NORDIC Ph.D. PROJECTS

In the Nordic countries extensive research is conducted within the fields of material technology, durability, execution and design.

Over the past few years, the number of Ph.D. students studying different items related to cement and concrete has increased significantly. This is caused partly by an increase in public funding of such studies and partly by an increase in financing from private companies.

In order to improve the opportunity for co-operation between Ph.D. students, and the institutions or companies, to which they are affiliated, the Research Committee of the Nordic Concrete Federation decided to make a survey of current Ph.D. projects. A total of 76 projects carried out at 16 different university departments are listed on the following pages, with information on institution, project, student, and supervisor and not least a contact e-mail address.

It is intended that the list may facilitate an increase in a sharing of experience and knowledge within fields of interest, which might lead to improvements of the individual projects. Furthermore, creation of personal networks between students and their supervisors may be valuable for future research and practical application.

Any comments or remarks to the list are of course very welcome. It is the intention to up-date this list at least once a year, and to publish it on our internet homepage.

It is the hope of the Research Committee that the list will be of interest for the students and their supervisors as well as for all readers of Nordic Concrete Research.

Dirch H. Bager
Chairman of the Research Committee.

DENMARK

Aalborg University – AAU
Department of Building Technology
Sohngaardsholmsvej 57
DK – 9000 Aalborg

Project:	**Frost induced transport of salts in concrete**	
	Project period	January 1999 – June 2002
	Project type & financial support	Industrial Ph.D. Danish Academy of Technical Sciences & Danish Technological Institute
	Ph. D. Student	M. Sc. Marianne Tange Jepsen
	Supervisors	Prof. Per Freiesleben Hansen/AAU & Section Manager, Ph.D. Mette Glavind/Danish Technological Institute, Concrete Centre
	Information	This project concerns the interaction of salt transport and ice formation in freezing concrete. One of the issues is the development of a method to map ice formation in hardened cement paste or concrete by continuous temperature scanning of the test specimen.
	e-mail	marianne.t.jepsen@teknologisk.dk
Project:	**Physical and thermodynamic properties of green concrete**	
	Project period	January 1999 – December 2001
	Project type & financial support	University Ph.D.
	Ph. D. Student	M.Sc., Jacob Thrysøe
	Supervisors	Prof. Per Freiesleben Hansen /AAU
	Information	Investigation of decomposition reactions and heat of evaporation of water phases in well-cured cement paste subjected to high temperatures, using a newly developed Differential Pressure Analysis-apparatus. Determination of activation energy in cement paste systems using a newly developed isochor volumeter.
	e-mail	i6jt@civil.auc.dk
Project:	**Activation energy of hardening portland cement systems**	
	Project period	Febuary 1999 – January 2002
	Project type & financial support	University Ph.D.
	Ph. D. Student	Peter Astrup Simmelsgaard
	Supervisors	Prof. Per Freiesleben Hansen /AAU
	Information	The project aims at theoretical and experimental investigation of activation energy of hardening high-performance concrete. Temperature dependence of the puzzolanic reaction is studied using a newly developed measuring technique.
	e-mail	I6pas@civil.auc.dk
Project:	**Water-Entrained High-Performance Concrete**	
	Project period	October 2000 – October 2003
	Project type & financial support	University Ph.D.
	Ph. D. Student	Thomas Østergaard
	Supervisors	Prof. Per Freiesleben Hansen /AAU
	Information	The project aims at theoretical and experimental investigation of mechanical, hardening and shrinkage properties of water-entrained cement based materials.
	e-mail	i6to@civil.auc.dk

Technical University of Denmark - DTU
Department of Civil Engineering
Building 118 – Brovej
DK – 2800 Lyngby

Project:	**Durability of Concrete Produced from White Portland Cement subjected to Chemical Attack**	
	Project period	July 201 – June 2004
	Project type & financial support	Ph.D. Aalborg Portland A/S
	Ph. D. Student	Erik Pram Nielsen
	Supervisors	Chiefgeologist Duncan Herfort / Aalborg Portland & Ass. Prof., Ph.D. Mette Geiker / BYG.DTU
	Information	The aim of the project is to develop a model that predicts the combined transport of chloride and sulfate ions in concrete produced from Portland cement (with special emphasis on White Portland cement). The transport rate of ions in solution will be derived from the resulting microstructure of the mix based on its physical microstructure, e.g. porosity, pore size distribution, etc. The interaction of ions with the solid phases in the paste will be modelled from a physical and mineralogical point of view and therefore require a thorough investigation of the chloride binding capacity of the AFm phases and any adsorption on the surfaces of the gel pores.
	e-mail	epn@aalborg-portland.dk
Project:	**Rheology of Self Compacting Concrete**	
	Project period	2001 – 2004
	Project type & financial support	Industrial Ph.D. Danish Academy of Technical Sciences & Danish Technological Institute
	Ph. D. Student	Lars Nyholm Thrane
	Supervisors	Head of Section, Ph.D. Mette Glavind / Danish Technological Institute, Concrete Centre & Ass. Prof. Ph.D. Mette R. Geiker / BYG.DTU Ass. Prof. Ph.D. Henrik Stang / BYG.DTU Ass. Prof. Ph.D. Peter Szabo / KT Concrete Technologist. Jørgen Feldborg Skaarup / 4K-Beton
	Information	
	e-mail	Lars.nyholm.thrane@teknologisk.dk & c961021@student.dtu.dk
Project:	**Instability of masonry and concrete walls**	
	Project period	
	Project type & financial support	Industrial Ph.D. Danish Academy of Technical Sciences & ???
	Ph. D. Student	Lars Z. Hansen
	Supervisors	Project manager, Ph.D. Bent Steen Andreasen & Professor Dr. Techn. Mogens Peter Nielsen
	Information	The aim of the project is to develop a new theory to calculate the load carrying capacity of masonry and concrete walls, which fail due to instability. The main goal is to find an estimate of the deformation at the peak load, which is safe. When the deformation at the peak load is known an analysis using the theory of plasticity is possible. The theory will be compared with experiments.
	e-mail	Lzh@byg.dtu.dk

Project:	**Crack Formation in Concrete Structures during the Hardening Phase**
Project period	Sept. 1999 – Sept. 2002
Project type & financial support	University Ph.D.
Ph. D. Student	Lennart Østergaard
Supervisors	Ass. Prof. Henrik Stang / BYG.DTU, Ass. Prof. Lars Damkilde / BYG.DTU & Ass. Prof. David Lange / UIUC
Information	Mechanisms governing the crack formation in an early stage are investigated, and experimental results together with mathematical modelling are used to predict the risk of cracking at early age.
e-mail	los@byg.dtu.dk

