konstruktions centrum

CHALMERS

Välkomna till årets gemensamma redovisning av examensarbeten.

Avdelningen för konstruktionsteknik på Chalmers utexaminerar ett relativt stort antal examensarbeten varje år. Många av dessa är initierade av och genomförs hos olika aktörer i näringslivet. Andra har en stark anknytning till de forskningsprojekt som bedrivs av forskargrupperna på avdelningen.
Som ett led i vår strävan för ett starkare samarbete till industrin och en effektivare kunskaps- och erfarenhetsöverföring planerar vi tillsammans med Konstruktionscentrum på Chalmers att samordna redovisningarna av examensarbeten för 2015 i form av en workshop. Vi hoppas att Ni på det sättet får bättre möjlighet att närvara vid redovisningarna för att ta del av presentationerna och bidra till diskussionen.

Master's thesis seminar day

DIVISION OF STRUCTURAL ENGINEERING

Chalmers University of Technology

Master's thesis seminars - June, 11th 2015

Session 1, 09:00-10:00

Room VB

Buckling analysis of orthotropic plates	
Abstract: Orthotropic plate refers to a steel plate with different stretching abilities in different directions which means that ordinary plate theory cannot be applied. In this master thesis both stiffened plate and a steel sandwich panel (SSP) will be analysed with respect to global buckling. The critical buckling stress was found using FE-analysis via Abaqus, EBPlate and analytically and compared. Using equivalent stiffness parameters an equivalent plate was modelled in Abaqus. The result was a parametric study on different geometry's of SSP.	
Students	**Jón Pétur Indriðason & Vésteinn Sigmundsson**
Opponents	Guðlaugur Már Guðmundsson & Óskar Bragi Guðmundsson
Supervisors	Mohammad Al-Emrani (Chalmers)
Examiner	Peter Nilsson (WSP)

Room VF

Structural assessment of concrete bridge deck slabs with FEM	
Abstract: Bridge deck slabs are one of the most exposed bridge parts and are often critical for the load carrying capacity. The aim of the thesis is to use existing models and to evaluate their load carrying capacity and study their structural response. This is achieved by a multi level structural assessment using results from FE analysis and relevant codes. A parametric study is carried out to investigate the influence of various parameters on the structural response of the bridge deck	
Students	**Waleed Hasan & Altaf Ashraf**
Opponents	Andreas Oscarsson & Jakob Brandin
Supervisors	Jiangpeng Shu & Kamyab Zandi
Examiner	Mario Plos

Room VH

Non-linear analysis of bridge protective piers exposed to ship collision	
Abstract: Protective piers are sacrificial structures and defend the bridge supports against ship collisions. The purpose of this report was to investigate the non-linear behaviour of these piers, which are to be built at the new Hisingsbron, at failure to verify the capacity required. This was done by setting up a non-linear FEM-model of the protective piers in the software Abaqus. Incoming kinetic energy from design ship size was compared to resisting energy by the protective piers.	
Students	**Johan Forsgran & Andreas Lamton**
Opponents	Niclas Görander & Christopher Halldén
Supervisors	Magnus Bäckström (COWI)
Examiner	Joosef Leppänen

Room VK

LCC and LCA for bridges made of different materials	
Abstract: The need for more pedestrian bridges is increasing during the years. Therefore, the purpose of the thesis was to determine the most cost and environmental efficient material for bridge construction. To achieve this, three bridges with the same free span of about 19 meters made of timber, steel and fibre reinforced polymers (FRP) has been compared from a life cycle perspective. In order to obtain the results LCA and LCC analyses were performed. Evaluating the results of different bridges produced valuable information for an optimum solution.	
Students	**Dimitra Dimopoulou & Nina Khoshkhoo**
Opponents	Anita Oshalim & Malin Stjerneman
Supervisors	Robert Kliger
Examiner	Robert Kliger

Master's thesis seminars - June, 11th 2015

Session 2, 10:00-11:00

Room VB

Fatigue strength of post-weld treated details with High Frequency Mechanical Impact Treatment	
Abstract: The present paper has established an assemblage of experimental results from various published reports considering the recently developed post-weld treatment technology, High Frequency Mechanical Impact (HFMI). HFMI is a progressive method utilized to enhance the fatigue strength of welded details by modifying the welded seam. Approximately 1450 tested specimens for four different welded geometries has been registered. Due to the accomplished database an evaluation based on the correlation between diverse parameters, such as plate thickness, steel quality, loading conditions etc., has been carried out.	
Students	**Ali Kakavand & Arman Ghahreman Jennatabadi**
Opponents	Mohammad Sadegh Khani
Supervisors	Poja Shams Hakimi
Examiner	Mohammad Al-Emrani

