting and this is good. The reviewer strongly disagrees with the setting of questions. It is undesirable to try to concentrate glaciological research into set channels; it is far better to leave it to the inspiration and enterprise of the individual glaciologist who will shape his programme according to the year to year developments of the science. Valuable contributions to the Conferences might be lost if research workers adhered rigidly to the set questions.

Discussion of the published papers are few and fragmentary. This is not surprising. Very few real discussions took place at Oslo owing to the large number of papers presented and the short time available for their consideration—a state of affairs which it is hoped will be rectified at Brussels this year.

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