

PUBLICATION NO. 8

NORDIC CONCRETE RESEARCH

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

**PUBLISHER: NORSKE BETONGFORENING
KRONPRINSENGATE 17
0251 OSLO 2**

OSLO DECEMBER 1989

ISSN 0800-6377
Printed by 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.

C O N T E N T S

	Page:
1. Xu Aimin	9
WATER DESORPTION ISOTHERMS OF CEMENT MORTAR WITH FLY ASH	
2. M.W. Braestrup	24
PUNCHING OF REINFORCED CONCRETE SLABS: CODE RULES, PLASTIC ANALYSIS, TEST RESULTS	
3. Krister Cederwall/An Li	49
THE APPLICATION OF THE NODAL FORCE CONCEPT IN YIELD-LINE ANALYSIS. An illustative example.	
4. S. Chatterji/A.D. Jensen	56
EFFLORESCENCE AND BREAKDOWN OF BUILDING MATERIALS	
5. Marianne Grauers	62
SHEAR FORCE CAPACITY OF THREE-LAYERED COMPOSITE CONCRETE SLABS	
6. Tor Arne Hammer/Jan Havdahl	72
THE DURABILITY OF CONCRETE ELEMENTS EXPOSED IN THE TIDAL ZONE	
7. Per Freiesleben Hansen/Ole Mejlhede Jensen	89
SELFDESICCATION SHRINKAGE IN LOW POROSITY CEMENT-SILICA MORTAR	
8. Seppo Huovinen	103
ABRASION OF CONCRETE BY ICE IN ARCTIC SEA STRUCTURES	
9. U-M. Jumppanen	116
EFFECT OF STRENGTH ON FIRE BEHAVIOUR OF CONCRETE	
10. H. Justnes/E. Aassved Hansen/H.E. Karganrood/ J.R. Smith-Nilsen	128
LATEX MODIFIED MORTAR REINFORCED WITH PLASTIC FIBRES - SYNERGISTICAL EFFECTS WITH RESPECT TO FRACTURE MECHANICAL PROPERTIES.	
11. M.T. Leivo	142
BEHAVIOUR OF CONCRETE IN SEVERE FROST ACTION	

12.	An Li/Krister Cederwall	159
	THE THEORETICAL AND EXPERIMENTAL STUDY OF COMPOSITE SLABS	
13.	S.Rosseland	176
	TESTING OF FIBREOPTIC CRACK-DETECTORS IN CONCRETE	
14.	Henrik Stang	186
	AUTOMATIC MICROCRACK CHARACTERIZATION IN FRC-MATERIALS.	
15.	Erik Thorenfeldt/Andrezej Tomaszewicz	199
	THIN STEEL MANTLE AS LATERAL CONFINEMENT IN REINFORCED CONCRETE COLUMNS, TEST RESULTS	
16.	Erikki Vesikari	209
	A STATISTICAL APPROACH TO THE SERVICE LIFE DESIGN OF CONCRETE STRUCTURES	
17.	DISCUSSION AND REPLY TO PAPERS, NCR 1988	221
18.	NORDIC CONCRETE RESEARCH PUBLICATIONS NO. 1 - 7	229
19.	ADDRESSES	241

PREFACE

The Research Committee of the Nordic Concrete Federation presents Volume 8 of the "Nordic Concrete Research", NCR 1989. It contains selected papers on concrete research carried out or concluded during 1989 in the five Nordic countries: Denmark, Finland, Iceland, Norway and Sweden.

The Research Committee has as one of its tasks to increase the professional contact between the concrete researchers in the Nordic countries and encourage contact between them and concrete scientists throughout the world.

By arranging large Nordic Research meetings every third year and frequently arranging small thematic seminars, the contact between the Nordic countries is well established. We hope that the edition of NCR may act as a worldwide link between concrete scientists in the Nordic countries and the rest of the world.

This publication invites scientists, also outside the Nordic countries, to an open discussion on the papers presented. This discussion and the authors' replies will be presented in the next issue of NCR. Discussions relating to papers in this issue of NCR have to be sent to the Chairman of the Research Committee by June 1st 1990.

Trondheim, November 1989

Jens Jacob Jensen
Chairman of the Research Committee

By the end of 1989, the editorial committee has the following members:

- Danmark:** Direktør Palle Nepper-Christensen Lic.techn. Mikael Bræstrup
Aalborg Portland Rambøll & Hannemann A/S
Cement og Betonlaboratoriet Teknikerbyen 38
Rørdalsvej 44 DK.2830 VIRUM
Postboks 165 DENMARK
DK-9100 Aalborg
DENMARK
- Finland:** Direktør Klaus Söderlund Dipl.ing. Heikki Kukko
Finska Betongföreningen Statens tekniska forsknings-
Mikonkatu 18 B 12 central VTT
SF-00100 HELSINKI Betong- och silikattekniska
FINLAND laboratoriet
Kemistvägen 3
PB 26
SF-02151 ESBO
FINLAND
- Island:** Direktør Hákon Olafsson
Rannsóknadstofnun Byggingaridarins
IS-Keldnaholt
ICELAND
- Norge:** Dr.techn. Jens Jacob Jensen Professor Erik Sellevold PH.D
SINTEF avd 65 - FCB Institutt for Betongkonstruk-
Forskningsinstituttet for Cement sjoner, Norges Tekniske Høg-
og Betong skole
N-7034 Trondheim 7034 TRONDHEIM
NORWAY NORWAY
- Sverige:** Professor Krister Cederwall Professor Lars Olof Nilsson
Avd for betongbyggnad Avdelingen for Bygnings-
Chalmers Tekniska Högskola materiallära
S-412 96 Göteborg Chalmers Tekniska Högskola
SWEDEN S-412 96 CÖTEBORG
SWEDEN