Room VF

ASSESMENT OF PUNCHING SHEAR CAPACITY OF TESTED RC BRIDGE DECK SLAB AT KIRUNA	
Abstract: To meet future transportation demands, there is need to improve transport infrastructures. These can be achieved by predicting load carrying capacity of existing bridges to allow large volume and high axle traffics to pass. RC bridge decks are among structural members with critical sections that needs addressing. This research proposes a multi-level structural analysis and evaluation to develop an efficient and calibrated punching shear capacity of existing bridge deck slabs.	
Students	**Ben Owilli**
Opponents	Lucia Abad
Supervisors	Shu Jiangpeng(Chalmers TH) and Niklas Baggae (Lulea TU)
Examiner	Mario Plos

Room VH

The effect of prestressing on dynamically loaded concrete beams	
Abstract: Concrete structures subjected to impact loading are of great interest within the field of civil engineering. This report aims at evaluating the accuracy of the concrete material models "Winfrith", "CSCM" and "CDPM2" used in the FE-software LS-DYNA with regard to dynamic loading. The performance of the material models is evaluated during drop-weight impact tests on reinforced concrete beams. Based on those results the most suitable material model is then used to study the effect of prestressing on dynamically loaded concrete beams. Considering the scope of the report "CSCM" provides the best combination of good results and stability. Hence it is used to evaluate the effect of prestressing on dynamically loaded concrete beams.	
Students	**Adam Johansson & Johan Fredberg**
Opponents	David Dackman & Walter Ek
Supervisors	Frida Holmquist (ÅF), Emil Carlsson (ÅF)
Examiner	Joosef Leppänen

Room VK

Dynamic response of timber floors – development of a design process for finding better concepts	
Abstract: A design process for timber floors with the dynamic response of paramount importance was developed. First, new design criteria, based on research from the last fifteen years, were formulated. Second, calculations and dynamic measurements of a benchmark floor showed that, even though fulfilling the criteria of the Eurocode, it failed to be accepted by the new design criteria. General principles for the design of timber floors were formulated and the process finally resulted in a promising concept.	
Students	**Jakob Brandin & Andreas Oscarsson**
Opponents	Altaf Ashraf & Waleed Hassan
Supervisors	Niklas Johanssson (Ramboll), Tobias Persson (A-hus)
Examiner	Robert Kliger

Master's thesis seminars - June, 11th 2015

Session 3, 11:00-12:00

Room VB

Lateral-torsional buckling of steel channel beams	
Abstract: In Eurocode 3, lateral-torsional buckling is considered using buckling curves but these are mainly optimized for I-beams. The objective has been to establish buckling curves for channel beams and compare how they correlate with existing ones. A parametric study with Finite Element Modeling in ANSYS was conducted on the beam load carrying capacity with various sizes, lengths and load configurations. The results indicate that the general method in EC3 underestimates the load carrying capacity of channel beams.	
Students	**Carl-Marcus Ekström & David Wesley**
Opponents	Jesús Armesto Barros & Andrés Serena Gómez
Supervisors	Martin Gustafsson (Reinertsen Sverige AB), Bo Edlund
Examiner	Mohammad Al-Emrani

Room VF

Design with regard to explosion	
Abstract: An impulse loaded member treated as a part of a structural system will behave differently than if treated separately. The question is how much influence the surrounding structure has on the constitutive elements' response and how much can be gained if the member is treated as a part of the structure. This thesis develops a 2DOF mass-spring model to simulate the behaviour of a beam-on-beams structural system subjected to explosion. The results are verified with the use of FE analysis.	
Students	**Simon Eliasson & Adam Sciegaj**
Opponents	Jonatan Andersson & Johan Antonsson
Supervisors	Mattias Carlsson (Reinertsen)
Examiner	Morgan Johansson

Room VH

Stress wave propagation between different materials	
Abstract: Bomb shelters need to sustain high loading for a short period of time, which make them complex to analyse. Using the theory of wave propagation combined with the theory of transformational elastodynamics, a small strengthening structure was designed that decrease the amplitude of the stress wave. The thesis consists of literature survey and case studies. The results show that it is possible to create a much thinner wall theoretically, where the material properties are highly dependent on the transformation function.	
Students	**Tim Svensson & Filip Tell**
Opponents	Jens Håkansson & Henrik Wallerman
Supervisors	Peter Olsson & Joosef Leppänen
Examiner	Peter Olsson & Joosef Leppänen

