

PUBLICATION NO. 3

NORDIC CONCRETE RESEARCH

EDITED BY
THE NORDIC CONCRETE FEDERATION
CONCRETE ASSOCIATION OF: DENMARK
FINLAND
ICELAND
NORWAY
SWEDEN

OSLO DECEMBER 1984

ISSN 0800-6377

Trykt hos Moberg & Helli A/S, Oslo

This publication may not be reproduced, stored in a retrieval system or transmitted in any form or by any means: electronic, electrostatic, magnetic tape, mechanical, photo-copying, recording or otherwise, without permission from the publisher or the author.

CONTENTS

	<u>Page:</u>
1. Robert Danewid AN INVESTIGATION OF REINFORCED CONCRETE BEAMS IN TWO SPANS SUBJECTED TO FATIGUE LOAD	7
2. Mats Emborg, /Stig Bernander TEMPERATURE STRESSES IN EARLY AGE CONCRETE DUE TO HYDRATION	28
3. Åke Grudemo THE CRYSTAL STRUCTURES OF CEMENT HYDRATION - A REVIEW AND A NEW GEL STRUCTURE MODEL	49
4. Asle Hoff/Karl Høiseth/Thor Arne Håverstad TESTING OF HIGH STRENGTH LIGHTWEIGHT AGGREGATE CONCRETE ELEMENTS	63
5. Pelle Hoflund/Åke Olofsson/Ralejs Tepfers SUBSEA REPAIR OF CONCRETE AND THE EFFECT OF FOULING	92
6. Jukka Jokela BEHAVIOUR AND DESIGN OF CONCRETE STRUCTURES UNDER THERMAL GRADIENTS	100
7. Lauri Kievekäs DURABILITY OF CONCRETE IN ARCTIC OFFSHORE STRUCTURES	129
8. Bernt J. Leira/Ivar Langen ON PROBABILISTIC DESIGN OF A CONCRETE FLOATING BRIDGE	140
9. Magne Maage UNDERWATER CONCRETE	167
10. Pertti Pitkänen PREDICTION OF TEMPERATURE, FIELDS OF MASSIVE CONCRETE STRUCTURES DURING HARDENING	183
11. Jorma Virtanen MINERAL BY-PRODUCTS AND FREEZE-THAW RESISTANCE OF CONCRETE	191
ADDRESSES	209

P R E F A C E

Extensive concrete research is carried out in the Nordic countries. The Research Committee within the Nordic Concrete Federation was created in the middle of the fifties and has been working since.

The aim of the Nordic Concrete Research Committee is to establish and improve contact between concrete scientists and between institutions concerned in the field of concrete research in the five Nordic countries. Activities include the arranging of small symposia and seminars and of triennial research congresses.

This book is the third annual book published by the Research Committee of the Nordic Concrete Federation.

The 11 papers selected for publishing this year are a cross-section of Nordic concrete research projects which are in progress in the Nordic countries. We hope that this book will present Nordic concrete research to the international community and contribute to a better contact and to improve cooperation between concrete scientists in the Nordic countries and the rest of the world.

The Research Committee takes this opportunity to thank the Norwegian Concrete Association who organized the printing and distribution of the book.

The volum is edited by the NORDIC CONCRETE RESEARCH COMMITTEE

DENMARK:

Lic.techn. Erik Skettrup
Afdelingen for bærende konstruktioner
Danmarks Tekniske Højskole
DK-2800 LYNGBY

Mr. Lars Hjort
Aalborg Portland
Cement- og Betonglaboratoriet
Rørdalsvej 44, Postboks 165
DK-9100 AALBORG

FINLAND:

Tekn.lic. Heikki Kaitila
Finska Betongföreningen
Mikaelsgatan 18 B 12
SF-00100 HELSINGFORS 10

Professor Aska Sarja
Statens tekniska forskningscentral
Betonimiehenkuja 5
SF-02150 ESBO 15

ICELAND:

Tekn.dr. Rikhardur Kristjansson
Línuhönnun hf
Armula 11
IS-105 REYKJAVIK

NORWAY:

Dr.ing. Finn Fluge
NOTEBY Norsk Teknisk Byggekontroll A/S
Postboks 2715 - St.Hanshaugen
N-OSLO 1

Dr.techn. Jens Jacob Jensen
SINTEF avd. FCB
Norges tekniske høyskole
N-7034 Trondheim - NTH

SWEDEN:

Professor Arne Hillerborg
Byggnadsmateriallära
Box 118
S-22100 LUND

Professor Krister Cederwall
Avd. for betongbyggnad
Chalmers Tekniska Högskola
S-41296 GÖTEBORG

Mr. Knut Berg
NORDIC CONCRETE FEDERATION
Kronprinsensgt. 17
N-OSLO 2