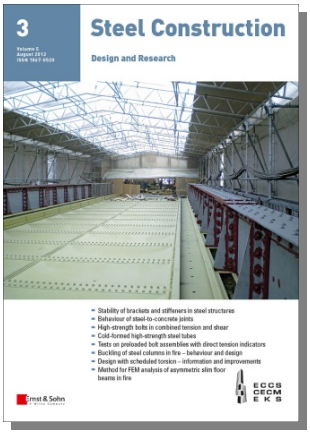
Steel Construction 3/2013

Design and Research

The international journal for steel construction in research and practice



Advertising Deadline:
July 12th 2013

Publishing Date:
August 14th 2013

Additional circulation:

- ECCS Annual Meeting, September 2013, Capry/Italy

Membership journal of the ECCS

European Convention for Constructional Steelwork

Products & Projects

Company news about products and projects in constructional steelwork

Deadline for press releases: 12thJuly 2013

Editorial Content

Editorial - Editor: Thomas Ummenhofer:
Offshore Windenergy – Challenging New Techniques

Michael Siems, Rüdiger Scharff:
Pushing the Limits – Mega Monopile Offshore Foundations for Wind Turbines

Offshore monopile foundations are simply structured and in large parts automated fabricable and quick to install. They are therefore the most economical type of foundation for up to 35 m water depth. It is in everyone's interest to extend the range of applicability of monopile foundations to water depth up to 40 m and more. Therefore the design and calculation procedures have to be established. Approaches are presented in this paper.

Andreas Thieme, Falko Schröder:
Characteristics and Production Processes of Modern Heavy Steel Plates for the Use in Offshore Installations

Steels for structural applications both for oil and gas as well as for offshore wind installations are demanding requirements that exceed those for steels used in normal structural steelwork. The applicable steel grades must show an optimum trade-off between sufficient toughness and good strength properties and have to allow at the same time easy fabrication, in particular concerning weldability. While sufficient toughness is of importance in order to avoid brusque failure phenomena such as brittle fracture, good strength properties are necessary to minimize the dead weight of this structure in order to facilitate the transport and erection process. The significance of good fabrication properties consist of two facets: A good weldability results in easy processing procedures and thus in cost efficiency fabrication. Further on, material with good weldability shows a higher resistance against cracking phenomena in the heat affected zone and hence also higher forgivingness against non-optimum welding conditions, which may occur during the erection in harsh environments. The steel for this material has to be tailor-made in the steel plant with the aim of producing it as clean as possible with specially adapted alloying concepts. The slabs and ingots, casted for plates for offshore use must fulfil both an accurate control of the segregation as well as a high thickness in order to get a high deformation ratio in the rolling process. These materials are produced with various rolling and heat treatment processes, each chosen by the desired grade, thickness and weight of the final plate. In use are the process of normalizing the plates, the thermomechanical rolling process and the quenching and tempering of the plates.
This article aims to support the designer or fabricator in the steel grade selection by explaining the different production methods and the resulting properties with respect to the final use.

Ernst & Sohn A Wiley Company

Wilhelm Ernst & Sohn – Verlag für Architektur und technische Wissenschaften GmbH & Co. KG, Rotherstraße 21, D- 10245 Berlin, Germany

Thomas Ummenhofer, Philipp Weidner:

Improvement factors for the design of welded details treated by high frequency hammer peening

Fatigue is an important aspect regarding the integrity of welded steel structures like bridges, cranes and offshore wind energy converters. As a consequence of increasing plant sizes, traffic loads and complex loading conditions, methods for improving the fatigue strength of those structures are continuously growing in importance. It could be proved within different research projects at KIT, that the fatigue life of existing and new welded details can be significantly increased by the application of high frequency hammer peening methods. For fatigue assessment different design approaches have been established to account for beneficial effects by the use of post weld treatment. Based on extensive fatigue tests at KIT, recommendations for fatigue assessment of welded details improved by high frequency hammer peening methods are given in this paper.