Project:	**2'd order theory of plastcity**
Project period	April 2001 – april 2004
Project type & financial support	University Ph.D.
Ph. D. Student	Tim Gudmand-Høyer
Supervisors	Project manager, Ph.D. Bent Steen Andreasen & Professor Dr. Techn. Mogens Peter Nielsen
Information	The aim of the project is to develop a new theory to calculate the load carrying capacity of concrete walls, including axial forces. The main goal is to find an estimate of the deformation at the peak load. When the deformation at the peak load is known an analysis using the theory of plasticity is possible. The theory will be compared with experiments.
e-mail	TimGH@get2net.dk

Technical University of Denmark - DTU
Department of Environment & Ressources
Building 115 – Bygningstorvet
DK – 2800 Lyngby

Project:	**Life cycle assessment of road construction and reuse of residues from solid waste incineration**
Project period	October 2001 – September 2004
Project type & financial support	University Ph.D. Financial support from Amagerforbrænding I/S; Vestforbrænding I/S; Vejteknisk Institut; Aalborg Portland A/S & DTU
Ph. D. Student	Harpa Birgisdottir
Supervisors	Prof. Thomas H. Christensen & Ass. Prof. Michael Hauschild
Information	The aim of the project is to develop a LCA model for road construction including the use of residues from solid waste incinerators as substitute for virgin material. This also includes the use of incineration residues in concrete used for road construction. The LCA deals with the use of resources, energy and emissions associated with the exploitation of natural resources, manufacturing of materials, construction of different kinds of roads, maintenance and demolition of roads. With respect to the waste incineration residues (bottom ash, stabilised fly ashes and air-pollution-control residues) the same issues are dealt with in relation to upgrading of materials and changes in construction and maintenance. Also the environmental savings in avoiding landfilling of the residues are considered.
e-mail	hab@er.dtu.dk

University of Copenhagen - KU
Geologisk Institut
Øster Voldgade 10
DK – 1350 Copenhagen K

Project: **Mineralogical and thermodynamic processes by sulphate and seawater attack on Danish concrete**

Project period	August 1999 – July 2002
Project type & financial support	Industrial Ph.D. Danish Academy of Technical Sciences & Aalborg Portland A/S
Ph. D. Student	Iver A. Juel
Supervisors	Chief geologist Duncan Herfort / Aalborg Portland & Ass. Prof. Jens Konnerup-Madsen / KU & Niels Thaulow / R.J. Lee, USA
Information	The project seeks to establish a better understanding of the long-term properties of concrete in sulphate and seawater environments. A model based on fundamental mineralogical and thermodynamic principles is developed. The model describes the durability of concrete in sulphate and chloride containing environments. The model is tested on concrete samples and laboratory made paste specimens.
e-mail	Iaj@aalborg-portland.dk

University of Aarhus - ÅU
Instrument Centre for Solid-State NMR Spectroscopy
Department of Chemistry
Langelandsgade 140
DK – 8000 Århus

Project:	**Structural, quantitative and kinetic investigations of Portland cement components and hydration reactions using solid-state NMR spectroscopy**	
	Project period	September 2000 – August 2004
	Project type & financial support	University Ph. D. The Danish Research Councils: Materials Research Programme
	Ph. D. Student	Morten Daugaard Andersen
	Supervisors	Dr. Jørgen Skibsted (ÅU) and Prof. Hans J. Jakobsen (ÅU)
	Information	Solid-state NMR spectroscopy has become an important tool in characterization of the hydration reactions of cement-based materials. The aim of the project is to develop new methods in solid-state NMR to obtain improved structural and quantitative information about cementitious materials. These methods will be employed in studies of the aluminate (AFm) phases in Portland cements and in variable-temperature NMR investigations of the phase transitions that occur for some of these phases (e.g. Friedels salt). Furthermore, solid-state ^{29}Si and ^{27}Al NMR will be utilized in a number of structural and kinetic investigations of the hydration reactions for the calcium silicate and aluminate phases of Portland cements employing different admixtures.
	e-mail	mad@chem.au.dk
Project:	**Structural investigations of clay minerals and new concretes obtained by addition of layered silicates**	
	Project period	September 2000 – August 2004
	Project type & financial support	University Ph. D. The Danish Research Councils: Materials Research Programme
	Ph. D. Student	Hanne Krøyer
	Supervisors	Dr. Jørgen Skibsted, (ÅU) Prof. Hans J. Jakobsen (ÅU), and Dr. Holger Lindgreen (GEUS, Copenhagen).
	Information	The principal aim of the project is to characterize the hydrational effects by addition of clay minerals to Portland cement. This includes solid-state NMR studies of the hydration kinetics for the calcium silicate and aluminate phases of Portland cements in the absence/presence of clay materials. This information will be combined with the results from powder X-ray diffraction (XRD) and microscopy methods as well as the results from a number of physical measurements on similar concretes. The project will also include fundamental structural investigations of some layered materials, employing a combination of NMR and XRD, and studies of the basic relationships between NMR parameters and structural data.
	e-mail	kroyer@chem.au.dk

FINLAND

Tampere University of Technology – TUT
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FIN – 33101 Tampere

Project:	**Service life of cement-based patch repairs in concrete facades and balconies**
Project period	1998 - 2001
Project type & financial support	Industrial project, funding by Tekes (Government), Akademy of Finland as well as several private companies.
Ph. D. Student	Mr. Jussi Mattila, lic.tech.
Supervisors	Prof. Ralf Lindberg
Information	The durability of cement-based patch repairs is studied experimentally from the viewpoint of carbonation induced corrosion. The project is a part of COST 521
e-mail	Jussi.mattila@tut.fi

Helsinki University of Technology - HUT
Department of Civil and Environmental Engineering
P.O. Box 2100
FIN – 02015 HUT

Project:	**Coatings for rapid construction work and their emissions**
Project period	01.01.2002 – 31.12.2003
Project type & financial support	The financial support is not yet approved.
Ph. D. Student	M. Sc. Leif Wirtanen
Supervisors	Prof. Vesa Penttala / HUT
Information	The aim of the research project is to clarify the chemical emissions from building materials in rapid construction work i.e. rapid curing materials. The moisture and emission characteristics of rapid curing coatings (plasters, levelling agents, adhesives, and paints) are the target of this study. The interactions between coatings and substrates, the influence of moisture on these interactions, and the emitted compounds subjected to different moisture loads will thus be clarified. Determining the correlation between pore structure, relative humidity, pH and emitting compounds of the different materials and material combinations during a moisture load will carry this out. The moisture induced physical and chemical changes in the materials will also be clarified.
e-mail	leif.wirtanen@hut.fi