Room VK

Semi-Rigid Connections in a Covered Pedestrian and Bicycle Timber Bridge	
Abstract: Connections in timber bridges are commonly modelled as either completely hinged or fully fixed, which in reality is difficult to achieve and therefore the connections will have an intermediate degree of fixation. The aim of this thesis was to further develop a bridge by performing a structural analysis, design connections and study the difference in global behaviour of the bridge due to the degree of fixation of the connections. In order to achieve the aim, an FE-model of the bridge was established in Abaqus/CAE.	
Students	**Anita Oshalim & Malin Stjerneman**
Opponents	Dennis Ferri & Sofia Lam
Supervisors	Robert Kliger
Examiner	Robert Kliger

Master's thesis seminars - June, 11th 2015

Session 4, 13:00-14:00

Room VB

Fatigue analysis of hybrid laser welds in steel sandwich bridge decks	
Abstract: Steel sandwich decks are a new concept in bridge design. The concept is made possible by implementing hybrid laser welding, due to the ability of larger penetration. The purpose was to investigate the fatigue strength of hybrid laser welds which resulted in a SN-curve. Additionally, the fatigue behavior of welded details in steel sandwich decks was studied with the aim of identifying critical details governing the fatigue design. The study was conducted by implementing the effective notch stress method in conjunction with finite element analysis.	
Students	**Linda Sandberg & Amanda Palmkvist**
Opponents	Evgenios Papadopoulos & Emmanouil Arvanitis
Supervisors	Mohammad Al-Emrani
Examiner	Mohammad Al-Emrani

Room VF

Design with Regard to Collision Impact **Comparison of Response between Mass-Spring systems and FE Analysis for Collision Impact on Simply Supported Concrete Slabs**	
Abstract: When two objects collide a dynamic response is obtained and the purpose of this Master's thesis was to improve the calculation techniques used for this. The objective was to investigate how well simplified 2DOF mass spring systems correspond to linear and non-linear FE analysis for structures, primarily concrete slabs, subjected to impact load. The correspondence between the models is good for all cases except for slabs with elasto-plastic response, and the results indicate that using 2DOF for modelling collision impacts is promising.	
Students	**Jonatan Andersson & Johan Antonsson**
Opponents	Simon Eliasson & Adam Sciegaj
Supervisors	Morgan Johansson (Reinertsen)
Examiner	Morgan Johansson (Reinertsen)

Room VH

Crack Width Profiles for Fibre Reinforced Concrete Elements with Conventional Reinforcement	
Abstract: This presentation aims to deepen the listeners' knowledge about the effect fibres have on flexural cracks through the concrete cover of reinforced concrete elements, in terms of crack width and crack pattern. Three-point bending tests were conducted and the actual crack width profiles were measured for surface cracks of 0.5 mm and 1 mm. No clear effect on the total crack width, attributable to the fibres, could be observed from the results. However, the cracks had a higher tendency to split into several smaller cracks when fibres were added.	
Students	**Niclas Görander & Christoper Halldén**
Opponents	Johan Forsgran & Andreas Lamton
Supervisors	Carlos G. Berrocal (Chalmers), David Fall (NCC Teknik) & Ingemar Löfgren (Thomas Betong, Chalmers)
Examiner	Ingemar Löfgren

Room VK

Multi-storey houses in timber – Stability and anchoring systems	
Abstract: Multi-storey buildings made of timber are studied. Loads acting in the vertical direction and lateral forces caused by the wind need to be transferred to the foundation. The self-weight of multi-storey timber buildings is usually not sufficient to resist the large tensile forces in the shear walls which must be anchored. These anchoring connections are expensive and not carefully executed which results in lower bearing capacity than designed for or in worst case, none at all. Anchorage systems suitable for multi-storey timber houses are proposed.	
Students	**Dennis Ferri & Sofia Lam**
Opponents	Dimitra Dimopoulou & Nina Khoshkhoo
Supervisors	Robert Kliger
Examiner	Reza Haghani Dogaheh

