BOOK REVIEW

Nordic Concrete Research

Reviewed by Bryant Mather, Chief, Structures Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS 39180-0631.

REFERENCE: *Nordic Concrete Research*, Publication 3, The Nordic Concrete Federation, Oslo, Norway, 1984, 210 pp.

Publication 2 in this series, issued in 1983, containing 15 papers, was reviewed in *Cement, Concretes, and Aggregates*, Vol. 7, No. 1, Summer 1985, p. 53 by G. M. Idorn. He expressed surprises as to why some of the papers were not offered to wider circulating periodicals and whether such an eclectic book would prove worthwhile. He noted as a flaw that none of the active research on curing concrete that is going on in several countries is reported and suggested that a future volume include estimates of return on investment in research.

The present volume includes 11 papers: 4 from Finland, 4 from Sweden, and 3 from Norway. From the photographs of the authors I expect that in many cases this publication provides a forum for younger, less internationally well-known researchers, to present some of their work to an international audience.

The flaw Dr. Idorn found in Publication 2 is not present here since 3 of the 11 papers (Emborg and Bernander on "Temperature Stresses in Early Age Concrete Due to Hydration," Jokela on "Behavior and Design of Concrete Structures under Thermal Gradients," and Pitkanen on "Prediction of Temperature Fields of Massive Concrete Structures During Hardening") deal with the aspect of curing that concerns maintenance of a favorable temperature in concrete during its early stages.

Åke Grudemo, the father of electron microscopy as applied to cement, reviews "The Crystal Structure of Cement Hydration" and presents "A New Gel Structure Model." This should be reprinted, perhaps in somewhat revised form in another medium for wider circulation and to permit publication of discussion (this Journal or *Cement and Concrete Research* are candidates).

The three structural design papers (Danewid on fatigue tests of full scale two-span beams; Hoff et al on high-strength lightweight aggregate beams and columns; and Leira and Langen on design of a floating bridge) are outside the sphere of this reviewer's competence but appear to deal with matters meriting attention.

Two papers on construction practice (Hoflund et al on subsea repair of concrete and Maage on underwater concrete) deal with real problems, the former will be useful to the work now being done in the reviewer's laboratory on cleaning concrete surfaces in preparation for repair, and the latter relates to other work also underway here on underwater concrete placement.

Finally, Kievekas on concrete durability in arctic offshore structures and Virtanen on effects on resistance of concrete to freezing and thawing of the use of fly ash, silica fume, and ground granulated iron blast-furnace slag are important contributions. Kievekas believes that there is something called "frost-salt attack" that includes a chemical component other than steel corrosion. This reviewer is not convinced that such a menace really exists. However when he speaks of what is needed for resistance to chemical attack he only lists sulfate-resisting cement. He concludes that in his concretes of low permeability, achieved by the use of high-range water reducing admixtures, one needs more and better entrained air-void systems than previously stipulated for less severe environments. I suspect the reduction of permeability, if followed by development of critical saturation, will, by itself, create a need for lower bubble spacing factors at a given thermal gradient on cooling. Virtanen confirms the findings of others especially in North America that use of pozzolans like fly ash or silica fume or nonportland hydraulic cements like ground granulated iron blast-furnace slag do not, per se, affect frost resistance of concrete. If the parameters of the air-void system of the paste are kept where they should be and comparisons are made at equal structural states, the effects will be trivial.