Project:	**Effects of ageing processes and frost attack on the microstructure and durability of High Performance Silica Fume Concrete**
Project period	2001 - 2004
Project type & financial support	Part of the EU-CONLIFE research project "Life-time prediction of High - Performance Concrete with respect to durability"
Ph. D. Student	M. Sc. Andrzej Cwirzen
Supervisors	Prof. Vesa Penttala / HUT
Information	The aim of the research project is to define the influence of the ageing processes and freezing - thawing cycles on the microstructure and durability of High Performance Silica Fume Concrete. The mixes differ in the w/c ratio, silica fume and air content. Ageing is realised by storing the samples for the period of 12 months in laboratory and field conditions. The frost attack is simulated by repeated freezing - thawing cycles following CIF/CDF and "Slab test" procedures as well as exposure of the specimens to the natural arctic conditions of Northern Finland. Freezing - thawing tests will be done with both non-aged and aged concrete.
e-mail	Cwirzen@rakserver.hut.fi

Åbo Akademi University - ÅAU
Domkyrktorget 3
FIN – 20500 Åbo

Project:	**Behaviour of granular materials under shear and pressure**
Project period	1998-2000
Project type & financial support	Government (TEKES) and private companies
Ph. D. Student	Erik Nordenswan
Supervisors	Prof. Jarl B. Rosenholm / ÅAU
Information	Research applies to compaction of no-slump concrete. The studies are not completed.
e-mail	Erik.nordenswan@addtek.com

Project:	**Alternative fuels / The impact of alternative fuels on the clinker production**
Project period	1998 - 2002
Project type & financial support	Scancem Doctor of Engineering Programme
Ph. D. Student	Ursula Kääntee
Supervisors	Prof. Mikko Hupa / ÅAU & Bo-Erik Eriksson / Cement Nordic AB Karl-Erik Nyman / Finnsementti Oy
Information	The clinker manufacturing process is modelled with kiln and pre-heater systems. The model is used to predict possible impacts and changes that different alternative fuels might have on the combustion and clinker formation processes.
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SWEDEN

Royal Institute of Technology (KTH)
Department of Structural Engineering
Structural Design and Bridges
SE-100 44 Stockholm

Project:	**The Design and Structural Behaviour of Concrete Block Pavements**	
	Project period	1997 – 2003
	Project type & financial support	Ph.D. Project. Swedish Agency for Innovation Systems, Cementa, Swedish Concrete Block Paving Association (Cementa, Skanska Prefab, Starka, Swerock), and KTH.
	Ph. D. Student	Mr. Mattias Wäppling, M.Sc., Lic. Tech.
	Supervisors	Prof. Johan Silfwerbrand
	Information	Licentiate Thesis: February 2001. The aim is to develop new knowledge on the structural behaviour of concrete block pavements and to develop improved functional properties and refined design methods. Measurements on concrete block pavements in Göteborg and Malmö as well as a test pavement in Uppsala are used as imput to the project.
	e-mail	Mattias.waeppling@struct.kth.se
Project:	**Functional Properties of Concrete Roads**	
	Project period	1997 - 2003
	Project type & financial support	Ph.D. Project. Swedish Agency for Innovation Systems, Cementa, and KTH.
	Ph. D. Student	Ms. Malin Löfsjögård, M.Sc., Lic. Tech.
	Supervisors	Prof. Johan Silfwerbrand (assisting: Mr. Örjan Petersson, M.Sc., Lic. Tech., CBI)
	Information	Licentiate Thesis: May 2000. The aim is to investigate, analyse, and quantify relationships between the properties of the concrete pavement and social factors such as environment, economy, traffic safety, road user comfort, and economy. The goal is to establish a model that can be used to optimise the designing and composition of the concrete pavement in order to obtain maximum possible benefit for society.
	e-mail	Malin.lofsjogard@cbi.se
Project:	**Integrated Design and Construction of Industrial Floors**	
	Project period	2001 - 2004
	Project type & financial support	Ph.D. Project. The Development Fund of the Swedish Construction Industry through the contractor NCC.
	Ph. D. Student	Mr. Jerry Hedebratt, M.Sc.
	Supervisors	Prof. Johan Silfwerbrand
	Information	The aim of the project is to develop the construction process of industrial floors further. The goal is to establish integration from design to construction. Within the project, methods for improved co-operation between selection of structural type, design, detailing, construction, quality control, and feedback will be developed. The project covers both plain and reinforced concrete floors.
	e-mail	Jerry.hedebratt@struct.kth.se

Project:	**Lifetime Issues Concerning Prestressing Steel in Concrete Structures**
Project period	2001 - 2004
Project type & financial support	Ph.D. Project. The Swedish Nuclear Watchdog.
Ph. D. Student	Mr. Thomas Roth, M.Sc.
Supervisors	Prof. Johan Silfwerbrand (assisting: Prof. Håkan Sundquist, KTH)
Information	The aim of the project is to develop new knowledge of these problems both generally and specifically concerning Swedish nuclear power stations. The project covers both bonded and unbonded prestressing steel.
e-mail	Thomas.roth@struct.kth.se
Project:	**Design and Construction of Concrete Bridges without Ordinary Reinforcement**
Project period	1997 - 2003
Project type & financial support	Ph.D. Project. Swedish Agency for Innovation Systems, Skanska, and KTH.
Ph. D. Student	Mr. Lütfi Ay, M.Sc., Lic. Tech.
Supervisors	Prof. Håkan Sundquist (assisting: Prof. Johan Silfwerbrand)
Information	Licentiate Thesis: 2000. The aim is to develop concrete bridges in which steel fibres and prestressing completely replace conventional reinforcement. A major part of the work deals with high performance steel fibre reinforced concrete.
e-mail	Lutfi.ay@struct.kth.se
Project:	**Remaining Structural Life of Railway Bridges**
Project period	1997 - 2003
Project type & financial support	Ph.D. Project. The Swedish National Rail Administration and KTH.
Ph. D. Student	Ms. Ulrika Johansson, M.Sc.
Supervisors	Prof. Håkan Sundquist (Assisting: Prof. Johan Silfwerbrand)
Information	The aim is to study the remaining load carrying capacity of concrete bridges primarily subjected to fatigue.
e-mail	Ulrika.johansson@struct.kth.se
Project:	**Punching Shear Capacity of Column Supported Flat Slabs**
Project period	2001 - 2004
Project type & financial support	Ph.D. Project. The Development Fund of the Swedish Construction Industry and KTH.
Ph. D. Student	Mr. Ghassem Hassanzadeh, M.Sc., Lic. Tech.
Supervisors	Prof. Håkan Sundquist
Information	Licentiate Thesis: 1998. The aim is to study the punching shear capacity of column supported flat reinforced concrete slabs. Some interesting topics are investigated, e.g., strengthening of existing slab-column connections, effects of varying the location of prestressing cables, and use of steel fibres.
e-mail	Ghassem.hassanzadeh@struct.kth.se

