

PUBLICATION NO. 21. 1/98

# 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, AUGUST 1998

ISBN 82-91341-14-1

Printed by Helli Grafisk AS, Oslo

## CONTENTS

1. Hallgren, Mikael – Kinnunen, Sven – Nylander, Birgitta p. 1  
PUNCHING SHEAR TESTS ON COLUMN FOOTINGS
2. Hassanzadeh, Ghassem – Sundquist, Håkan p. 23  
STRENGTHENING OF BRIDGE SLABS ON COLUMNS
3. Holand, Ivar – Lindgård, Jan – Jacobsen, Stefan p. 35  
CONCRETE FIELD EXPOSURE STATIONS IN NORWAY
4. Justnes, Harald p. 48  
A REVIEW OF CHLORIDE BINDING IN  
CEMENTITIOUS SYSTEMS
5. Lindgård, Jan – Hammer, Tor Arne p. 64  
FIRE RESISTANCE OF STRUCTURAL  
LIGHTWEIGHT AGGREGATE CONCRETE  
A LITERATURE SURVEY WITH FOCUS ON SPALLING
6. Kukko, Heikki – Paroll, Hemming p. 78  
NORDIC CONCRETE FEDERATION MINI-SEMINAR  
“MOISTURE MEASUREMENT IN CONCRETE  
CONSTRUCTIONS EXPOSED TO TEMPERATURE AND  
MOISTURE VARIATIONS”
7. Meyer, Find p. 86  
AIR VOID DISTRIBUTION IN CONCRETE FOR THE  
GREAT BELT LINK, WEST BRIDGE
8. Paroll, Hemming – Nykänen, Esa p. 103  
MEASUREMENT OF RELATIVE HUMIDITY AND  
TEMPERATURE IN A NEW CONCRETE BRIDGE VS.  
LABORATORY SAMPLES
9. Persson, Bertil p. 120  
SELF-DESICCATION AND ITS IMPORTANCE IN  
CONCRETE TECHNOLOGY
10. Vares, Sirje – Häkkinen, Tarja p. 130  
ENVIRONMENTAL BURDENS OF CONCRETE AND  
CONCRETE PRODUCTS
11. Wallevik, Jon E. – Wallevik, Olafur H. p. 144  
EFFECT OF ECCENTRICITY AND TILTING IN COAXIAL  
CYLINDER VISCOMETERS WHEN TESTING CEMENT PASTE

**NORDISK BETONFORBUND  
FORSKNINGSKOMITÉ  
Contact Information**

**The Nordic Concrete Federation  
Research Committee**

**DENMARK**

**Prof. Rune Brincker**  
tel: +45 98 15 85 22  
fax: +45 98 14 82 43  
Dept. of Building Technology and  
Structural Engineering  
Aalborg University  
Sohngårdsholmsvej 5  
DK-9000 AALBORG

**Prof. Henrik Stang**  
tel: +45 45 88 35 11  
(direkt: +45 45 25 17 35)  
fax: +45 45 88 32 82  
Dept. of Structural Eng. And Materials  
Building 118  
Technical University of Denmark  
DK 2800 LYNGBY  
E-mail: henrik.stang@abk.dtu.dk

**FINLAND**

**Mr. Klaus Söderlund**  
tel: +358 9 65 14 11  
fax: +358 9 65 11 45  
Concrete Association of Finland  
Mikonkatu 18 B 12  
FIN-00100 HELSINKI

**Mr. Heikki Kukko**  
tel: +358 94 56 69 00  
fax: +358 94 56 70 04  
VTT Byggnadsteknik  
P.B. 1805  
FIN-02044 VTT, FINLAND

**ICELAND**

**Mr. Ólafur Wallevik**  
tel: +354 567 60 00  
fax: +354 567 88 11  
The Icelandic Technical Research Institute  
Keldnaholti  
IS-112 REYKJAVÍK

**Mr. Leó Jónsson**  
tel: +354 565 14 44  
fax: +354 565 24 73  
Pípugerðin hf  
Suðurhraun 2  
IS-210 GARÐABÆR  
E-mail: steypais@mmedia.is

**NORWAY**

**Mr. Tor Arne Hammer**  
tel: +47 73 59 52 24  
fax: +47 73 59 71 36  
SINTEF Civil and Environmental Eng  
Div. Cement and Concrete  
N-7034 TRONDHEIM  
E-mail: Tor.hammer@civil.sintef.no

**Dr. ing. Erik Åldstedt**  
tel: +47 67 58 00 58  
fax: +47 67 53 38 71  
Multiconsult AS  
P.O.Box 40  
N-1324 LYSAKER

**SWEDEN**

**Dr. Åke Skarendahl**  
tel: +46 8 696 11 00  
fax: +46 8 24 31 37  
Swedish Cement and Concrete Research  
Institute  
S-100 44 STOCKHOLM  
E-mail: ake.skarendahl@cbi.se

**Prof. Lennart Elfgren**  
tel: +46 920 91 360  
fax: 46 920 91 913  
Div. of Structural Engineering  
Luleå University of Technology  
S-971 87 LULELÅ  
E-mail: Lennart.Elfgren@ce.luth.se

**PUBLISHING**

**Mr. Knut R. Berg**  
tel: +47 22 94 75 00  
fax: +47 22 94 75 02  
Norsk Betongforening  
Postboks 2312 Solli

N-0201 OSLO 2

## PREFACE

Dear fellow concrete technologists. The Nordic Concrete Federation has the pleasure of introducing a new chapter in the history of the federation. We are now using new communication technologies, the World Wide Web (www). The Nordic Concrete Federation publication, The Nordic Concrete Research (NCR) will from now on, also be published on the net. The web-site address is: <http://www.itn.is/ncr/>

You will be able to add your E-mail address on a mailing list at the NRC web-site, and when a new issue of the NCR is publicised, 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.

On the NCR web-site you will be able to view paper abstract by title and/or search by key words. If you are interested in a particular paper, you can download it to your own computer in Microsoft® Word™ format (This will be available for papers published 1998 and there after). You will also be able to view abstracts from previous issues of the NCR and if you are interested in the article, you can order it by filling out an order form on one of the web pages and request that issue by E-mail.

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

We hope that this edition of NCR together with the electronic version of the publication may help to bring together concrete scientists in the Nordic countries and those in the rest of the world.

Reykjavik, June 1998

Olafur H. Wallevik

Chairman of the Research Committee