

NORDIC CONCRETE RESEARCH

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

**PUBLISHER: NORSK BETONGFORENING
POSTBOKS 2312, SOLLI
0201 OSLO**

OSLO, JUNE 2001

ISBN 82-91341-44-3

Printed by Helli Grafisk AS, Oslo

CONTENTS

1.	Bager, Dirch, H. – Geiker, Mette R. – Jensen, Rune M.	1
	RHEOLOGY OF SELF-COMPACTING MORTARS, INFLUENCE OF PARTICLE GRADING	
2.	Hansen, Lars Pilegaard – Heshe, Gert	17
	STATIC, FIRE AND FATIGUE TESTS OF ULTRA HIGH STRENGTH FIBRE REINFORCED CONCRETE AND RIBBED BARS	
3.	Juvas, Klaus – Käppi, Aulis – Salo, Kai – Nordenswan, Erik	39
	THE EFFECTS OF CEMENT VARIATIONS ON CONCRETE WORKABILITY	
4.	Nagy, Agnes	47
	PARAMETER STUDY OF THERMAL CRACKING IN HPC AND NPC STRUCTURES	
5.	Löfgren, Ingemar – Gylltoft, Kent	61
	IN-SITU CAST CONCRETE BUILDING	
6.	Smeplass, Sverre – Mørtzell, Ernst	83
	THE APPLICABILITY OF THE PARTICLE MATRIX MODELL TO SELF-COMPACTING CONCRETE (SCC)	

NORDIC CONCRETE RESEARCH

NCR homepage: <http://www.itn.is/ncr/>

Nordic Concrete Research (NCR) is a publication of The Nordic Concrete Federation presenting research and practical experience in the field of concrete technology, both from structural and material perspective. The Nordic Concrete Federation is a collaboration organization of the concrete associations in the five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden.

The internet version is free of charge, and a subscription on the booklet costs 200 NOK, (~22 USD) two issues a year, postage not included. You can order a single issue of NCR (NOK 150) postage not included, or subscribe on the booklet form of the publication on the NCR web page, or by contacting Norwegian Concrete Association, P.O. box 2312 Solli, 0201 OSLO, Norway. E-mail: lise.lystad@nif.no

Two issues a year

The aim is to publish two issues a year.

The NCR web pages contain among others all the abstracts of the publications from 1986 and search machine to find papers containing particular word or words. A page where one can easily order an issue, find information about the federation, the research committee, calendar of events etc. In the creation of the NCR web pages, emphasis has been made to make them as simple as possible to shorten the access and downloading time. We thus follow the modern trend of electronic communication of knowledge via the Internet, as it is the future to come. Though one feels for the time being that it isn't the same as the good old booklet.

New issue notified by e-mail

You will be able to add your e-mail address on a mailing list at the NCR web-site, and when a new issue of the NCR is publicized, you will automatically receive a notification by e-mail. You will also have the possibility to remove your e-mail address from the mailing list.

Download the papers

If you are interested in a particular paper, you can download the papers in PDF file format and reveal them by use of Adobe® Acrobat® Reader (can also be downloaded free from the NCR web page). This will be available only for papers published in 1998 and later. You will also be able to view abstracts from previous issues of the NCR, but if you are interested in one of those articles, you will have to buy the complete issue by filling in an order form on one of the web pages. Price of a single issue, NOK 150, postage not included.

In addition, the web-site will contain information about the Nordic Concrete Federation, calendar of activities like seminars and conferences in the Nordic countries in the field of concrete technology.

We hope that the Internet version of the NCR will find many readers throughout the world and stimulate the establishment of personal contacts and co-operation between concrete researchers in our part and the rest of the world.

Dr. Dirch H. Bager
Chairman of the Research Committee

Research Committee

Dr. Dirch H. Bager, Chairman for the Research Committee

Dr. Mette Glavind, Chairman for the organizing committee for the XVIII Research Symposium in Copenhagen 2002.