Royal Institute of Technology (KTH)
Department of Structural Engineering
Concrete Structures
SE-100 44 Stockholm

Project:	**Load carrying capacity of steel fibre reinforced shotcrete**	
	Project period	1998 - 2002
	Project type & financial support	Swedish Rock Engineering Research, Swedish National Rail Administration, Swedish National Road Administration, The Development Fund of the Swedish Construction Industry through the contractor Besab
	Ph.D. student	Mr Ulf Nilsson, MSc, LicTech
	Supervisor	Prof. Jonas Holmgren
	Information	www.struct.kth.se/research/concrete/ulfn_design.htm
	e-mail	ulf.nilsson@struct.kth.se
Project:	**Repair and strengthening of concrete structures with advanced, cement based fibre composites**	
	Project period	1998 - 2002
	Project type & financial support	Swedish National Rail Administration, Swedish National Road Administration, Cementa, Tyréns
	Ph.D. student	Mr Anders Wiberg, MSc, LicTech
	Supervisor	Prof. Jonas Holmgren (assisting: Prof. Åke Skarendahl)
	Information	www.struct.kth.se/research/concrete/anwi_upgrading%20.htm
	e-mail	anders.wiberg@struct.kth.se
Project:	**Design of structural elements of reinforced foam concrete**	
	Project period	1998 - 2003
	Project type & financial support	KTH
	Ph.D. student	Mr Daniel Masanja, MSc
	Supervisor	Prof. Jonas Holmgren
	Information	www.struct.kth.se/research/concrete/damas_design.htm
	e-mail	daniel.masanja@struct.kth.se
Project:	**Self compacting concrete**	
	Project period	2002 - 2003
	Project type & financial support	Cement and Concrete Institute
	Ph.D. student	Mr Peter Billberg, MSc, LicTech
	Supervisor	Prof. Jonas Holmgren (assisting: Prof. Åke Skarendahl)
	Information	Studies of the tixotropy of self compacting concrete
	e-mail	peter.billberg@cbi.se
Project:	**Interaction between existing concrete structures and repair materials.**	
	Project period	2002 - 2004
	Project type & financial support	Cement and Concrete Institute
	Ph.D. student	Mr Pål Skoglund, MSc
	Supervisor	Prof. Jonas Holmgren (assisting: Prof. Åke Skarendahl)
	Information	Studies of transport mechanisms at the interface of existing concrete and repair materials
	e-mail	pal.skoglund@cbi.se

Project:	**Protection structures in high strength concrete and rock subjected to weapon effects**
Project period	2001 - 2005
Project type & financial support	The Swedish Defence, The Swedish Defence Research Agency (FOI)
Ph.D. student	Mr Johan Magnusson, MSc
Supervisor	Prof. Jonas Holmgren
Information	Studies of the design of protection structures with special reference to the development of weapons and materials
e-mail	jomag@foi.se
Project:	**Protection structures in concrete subjected to weapon effects**
Project period	2001 - 2005
Project type & financial support	The Swedish Defence, Sycon
Ph.D. student	Ms Sofia Belin, MSc
Supervisor	Prof. Jonas Holmgren
Information	Studies of the design of protection structures with special reference to the development of weapons and materials
e-mail	sofia.belin@sycon.se

Chalmers University of Technology - CTH
Division of Building Materials
SE – 412 96 Gothenburg

Project:	**Mechanical properties of concrete sleepers**
Project period	2000 – 2002
Project type & financial support	Scancem Doctor of Engineering Programme CHARMEC (Chalmers Railway Mechanics)
Ph. D. Student	Tekn lic Rikard Gustavson
Supervisors	Prof. Kent Gylltoft
Information	In railway traffic, new demands for increased speed and comfort as well as axle load are constantly put forward. This in turn increases the demands on the track structure concerning load carrying capacity, stability etc. New concrete products for railway tracks for ordinary- and especially high speed traffic are requested. The development requires methods and models for detailed and accurate analyses. The mechanical properties of a prestressed concrete sleeper is to a large extent dependent on the bond between the prestressed strands and the concrete. A numerical model of the strand-concrete interface is developed and calibrated by use of results from experimental tests.
e-mail	Ricard.gustavson@ste.chalmers.se

Project:	**Composite structures – Confined Concrete**
Project period	1998 – 2002
Project type & financial support	Doctorand FORMAS (The Swedish Research Council for Environment, agricultural sciences and Spatial Planning), SBUF (the Development Fund of the Swedish Construction Industry)
Ph. D. Student	Tekn lic. Mathias Johansson
Supervisors	Prof. Kent Gylltoft
Information	The aim of this study is to increase the knowledge of the structural behaviour of composite columns consisting of circular hollow steel sections filled with concrete. The main topics of interest are to study how the structural behaviour of the column is influenced by: the bond strength between the steel tube and the concrete core; the increased concrete compressive strength due to confinement; and various means of load application to the column..
e-mail	Mathias.johansson@ste.chalmers.se

Project:	**Industrial bridge construction**
Project period	1999 – 2003
Project type & financial support	Infrastrukturprogrammet Väg Bro Tunnel NUTEK (the Swedish National Board for Industrial and Technical Development)
Ph. D. Student	Civ ing Peter Harryson
Supervisors	Prof. Kent Gylltoft
Information	Development of new techniques and methods in bridge construction has not been very progressive in Sweden over the last decades; present building codes for bridges do not encourage such a development. Bridges in Sweden are often cast in-situ, involving a massive use of manpower and many techniques that can be described as more or less crafts manlike; for example pre-cast concrete elements are not used very often. The aim is, proceeding from today's conventional bridge construction, to provide techniques, design methods and construction methods in order to develop a more industrial building process for bridge construction.
e-mail	Peter.harryson@ste.chalmers.se
Project:	**Structural Concrete Systems – New concepts for in-situ concrete construction**
Project period	1999 – 2003
Project type & financial support	Doctorand Thomas Concrete Group AB
Ph. D. Student	Civ ing Ingemar Löfgren
Supervisors	Prof. Kent Gylltoft
Information	The aim is to develop innovative structural building systems for buildings, allowing for a more industrialised and cost-effective production process. The project will be focused on in-situ cast concrete apartment- and office buildings. The intention is to consider structural aspects of concrete structures, such as load-carrying capacity, stability, flexibility, fire protection etc, and to some extent handle human oriented aspects such as architecture, comfort, climate conditions, acoustics etc.
e-mail	Ingemar.lofgren@ste.chalmers.se
Project:	**Dynamic behaviour of concrete structures subjected to blast and fragments**
Project period	2000 – 2004
Project type & financial support	Doctorand Statens Räddingsverk (the Swedish Rescue Service)
Ph. D. Student	Civ ing Joosef Leppänen
Supervisors	Prof. Kent Gylltoft
Information	A new reinforcement detailing, using spliced reinforcement loops within the frame corners have been introduced in civil defence shelters. Static tests and analyses have shown that the construction will have a ductile behaviour and good load bearing capacity. The aim for the project is that the effects of the splinter and heat can be taken into account in the analysis of the civil defence shelter subjected to an explosion.
e-mail	Joosef.leppanen@ste.chalmers.se

