

Posting

Suggested topics for Master's theses at the Chair of Steel and Hybrid Structures

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Suggested topics for Master's theses

- **»Capillary Glass Units as IGUs – Evaluation of Experimental Data for the Assessment of Indoor Climatic Conditions «**
Fluid-carrying glasses (IGU) shall be used in insulating glass units for active cooling and heating of rooms. Within the project experimental data will be evaluated and the functionality of the capillary glass units is presented based on the calculation of the indoor climate conditions (thermal comfort). *(Contact: Sirtl)*
- **»Bending Tests on newly Developed Capillary Glasses as part of Insulating Glass Units«**
Fluid-carrying capillary glasses shall be used in insulating glass units. Bending tests will be performed on capillary glasses to obtain the bending tensile strength of the material. *(Contact: Sirtl)*
- **»Static-Constructive Investigations of Skywalk Bauhaus.Walk«**
As part of an interdisciplinary master thesis, which was conducted by the Faculty of Architecture and Urban Studies in cooperation with the Chair of Steel and Hybrid Structures, a mobile Skywalk was developed and a feasibility study on various aspects is being prepared. This project offers many opportunities to statically and creatively expand interesting concepts. Moreover, various details are constructively to design and to be carried out the analysis of it. The different tasks should be primarily prepared in Student research projects. *(Contact: Mämpel)*
- **»Computational Investigation on the Influence of Welded Crane Rails to the Stability Behaviour of Crane Runway Girders«**
For the design of crane runway girders, crane rails (welded squared rails) which are often rigid connected are normally not taken into account in determining section properties. The effects of an integrated consideration on the resistance are the content of current investigations. Further considerations of crane runway girders and its stability problem with optimised cross section properties for single span girder has already carried out. Based on this, further static systems such as two span girder should be considered. A parametric study should be used in verification of how different cross Section properties affect ultimate limit state as well as serviceability. In this content the stability behaviour of the girders plays an important role to the design. In addition, the

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investigations should be conducted with regard to the fatigue resistance of the weld seam between crane runway girder and the rail. This has to be included into the consideration of verification procedure. *(Contact: Mämpel)*

- **»Computational Investigation of new Type of Roof- and Facade Construction from Honeycombed-Element-System«**

An existing constructive concept for roof- and facade constructions made of honeycombed elements, which is designed as system-design, should be investigated under static point of view. The goal is to develop a system structural analysis, which regard to both global and local verifications.

(Contact: Mämpel, Sirtl, Ibanez)

- **»Plate Buckling under Biaxial Compressive Stresses«**

For the verification of buckling panels under biaxial compressive stresses, an extended verification method has to be developed. Further investigations for plates that are partially under tension and biaxial compression should be done. Literature research to the broaden verification method as well as above mentioned situation of partially under tension of buckling plates with subsequent numerical investigation are to be conducted and evaluated. *(Contact: Mämpel)*

- **»Geometric Imperfections for Plate-Buckling Verification«**

Numerical methods continue to become increasingly important. This also applies to verifications against plate buckling. For this stability mode, investigations using numerical methods should be carried out considering equivalent geometric imperfections and be, compared with existing design models. In this context unstiffened and stiffened buckling panels are to be included in the investigations. *(Contact: Mämpel)*

- **»Plate-Buckling Verification in Steel Bridge Construction«**

For the investigation of plate buckling two main methods are distinguished. Until now, the conventional method in Germany is the method of reduced stresses. In the European context, this is not the standard procedure and a method taking into account effective cross-sections is focused.

With regard to capacity and fatigue behaviour, which is of particular importance in the bridge design, comparative studies are to be carried out with the mentioned verification methods. In addition, numerical computations are to be performed which permit further evaluations and investigations regarding the design models. *(Contact: Mämpel)*

- **»Stiffening Concepts of Buckling Panels«**

In the past, different stiffening variants and concepts using different types of stiffeners were applied for buckling endangered plates in practice. In this context, conventional stiffening concepts are to be investigated and evaluated. In addition, new stiffening concepts are to be developed. Next to the aspect of

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load capacity, the practicability of the construction and influences of cost-effectiveness are to be included in the investigations. *(Contact: Mämpel)*

- **»Regarding the Connection Behaviour in Structural Beam Analysis Software«**

For the calculation of internal forces and moments of steel and composite structures using beam theory, the behaviour of semi rigid joints has to be considered in terms of rotational spring stiffness. In practical application, this is connected to an iterative process, since the design of the connection can only be performed after having knowledge about the stressing of the joints. Within the framework of this thesis, spring models should be simplified to describe connection stiffness with only few possible influencing parameters. The aim is to integrate the connection description obtained thereby as an adaptive element in structural beam analysis software and to automate the iterative process of the calculation. *(Contact: Mämpel, Sirtl, Ibanez)*

- **»Further Investigations of Lateral Torsional Buckling of Girders with out of the Plane Elastic Intermediate supports of the Compression Flange«**

New scientific work indicates that systems with stability problems supported by elastic intermediate springs of the compression flange, the limit load results not of the first eigenmode. For limit load determination, higher eigenmodes has to be considered. As a part of student work, various publications have to be examined and further comparison calculations should be performed. *(Contact: Mämpel)*

- **»Characterization of Shear Deformation in the Range of Discontinuity in Beams with Wide Flanges«**

As a part of research on numerical methods the Chair of Steel and Hybrid Structures is currently developing further approaches to determine the effects of shear lag and the resulting normal stress for beam elements. There are additional effects in the area of discontinuity that requires further examination. For the better assessment of the behaviour and to derivate a calculation approach, further comparative calculation on detailed FE-models are required. As a part of student project or Master's thesis, a series of FE-simulations are to perform and to evaluate. If possible, the derivation of a calculation approach should be developed. *(Contact: Mämpel)*

- **»Evaluation of the Stability Behaviour of Cold Formed Σ -Purlins using Higher and High Strength Steel«**

The application of high strength steel becomes an increasing use in constructional steel work. This is also for cold-formed thin wall structural components for example Σ -purlin. Meanwhile, steel grades of S420 and S550 are propagated. Regarding to very slender components and distinct stability problem (plate buck-

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ling, distortional buckling, lateral torsional buckling), the efficient use of material is questioned. As a part of a special project, the cross section in the market with higher strength and high strength steel grades are to be examined. The economic efficiency is to be compared with standard steel strengths.

(Contact: Mämpel)

- **»Implementation of Total Equivalent Imperfection Method for Girder under Bending and Compressive Stresses«**

Recent research work concern evermore about a global stability verification of a combined loading for bending and normal stresses of steel beams using the application of computational method in accordance with 2nd order theory. Based on the general verification method of the EC3 a generalized equivalent imperfection method is developed according to Papp. In the context of Master's thesis, the approach of this method should be profoundly explained and implemented in a suitable structural analyses program for beam elements. The application and functional capability are to be examined and evaluated with regard to various comparison calculations. *(Contact: Mämpel)*

- **»Software Developments in Themes of Steel, Composite and Hybrid Construction«**

Program developments for different problems premising an easy allocation by spreadsheet-based VBA-programming.

For example: Development of a program for the calculation of connection resistance and stiffness.

(Contact: Mämpel, Sirtl, Ibanez)

Further tasks are possible upon request.

Gladly we will supervise your own suitable topics, in agreement with the chair.

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