- | | | |
|-------------------|---|---|
| Denmark | Dr. Dirch H. Bager
Research and Development Centre (RDC)
Aalborg Portland A/S
Rørdalsvej 44
P.O. Box 165
DK-9100 Aalborg, Denmark
Tel: +45 99 33 77 12
Fax: +45 98 16 47 41
E-mail: db@aalborg-portland.dk | Dr. Mette Glavind
Concrete Centre,
Danish Technological Institute
Gregersensvej
P-O. Box 141
DK-2630 Taastrup, Denmark
Tel: + 45 72 20 22 20
Fax: + 45 72 20 23 73
E-mail: mette.glavind@teknologisk.dk |
| Finland | Mr. Klaus Söderlund
Concrete Association of Finland
Unionkatu 14 PL 11
FIN-00130 Helsinki, Finland
Tel: +358 9 6962 3620
Fax: +358 9 65 11 45
E-mail: klaus.soderlund@betoni.com | Dr. Klaus Juvas
Addtek Research & Development
Box 23
FIN - 21601 Pargas, Finland
Tel: +358 204 55 6424
Fax: +358 204 55 6254
E-mail: Klaus.Juvas@addtek.com |
| Iceland | Dr. Gisli Gudmundsson
The Icelandic Building Research Institute
Rb - Keldnaholt
IS - 112 Reykjavik
Tel: +354 570 7322
Fax: +354 570 7311
E-mail: gudmundsson.g@rabygg.is | Mr. Gylfi Sigurdsson
c/o Almenna Verkfræðistofan
Fellsmula 26
IS - 108 Reykjavik
Tel: +354 588 8100
Fax: +354 588 0284
E-mail: Gylfi@almenna.is |
| Norway | Dr. Kjell Skjeggerud
Norcem, FoU Department
P.O.Box 38
N-3950 Brevik, Norway
Tel.: +47 35 57 20 00
Fax: +47 35 57 04 00
E-mail:
kjell.skjeggerud@norcem.scancem.com | Dr. Terje Kanstad
Department of Structural Engineering
NTNU.
N-7491 Trondheim, Norway
Tel: +47 73 59 45 19
Fax: +47 73 59 47 01
E-mail: terje.kanstad@bygg.ntnu.no |
| Sweden | Professor Johan Silfwerbrand
Dept. of Structural Engineering,
Royal Institute of Technology
SE-100 44 Stockholm, Sweden
Tel: +46 8 7907946
Fax: +46 8 21 69 49
E-mail: johan.silfwerbrand@struct.kth.se | Prof. Per-Erik Petersson
SP Swedish National Testing and
Research Institute
Building Technology
P.O. Box 857
SE-501 15 Borås
Tel: +46 33 16 52 17
Fax: +46 33 13 45 16
E-mail: pererik.petersson@sp.se |
| Publishing | Mr. Knut R. Berg
Norsk Betongforening
Postboks 2312 Solli
N-0201 Oslo 2, Norway
Tel: +47 22 94 75 00
Fax: +47 22 94 75 01
E-mail: knut.berg@nif.no | |

Preface

Nordic Concrete Research serves as a window to the rest of the world for concrete research in the Nordic countries. Today, 267 thoroughly reviewed papers presenting the concrete research in the Nordic countries have been published in the publication series since 1982. The present volume of Nordic Concrete Research – no. 26 in the series - contains 6 new contributions from actual ongoing concrete research in the Nordic Countries.

The Research Committee of the Nordic Concrete Federation invites Nordic concrete scientists to publish their research in Nordic Concrete Research. In particular we will focus on ongoing Ph.D. projects in order to widespread information on actual high-level concrete research as well as to stimulate inter-Nordic co-operation between young concrete scientists.

It is the aim for the Research Committee to ensure a quick review and publishing procedure in order to be able to publish the papers while the results are still new. This should make the publication valuable for publishing research results, especially for Ph.D. students.

The main task of the Research Committee is to encourage concrete research in the Nordic countries by stimulating inter-Nordic co-operation. Therefore the main activities for the Research Committee is publishing of the publication Nordic Concrete Research, arranging the large Nordic Concrete Research Symposia every third year and supporting organisers of Nordic thematic workshops. These activities further help to provide young scientists with Nordic connections on both a professional and private level, thus stimulating continuation of the inter-Nordic research co-operation. The next Concrete Research Symposia will take place in Helsingør, some 30 km north of Copenhagen, on the 12 - 14 of July 2002. We look forward to welcome **you** to this event. For this occasion a special volume of Nordic Concrete Research will be published, containing extended abstracts of far the most of the actual ongoing projects on concrete research in the Nordic Countries.

For the last decade attendance of young scientist at the research symposia have been on a surprisingly low level, in spite of the potential benefit obtainable from participating. The Nordic Concrete Federation has realised the bad economic situation at the Technical Universities in the Nordic countries. Therefore it has been decided to reduce the participation fee for Ph.D. students from the Nordic countries. Details can be found on the NCR homepage www.itn.is/ncr/ and in the announcements.

Aalborg, June 2001.

Dirch H. Bager
Chairman of the Research Committee