Project:	**Fracture mechanics for concrete structures – compression modelling**
Project period	2000 – 2004
Project type & financial support	Doctorand FORMAS (the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning), Stiftelsen Svensk Betongforskning (the Foundation of Swedish Concrete Research)
Ph. D. Student	Civ ing Peter Grassl
Supervisors	Prof. Kent Gylltoft & Tekn. Dr. Karin Lundgren
Information	In earlier projects at the Division of Concrete Structures two failure modes of concrete structures were treated, i.e. tensile and bond failure. In this project the third basic failure mode will be studied: compressive failure in concrete. The aim of the project is to develop a model that takes into account the localisation of the compressive failure and describes the influence of a tri-axial stress state in a reasonable way.
e-mail	Peter.grassl@ste.chalmers.se
Project:	**Dynamically loaded concrete structures – measurement and analysis of response**
Project period	2001 – 2005
Project type & financial support	Infrastrukturprogrammet Väg Bro Tunnel NUTEK (the Swedish National Board for Industrial and Technical Development), Skanska
Ph. D. Student	Civ ing Per-Ola Svahn
Supervisors	Prof. Kent Gylltoft & Prof. Kennet Axelsson
Information	The load capacity of driven concrete piles have been utilized more and more efficient for static loads during the last decades. Hence the phase of installation has been even more critical. The reinforced concrete element is subjected with transient loads at a high stress level. Splitting failure will sometimes cause big damage and interaction with surrounding water will under certain circumstances decrease the capacity significant.
e-mail	Per-ola.svahn@ing.hj.se
Project:	**Environmental assessment of cement and concrete**
Project period	1998 – 2004
Project type & financial support	Industrial Ph.D. project. Scancem Doctor of Engineering Programme
Ph. D. Student	Karin Gäbel
Supervisors	Prof. Anne-Marie Tillmann / Chalmers
Information	The project aims at building up a computer-based simulation LCI model of Cementa's plants, including local environment impact. The model is to be limited to the "craddle to gate" part of the process, i.e. the raw materials used in production will be traced upstream to the point at which they are removed as a natural resource, but the products will not be traced downstream, to the building processes, use and demolition.
e-mail	Karin.gabel@cementa.se

Project:	**Mechanism and chemistry of modern rendering systems based on mineral binders modified by different admixtures as organic resins and fibres**	
	Project period	2001 - 2006
	Project type & financial support	Ph.D project Scancem Doctor of Engineering Programme
	Ph. D. Student	Carl-Magnus Capener
	Supervisors	Prof. Lars-Olof Nilsson & Dr. Jadwiga Palicka / Optiroc Group AB
	Information	The aim of the project is to clarify the relationships between the composition and substrate on one hand and the hardening process, structure, properties and their influence on frost resistance on the other hand. The study will be concentrated on the interaction between the chemistry of the hardening process, the received macro and microstructure and various water and moisture transfer properties. Among the decisive properties of the hardened renders the focus will be kept on moisture permeability.
	e-mail	capener@bm.chalmers.se
Project:	**Probabilistic Service Life Design of Concrete Structures. Environmental Actions and Response**	
	Project period	1998 - 2004
	Project type & financial support	PhD-project Funding from the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning
	Ph. D. Student	Lic. Techn. Anders Lindvall
	Supervisors	Prof. Lars-Olof Nilsson
	Information	Tools for probabilistic service life design are lacking precise input data for material properties and environmental actions. The project aims at quantifying and model the interaction between the regional, local and surface climate around a concrete structure and the environmental response by concrete surfaces. The focus is reinforcement corrosion and environmental actions on marine structures and structures exposed to de-icing salts.
	e-mail	Lindvall@bm.chalmers.se
Project:	**Rheology of Fresh Concrete with Mineral Additions**	
	Project period	March 2001-February 2006
	Project type & financial support	PhD project Thomas Concrete Group AB
	Ph. D. Student	MSc Eng. Oskar Esping
	Supervisors	Prof. Lars-Olof Nilsson & Ass. Prof Per-Erik Petersson, SP
	Information	The aim of this project is to increase the knowledge of how properties and composition of the admixtures are connected to the rheology of fresh concrete. The focus is on fresh self-compacting concrete for buildings. Combines of, in Sweden normally used, cement, filler and aggregates together with a plasticizer are to be used. The effect of mineral fillers, both as naturals and industrial by-products, on the workability is of special interest.
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P.O. Box 118
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Project:	**Influence of ageing on the frost resistance of concrete**	
	Project period	1996-2002
	Project type & financial support	Ph.D-projekt
	Ph. D. Student	Civ. Eng. Peter Utgenannt
	Supervisors	Prof. Göran Fagerlund, adj. Prof. Per-Erik Petersson
	Information	The aim of the project is to study the influence ofe ageing effects on the durability of concrete. Carbonation is of special interest. An important part of the project deals with field exposure in marine environment and environments exposed to de-icing salt.
	e-mail	Peter.utgenannt@sp.se
Project:	**Industrial waste materials and filler in concrete: Early strength development, especially for winter conditions**	
	Project period	2000-2003
	Project type & financial support	Ph.D-projekt
	Ph. D. Student	Civ. Eng., Monica Lundgren
	Supervisors	Prof. Göran Fagerlund, adj Prof Per-Erik Petersson
	Information	The aim is to study how the use of industril waste materials (blast furnace slag, fly ash, silica fume) and filler influences the earky strengt development under winter conditions. The project is mainly based on laboratory studies.
	e-mail	Monica.lundgren@sp.se
Project:	**Industrial waste materials and filler in concrete: Influence on long term properties/durability**	
	Project period	2000-2005
	Project type & financial support	Ph.D-projekt
	Ph. D. Student	Civ. Eng., Dimitios Boubitsas
	Supervisors	Prof. Göran Fagerlund, adj Prof Per-Erik Petersson
	Information	The aim of the project is to study how the use of industrial waste materials (blast furnace slag, fly ash, silica fume) and filler influences the long term properties and durability of reinforced concrete. The project will mainly be based on laboratory studies but field exposure will be an important part of the project as well.
	e-mail	Dimitrios.boubitsas@byggtek.lth.se