Master's thesis seminars - June, 11th 2015

Session 5, 14:00-15:00

Room VB

Finite Element Design of Orthotropic Steel Bridge Decks	
Abstract: Designing OSDs using FE software can be arduous and time consuming. The purpose of this Master's thesis was to compare different design approaches, and give recommendations with regard to accuracy and modelling simplicity. Two different approaches were investigated; a detailed shell model and a model which uses a less demanding equivalent deck plate. The models were compared with regard to section forces and stresses to see which simplifications can be justified. The stresses in the two models were found to correspond well, which means that using equivalent plate is a promising model.	
Students	**Jens Håkansson & Henrik Wallerman**
Opponents	Tim Svensson & Filip Tell
Supervisors	Poja Shams Hakimi (ELU)
Examiner	Mohammad Al-Emrani

Room VF

Application of modified compression field theory on glass and basalt fibre reinforced concrete	
Abstract: Glass and basalt fibre reinforcement products are not as widely investigated as steel fibre reinforcement, for example regarding the shear capacity in beams. The purpose was to analyse the shear capacity of glass and basalt fibre reinforced concrete beams. The first study gave two tensile stress-strain curves with 0,3% fibre volume and concrete strengths C25/30 and C50/60, respectively. The second study analysed the applicability of the modified compression field theory on glass- and basalt fibre reinforced concrete. The results show good comparison with experimental data.	
Students	**Erika Abrahamsson & Josefin Petersson**
Opponents	Birgit Amblie Solerod & Elin Alexandersson
Supervisors	Ludwig Lundberg (ÅF Infrastracture), Thomas Blanksvärd (Skanska Teknik) & Rasmus Rempling
Examiner	Rasmus Rempling

Room VH

Experimental investigation on electrical resistivity of SFRC	
Abstract: Steel fibres could be used in civil engineering structures made of reinforced concrete to provide crack control mechanisms. However, there are concerns that their conductivity may increase the corrosion rate of conventional reinforcement. This Master's thesis aims at identifying how fibre content and orientation may influence the resistivity of concrete at various moisture contents and whether a low measured resistivity of SFRC could lead to increased corrosion rates. The results showed that the moisture content is the main factor controlling resistivity but fibre content and orientation influenced resistivity significantly in saturated conditions.	
Students	**Lucía Abad**
Opponents	Sandra Bentland
Supervisors	Carlos Gil Berrocal, Ingemar Löfgren, Tang Luping
Examiner	Tang Luping

Room VK

Consequences of implementing timber in medium high rise buildings	
Abstract: Timber is often disregarded as an option for tall buildings. Instead more conventional systems of concrete and steel are preferred. The aim of the project was to develop possible mixed conceptual concepts and present the consequences of implementing timber. The influence on the stabilising system, the dimensions of the structural components and different vertical deformations were investigated. A mixed alternative proved to be promising provided that timber elements are treated to reduce vertical deformations, the effective span of floor elements is limited and structural connections are designed to permit differential deformations.	
Students	**Thomas Andersson & Lina Hammarberg**
Opponents	Lisa Dahlström & Jennifer Ringsby
Supervisors	WSP, Peder Bodén & Arnoud Vink
Examiner	Björn Engström

Master's thesis seminars - June, 11th 2015

Session 6, 15:00-16:00

Room VB

Steel-sandwich elements in long-span bridge applications	
Abstract: The purpose of this project is to evaluate the use of steel-sandwich elements in long-span bridges. To achieve this goal, a literature study on the design of suspension bridges is performed. Thereafter, using the section of an existing suspension bridge, a comparison is made between the conventional orthotropic deck and one composed of optimized steel sandwich elements. Finally, the structural performance of the steel-sandwich elements is verified by finite element analysis.	
Students	**Emmanouil Arvanitis & Evgenios Papadopoulos**
Opponents	Amanda Palmkvist & Linda Sandberg
Supervisors	Peter Nilsson (WSP)
Examiner	Mohammad Al-Emrani

Room VF

Meso mechanical study of concrete - Numerical modelling with experimental verification	
Abstract: In order to develop concrete into a more environmental friendly building material, a better understanding of concrete's behaviour at meso level is needed. The purpose was to establish a 2D FE-model of crack initiation and propagation of concrete at meso level. This was approached by combining FE-modelling with tensile testing of small-scale samples. With results in form of modelling techniques and stress-displacement curves, an experimentally verified FE-model was achieved. The model can be used for simulating concrete cracking and evaluate material properties at meso level.	
Students	**Elin Alexandersson & Birgit Amblie Solerød**
Opponents	Erika Abrahamsson & Josefin Petersson
Supervisors	Mathias Flansbjer (SP) & Rasmus Rempling
Examiner	Rasmus Rempling