Project:	**Internal frost damage of concrete**
Project period	1997 - 2002
Project type & financial support	Ph.D. Financed 50% by industry (Cementa AB) and 50% by government (Vinnova)
Ph. D. Student	Katja Fridh
Supervisors	Prof. Göran Fagerlund
Information	The aim of this PhD-project is to explain the mechanism of internal frost damage in concrete. The methods used are length-change measurements and ice-formation measurements both separately and combined. The climate is varied both externally (freezing rate, duration and lowest temperature) and internally (degree of saturation) during studies of the response in length-change and ice formation.
e-mail	katja.fridh@byggtek.lth.se
Project:	**The Optimal Concrete Building**
Project period	2000 – 2004 (with licentiate thesis in 2002)
Project type & financial support	Industry doctoral project associated to the national Swedish reseach programme'Competitive Building'. Financial support from the Swedish Foundation for Strategic Research (SSF) and Cementa AB.
Ph. D. Student	Mats Öberg
Supervisors	Prof. Göran Fagerlund, dep. of Building Materials, Lund University
Information	The aim of the project is to practise integrated life cycle design ('ILCD') on a concrete multi-family dwelling building under Swedish conditions to examine how the long term performance (economy, function, ecology…) can be predicted and optimised from priorities given in the specific project. By doing this it is expected that the overall functional quality of the building over the entire life cycle can be enhanced and that the inherent qualities of concrete as a building material can be exposed and exploited.
e-mail	mats.oberg@cementa.se
Project:	**Non-shrinking inorganic binder systems**
Project period	1997 - 2002
Project type & financial support	Scancem Doctor of Engineering Programme
Ph. D. Student	Cecilie Evju
Supervisors	Prof. Jan-Olov Bovin + doc. Staffan Hansen / Materials Chemistry, LTH & Rainer Ålgars / Optiroc Group AB
Information	Characterisation of early hydration of special binder systems forming ettringite. Emphasis on phase formation and volume stability during hardening. Techniques: synchrotron radiation and isothermal calorimetry. Study the influence of sulfate source on the ettringite formation and the influence of accelerators and retarders.
e-mail	Cecilie.Evju@materialkemi.lth.se

Project:	**Chemical emissions from concrete**
Project period	1998 – 2003
Project type & financial support	Fil. Dr.
Ph. D. Student	Tina Hjellström
Supervisors	Lars Wadsö / LTH
Information	In this project the aim is to collect knowledge about emissions from building materials, both what comes out and potential emissions. The focus is on transport in and emissions of volatile organic compounds from concrete. The first part in the project is to try different methods and proceedings for conditioning, sampling and detection of volatile organic compounds, formaldehyde and ammonia. The second part deals with the study of emissions from concrete. In this part the factors are additives, aggregates, fillers, form-oil, water to cement ratio, temperature and humidity. Also potential contributors like grinding aids and fillers in cement will be studied.
e-mail	Tina.hjellstrom@research.scancem.com

Luleå University of Technology - LTU
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S – 971 87 Luleå

Project:	**Hardening Technology: Self-compacting concrete**	
	Project period	1999 - 2004
	Project type & financial support	Ph.D.
	Ph. D. Student	Sofia Utsi
	Supervisors	Jan-Erik Jonasson, Mats Emborg, Lennart Elfgren, LTU
	Information	Hardening technology and rheology of self-compacting concrete is studied. The effect of different types of aggregate, cement content, admixtures and filler contents is tested with a viscometer. The results are intended to give a useful and reliable test method that is adjustable for testing in the field. The influences of restraint stresses as a result of temperature and creep are important parts of the project.
	e-mail	Sofia.Utsi@ce.luth.se
Project::	**Strengthening of Concrete Structures with Prestressed Reinforcement**	
	Project period	1998 - 2003
	Project type & financial support	Ph.D.
	Ph. D. Student	Håkan Nordin
	Supervisors	Björn Täljsten, Skanska/LTU; Thomas Olofsson, L Elfgren, LTU
	Information	Carbon Fibre Reinforced Polymers, CFRP, are used to strengthen concrete structures. The possibility to use prestressed CFRP are studied.
	e-mail	Hakan.Nordin@ce.luth.se
Project:	**Monitoring of Structures**	
	Project period	2001 - 2005
	Project type & financial support	Ph.D.
	Ph. D. Student	Arvid Hejll
	Supervisors	Thomas Olofsson, LTU; Björn Täljsten, Skanska/LTU; Lennart Elfgren, LTU
	Information	Methods to monitor deformations in structures will be investigated in order to form a basis for assessment and maintenance programs.
	e-mail	Arvid.Hejll@ce.luth.se

Project:	**Hardening Technology. Structural Modelling. User-friendly methods.**	
	Project period	1998 - 2003
	Project type & financial support	Ph.D.
	Ph. D. Student	Mårten Larsson
	Supervisors	Jan-Erik Jonasson, Mats Emborg, Lennart Elfgren, LTU
	Information	An understanding of how different types of cracks arise will give a direct base to propose possible measures to be taken and it will also give a rational background to the estimation of the risk of early cracking. The following areas are treated: I. Modelling of crucial material properties for a thermal stress analysis. II. Improvement of simplified methods for thermal crack estimation. III. Formulation of a simplified method for practical use. IV. Comparison of results from a simplified method formulated for practical use with results from full-scale field observations. In 2000 Mårten Larsson presented a Techn. licentiate thesis summarising the results up to now: Estimation of Crack Risk in Early Age Concrete. Simplified Methods for Practical Use, Division of Structural Engineering, Luleå University of Technology, April 2000, 170 pp
	e-mail	Marten.Larsson@ncc.se
Project:	**Steel Fibre Reinforced Self Compacting Concrete as a base for a more industrialised construction**	
	Project period	1998 - 2003
	Project type & financial support	Ph.D.
	Ph. D. Student	Jonas Carlswärd
	Supervisors	Mats Emborg, Jan-Erik Jonasson, Lennart Elfgren, LTU
	Information	The project comprises studies on steel fibre reinforced and self-compacting concrete both from a design as well as a production point of view. Basically, this means that part of the work aims at establishing test and design methods for typical applications of the new material while another part deals with rheological aspects, i.e. studies on the fresh concrete properties. Also, as the material is presently used at a regular basis the project also involves full-scale studies and follow-ups.
	e-mail	Jonas.Carlswärd@ce.luth.se
Project:	**Steel Fibre Reinforced Sprayed Concrete. Corrosion and Durability**	
	Project period	1998 - 2003
	Project type & financial support	Ph.D.
	Ph. D. Student	Erik Nordström
	Supervisors	Lennart Elfgren, LTU; Jan Alemo, Vattenfall
	Information	An extensive series of field tests are carried out on steel fibre reinforced sprayed concrete, SFRSC, in three environments: in a river; close to a high way; in an urban tunnel. Crack widths and corrosion rates are studied and modelled. In 2000 Erik Nordström presented a Techn. licentiate thesis summarising the results up to now: *Steel Fibre Corrosion in Cracks. Durability of Sprayed Concrete. Licentiate Thesis 2000:49, Division of Structural Engineering, Luleå University of Technology, December 2000, 103 pp.*
	e-mail	Erik.Nordstrom@vuab.se