Room VH

Façade Elements of Vacuum Insulated Textile Reinforced Green Concrete	
Abstract: This Master's thesis project was part of an ongoing research project that aims to develop a Passive House classified façade element of textile reinforced green concrete and novel insulation materials that can reduce the energy use, material use and emissions in the building sector. The aim of this Master's thesis project was to model and simulate the behaviour of the element when installed in the research arena HSB Living Lab and to study shrinkage of green concrete. A laboratory study of green concrete with and without fly ash was conducted to evaluate the effect of fly ash as a shrinkage reducer.	
Students	**Sandra Bentland**
Opponents	Ben Owilli
Supervisors	Filip Nilenius, Angela Sasic Kalagasidis & Helén Jansson
Examiner	Filip Nilenius

Room VK

Influence of shrinkage strain in prediction of crack widths using different calculation methods	
Abstract: It is not specified in Eurocode 2 if and how shrinkage strain of concrete should be considered in calculations of crack widths in reinforced concrete structures. The aim of this study was to investigate different approximate approaches to calculate steel stress and crack widths with regard to shrinkage. A parametric study was performed where the more accurate calculation method in fib Model Code 2010 was used as a reference. The project resulted in recommended procedures for crack width calculations.	
Students	**Emmanuel Obiadada Okoye**
Opponents	
Supervisors	Björn Engström
Examiner	Björn Engström

Master's thesis seminars - June, 11th 2015

Session 7, 16:00-17:00

Room VB

Utilisation of steel sandwich panel decks in medium span bridges – a case study	
Abstract: Steel sandwich panels (SSP), composed of two face plates attached to a core, have a high strength-to-weight ratio. The purpose of this thesis was to evaluate the potential of SSP decks as a cost-efficient alternative to concrete decking in launched composite bridges. The behaviour of the SSP deck was studied with FE-analyses and compared with an existing composite bridge. The results showed that the construction time can be significantly reduced since the main girders can be launched together with the SSP deck.	
Students	**David Dackman & Walter Ek**
Opponents	Johan Fredberg & Adam Johansson
Supervisors	Peter Nilsson, WSP
Examiner	Mohammad Al-Emrani

Room VF

Towards pedestrian graphene bridges **A dynamic analysis and evaluation**	
Abstract: The use of graphene in pedestrian bridges, where aesthetics and design have an important role, will lead to a revolution in the field. The strength and lightness of graphene will broaden the possibilities in span lengths and slenderness. Together with these possibilities dynamic problems may arise. This project reviewed the dynamic problems of pedestrian bridges. Different bridge models with several cross-sections and materials were designed and analysed, comparing their dynamic behaviour. In conclusion, the evaluation highlighted the dynamic issues with ultra-lightweight materials.	
Students	**Jesús Armesto Barros & Andrés Serena Gómez**
Opponents	David Wesley & Carl-Marcus Ekström
Supervisors	Alexandre Mathern (NCC Construction) & Rasmus Rempling (Chalmers)
Examiner	Rasmus Rempling

Room VH

Structural modelling of textile reinforced concrete (TRC) sandwich panels	
Abstract: In TRC sandwich panels, the conventional steel reinforcement is replaced by high strength textile fibre mesh, enabling reduced thickness without losing the panel's strength and ductility. Implementation of TRC in sandwich panels was discussed and modelled. Due to the reduced thickness of the panel, the design of the connection between the outer and inner panels is among the main challenges. The results of 3D FE-models combined with test results of different commercially available connectors showed a great influence of the bond between concrete and connectors. A modified plate connector was then examined as a promising solution for the TRC panels.	
Students	**Guðlaugur Már Guðmundsson & Óskar Bragi Guðmundsson**
Opponents	Jón Pétur Indriðason & Vésteinn Sigmundsson
Supervisors	Kamyab Zandi
Examiner	Filip Nilenius

Contention of FRP members	
Abstract: In order to use the FRP material in structure's applications the better understanding of FRP connection and setting a proper design is completely vital. This report is the part of on-going study in the field of FRP composites connections and has the aim to increase the knowledge in this regards by presenting the important parameters in mechanical and bonded connection. This report also presents the experimental works that has been done in both mechanical and adhesive connections. In the last part of this report the new methods for connection is presented.	
Students	**Mohammad Sadegh Khani**
Opponents	Ali Kakavand & Arman Ghahraman & Andres Cuaran Bermudez
Supervisors	Reza Haghani
Examiner	Reza haghani