Project:	**Strengthening of Concrete Structures**
Project period	1998 - 2003
Project type & financial support	Ph.D.
Ph. D. Student	Anders Carolin
Supervisors	Björn Täljsten, Skanska/LTU, Lennart Elfgren, LTU
Information	Design and analysis of strengthening methods are studied. In 2001 Anders Carolin presented a Techn. licentiate thesis summarising the results up to now: *Strengthening of Concrete Structures with CFRP. Field tests and Shear Strengthening. Licentiate Thesis 2001:01, Division of Structural Engineering, Luleå University of Technology, June 200.*
e-mail	Anders.Carolin@ce.luth.se

Project:	**Hardening Technology. Influence of Restraint**
Project period	1998 - 2003
Project type & financial support	Ph.D.
Ph. D. Student	Martin Nilsson
Supervisors	Jan-Erik Jonasson, Mats Emborg, Lennart Elfgren
Information	The influence is studied of what kind of restraint a slab gives to a wall which is casted on top of the slab. Cracking, shrinkage and creep are studierd and modelled for young concrete. Probabilistic methods are applied. In 2000 Martin Nilsson presented a Techn. licentiate thesis summarising the results up till now: *Thermal cracking of young concrete. Partial coefficients, restraint effects and influences of casting joints*. *Licentiate Thesis 2000:27, Division of Structural Engineering, Luleå University of Technology, October 2000, 267 pp.*
e-mail	Martin.Nilsson@ce.luth.se

Project:	**Evaluation of Concrete Structures: Strength Development and Fatigue Capacity**
Project period	1998 - 2003
Project type & financial support	Ph.D.
Ph. D. Student	Håkan Thun
Supervisors	Ulf Ohlsson, Lennart Elfgren
Information	The project can be divided into two parts: (1) Create realistic refined methods to calculate the concrete fatigue capacity. Present codes are conservative. Recent work shows a great potential. At present a hypothesis regarding strain and energy is studied as an alternative to the classic Wöhler method with stress variations. (2) Develop better criteria and basis for evaluation of actual concrete strength in existing structures.
e-mail	Hakan.Thun@ce.luth.se

NORWAY

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N – 7491 Trondheim

Project:	**Condition Assessment and Service Life Management of Concrete Harbor Structures**	
	Project period	January 1996 – December 2001
	Project type & financial support	Ph.D.
	Ph. D. Student	Arne Gussiås
	Supervisors	Prof. Odd E. Gjørv
	Information	To develop strategies, systems and procedures that will facilitate the maintenance of concrete harbor structures both on a project level and network level.
	e-mail	Argu@interconsult.no
Project:	**Instrumentation and Monitoring of Steel Corrosion in Concrete Structures**	
	Project period	August 1998 – June 2002
	Project type & financial support	Ph. D.
	Ph. D. Student	Franz Pruckner
	Supervisors	Prof. Odd E. Gjørv
	Information	To provide more basic information about performance and reliability of various sensor systems for automatic monitoring of steel corrosion in concrete structures
	e-mail	Franz.pruckner@protector-group.no
Project:	**Performance of Concrete Structures Mechanically Repaired due to Steel Corrosion**	
	Project period	August 2002 – June 2002
	Project type & financial support	Ph.D.
	Ph. D. Student	Bård Arntsen
	Supervisors	Prof. Odd E. Gjørv & Prof. Geir Horrigmoe
	Information	To study and analyse the effiency and long-term performance of mechanical repairs due to chloride induced steel corrosion in concrete structures
	e-mail	Baard.arntzen@tek.norut.no
Project:	**Surface Protection of Concrete Structures**	
	Project period	August 2000 – June 2004
	Project type & financial support	Ph.D.
	Ph. D. Student	Guofei Liu
	Supervisors	Prof. Odd E. Gjørv
	Information	To provide more basic information on the use of surface protection of concrete structures in chloride containing environment
	e-mail	Guofei.liu@bygg.ntnu.no

Project:	**Service Life of Concrete Structures and Performance-Based Quality Control**	
	Project period	January 2001 – December 2004
	Project type & financial support	Ph.D.
	Ph. D. Student	Vemund Årskog
	Supervisors	Prof. Odd E. Gjørv & Prof. Bernt J. Leira
	Information	To contribute to a more controlled service life of concrete structures by developing a better basis for performance-based quality control during construction
	e-mail	Vemund.aarskog@hials.no
Project:	**Service Life Design of Concrete Structures in Marine Environment**	
	Project period	August 2001 – August 2003
	Project type & financial support	Ph.D.
	Ph. D. Student	Rui Miguel Ferreria
	Supervisors	Prof. Said Jalali & Prof. Odd E. Gjørv
	Information	To provide a better basis for implementation of probalistic-based durability design of concrete structures in marine environment
	e-mail	Rmf@civil.uminho.pt
Project:	**Utilization of Ethiopian Natural Pozzolanic Materials in Concrete**	
	Project period	August 1998 – August 2002
	Project type & financial support	Ph.D.
	Ph. D. Student	Surafel Ketema Desta
	Supervisors	Prof. Odd E. Gjørv & Prof. Harald Justness
	Information	To investigate Ethiopian natural pozzolanic materials and to provide a better basis for the Ethiopian construction industry to utilize such materials in concrete
	e-mail	Surafel.ketema@bygg.ntnu.no
Project:	**Rheological description on fresh concrete as a function of time, the multi-phase model.**	
	Project period	1998 – 2001
	Project type & financial support	Financial support: Borregaard Ligno Tech Inc & The Norwegian Research Council
	Ph. D. Student	M.Sc. Jon Elvar Wallevik
	Supervisors	Prof. Erik J. Sellevold / NTNU; Prof. Fridtjov Irgens / NTNU & Sverre Smeplass /Selmer Skanska
	Information	A specific material model and a mathematical approach is used in the attempt to increase the understanding of the workability and workability loos of fresh concrete. The main objective is to give rheological description of fresh concrete as a function of time (i.e. the workability and workability loss), including the role of plasticizers in this process. Major emphasis will be put on the effect of various types of lignosulfonates, as a part of developing process in the aim of increasing the workability retention with potential new products from Borregaard Ligno Tech in the near future.
	e-mail	Jon.wallevik@bygg.ntnu.no

Project:	**Temperature effects on corrosion processes related to concrete reinforcement**
Project period	2001 – 2005
Project type & financial support	Financial support: Norwegian Public Roads Administration & Norwegian Research Council
Ph. D. Student	Jan-Magnus Østvik Jr.
Supervisors	Prof. Øystein Vennesland / NTNU & Dr. Ing. Claus Kenneth Larsen
Information	Corrosion of reinforcing steel is a world wide problem. Still the knowledge of corrosion is limited. The objective of this project is to detect the electrode (anode/cathode) processes variation with temperature. Also to investigate the concrete conductivity's variation with temperature. In short terms this project is related to corrosion versus temperature both in field and in laboratory.
e-mail	Jan.ostvik@bygg.ntnu.no

Project:	**Slipforming of Vertical Concrete Structures. Friction between concrete and slipform panel**
Project period	1997 – 2001
Project type & financial support	Financial support: Aker Engineering AS; Selmer Skanska AS; Veidekke ASA; NCC Anlegg AS; Norcem AS; Gleitbau Ges.m.b.H & Research Council of Norway
Ph. D. Student	Kjell Tore Fosså
Supervisors	Prof. Magne Maage, former assistent professor Sverre Smeplass & Prof. Malvin Sandvik
Information	The prime objective of the research program is to improve the understanding of the slipform technique as a construction method in order to ensure high quality concrete structures. The objective is to identify the parameters affecting the friction that occur during lifting of the slipform panel. It is assumed that decreased friction will reduce the risk for any surface damages during slipforming.
e-mail	Kjell.fossa@bygg.ntnu.no

Project:	**Creep deformations due to self-stresses in hardening high performance concrete, effect of temperature**
Project period	2000 – 2002
Project type & financial support	Financial support: Norwegian Research Council & Norwegian Concrete Industry
Ph. D. Student	Dawood Atrushi
Supervisors	Terje Kanstad & Erik J. Sellevold
Information	The main topic is assessment of the risk of early age cracking in concrete due to restrained volume changes. The project particularly focuses on experimental determination and modelling of creep in young concrete. Creep in compression and tension as well as the influence of temperature on creep is studied experimentally
e-mail	Dawood.atrushi@bygg.ntnu.no

Project:	**Deformations and crack sensitivity at early ages. Materials technology and calculation methods**	
	Project period	2002 – 2004
	Project type & financial support	Financial support: Norwegian Research Council & Norwegian Concrete Industry
	Ph. D. Student	Ji Guomin
	Supervisors	Erik J. Sellevold, Øyvind Bjøntegaard & Terje Kanstad
	Information	Modelling of the experimental behaviour of concrete at early ages exposed to realistic temperature histories and variability degree of restraint. Further development of the materials models and calculation tools developed within IPACS and the parallel Norwegian research projects.
	e-mail	
Project:	**Deformations in concrete cantilever bridges, observation and theoretical modelling**	
	Project period	1998 – 2001
	Project type & financial support	Financial support: Norwegian Research Council through SINTEF's research program "Computional mechanics in civil engineering"
	Ph. D. Student	Peter F. Takacs
	Supervisors	Terje Kanstad
	Information	Deformation in segmental cast cantilever bridges are studied. Deformations are monitored in three bridges in Norway. Numerical models are investigated as robust analysis tools for deformation prediction. The main emphasise is laid on creep and shrinkage modelling. Probabilistic methods are used to take into account the significant uncertainty in the prediction of these phenomena.
	e-mail	Peter.takacs@bygg.ntnu.no
Project:	**Structural behaviour of post tensioned concrete structures. Flat slab. Slabs on ground**	
	Project period	1996 – 2001
	Project type & financial support	Financial support: Norwegian Concrete Industry
	Ph. D. Student	Steinar Trygstad
	Supervisors	Terje Kanstad
	Information	Experimental and theoretical studies of prestressed concrete. Full scale failure test of one slab (16x19m) and three slabs on ground (4x4m). Nonlinear and time dependent FE analysis (Diane, TNO, NL) and simplified calculation methods have been used
	e-mail	Steinar@spennconsult.no

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Project:	**Properties of environment friendly cements in self-compacting concrete**
Project period	1997 – 2002
Project type & financial support	Financial support: Norcem Scancem Doctor of Engineering Programme
Ph. D. Student	Tom. I Fredrik
Supervisors	Prof. Erik J. Sellevold
Information	The trend is towards more environment friendly solutions and greater use of fillers in the production of cement and concrete. The project is focusing on replacing parts of the clinker with alternative raw materials (e.g. fly ash, limestone and slag) to produce blended cements. The properties of the environment-friendly cements will be characterised in self-compacting concrete.
e-mail	Tom.fredvik@norcem.no

Project:	**Utilization of alkali reactive crushed rock fines in concrete production**
Project period	1999 – 2003
Project type & financial support	Financial Support: NorBetong AS Scancem Doctor of Engineering Programme
Ph. D. Student	Bård Pedersen
Supervisors	Prof. Magne Maage / NTNU
Information	The main purpose of this project is to clarify which reactions are taking place when using alkali reactive aggregates crushed down to filler, and the consequences in terms of durability of concrete structures. Studies on effect on fresh concrete including self-compacting concrete are included in this project. A main issue is to develop knowledge to maintain full ressource utilisation at the production plants by being able to use what was earlier supposed to be waste.
e-mail	Bard.pedersen@bygg.ntnu.no

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Project: **The impact of the process factors on the LWA process with priority on the kiln process**

Project period	1998 – 2002
Project type & financial support	Scancem Doctor of Engineering Programme
Ph. D. Student	Martin Siljan
Supervisors	Prof. Morten C. Melaaen / HiT & Bernt M. Tvete / Optiroc Group
Information	In this project the focus will be on understanding and improving the production process for of LWA, especially the drying of the clay. The two main tools are computer-simulations, both CFD in FLUENT and modelling of the drying process in a locally developed code, and a pilot plant where several tests will be performed over the next two years. The goal for the work is: • To help in development of the production line • To reduce energy consumption through increased production • To form a basis for development of new production line concepts
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