Werner Rücker, Pablo Cuellar, Matthias Baeßler, Krasimire Karabeliov, Steven Georgi:

Large Scale Testing Facility for Cyclic Axially loaded Piles

Offshore piles have to withstand predominantly cyclic axial loads when they are installed in multi-pile configurations, as in jacket foundations. The dimensions of the pile are ruled both by the internal capacity and fatigue behavior of the steel cross section as well as by its external capacity in the pile-soil interaction. Due to the large numbers of piled foundations required for the current and future installation of offshore wind-farms, there is a pressing need to optimize the dimensions and related costs of the single piles. Concerning the pile capacity, two major topics of research are the determination of possible capacity gains due to pile ageing effects and a proper consideration of cyclic degradation. In order to investigate both effects, a large scale testing facility has been constructed at the BAM TTS site in Horstwalde, near Berlin. In this open-air facility, large driven pipe piles can be loaded cyclically in both tension and compression, while the ageing effects can be studied by introducing temporal delays between the testing campaigns. First results already show a moderate increase in pile capacity with time. Concerning the expectable capacity degradation of the cyclically loaded piles, the preliminary results showed a wide range of outcomes, some of them not predicted by past experience. Additional tests are currently being conducted for further clarification.

Michael Schmidt, Ekkehard Fehling, Torsten Leutbecher:

Grouted Connections for Offshore Wind Turbine Structure (part 1): Grouting Material and Quality Control

For Offshore Wind Turbine structures, grouted connections are widely used to connect the tower structure to the foundation while accommodating for unavoidable geometrical tolerances effectively.
The long time behavior of high- and ultra-high strength grouts primarily depend on both the adequate strength and durability of the material as well as on the process reliability. The performance of the fresh and of the hardened grout is influenced by multiple factors which have to be evaluated and to be considered individually respecting the “rough” offshore conditions: Performance and consistency of the mix, ambient conditions at the place and time of use, equipment for and steadiness of the mixing and casting process, length of casting time and mechanical and thermal loadings in the early stage. To assure a sufficient long term behavior, a meaningful quality assurances System shall be installed covering both the material and the process.

Michael Schmidt, Ekkehard Fehling, Torsten Leutbecher:

Grouted Connections for Offshore Wind Turbine Structure (part 2): Structural Modeling and Design of Grouted Connections

For Offshore Wind Turbine structures, grouted connections are widely used to connect the tower structure to the foundation while accommodating for unavoidable geometrical tolerances effectively.
In many cases the design checks of grouted connections follows international codes which contain analytical design equations. In order to also obey mechanical consistency and to satisfy basic requirements according to the Eurocodes, different mechanical models have been used in a number of cases. In this regard, nonlinear Finite Element models as well as Strut-and-Tie models have been applied. Findings from these calculations as well as from experimental investigations on both the material and the structural level are analyzed and compared. In conclusion, proposals for improved design approaches are presented in Part 2.

Martin Stadler, Martin Mensinger:

Simplified Finite Element Analyses for Fire Design of Slabs Including Membrane Action

Simplifications to finite element models are presented. These form part of a new method for designing full concrete and composite slab systems with partially unprotected secondary steel beams in the case of fire, taking into account tensile membrane action. Internal forces can be determined with the simplified model, and cross-section design procedures can be applied to calculate the required reinforcement amount equivalent to ambient temperature. The finite element model is simplified by replacing the thermal analysis with a substitute thermal loading. Non-linear material behaviour is taken into account by a reduced stiffness of the model which allows an efficient linear elastic calculation. The new method presented therefore enables the simple and efficient design of slab systems in the case of fire.

Reports

Ewa Maria Kido, Zbigniew Cywiński:

The new steel-glass architecture of buildings in Japan

Practical examples of modern architecture in the western hemisphere, based upon the structural composition of steel and glass, have been presented within the recent years several times. Hereby, also their theoretical background has been discussed. This paper is focused on the relevant architectural representations in Japan. Buildings of commercial and public use are here of sole interest – with special emphasis on their ultramodern design character. Other types of infrastructure objects, like railway station and airport constructions are planned to be considered in future.

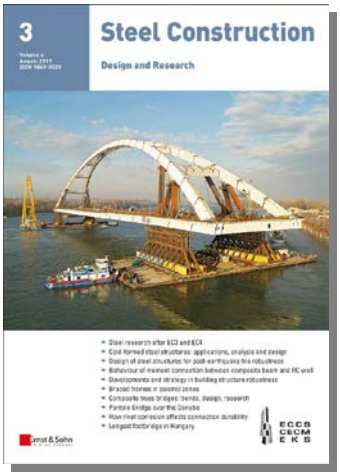
Ernst & Sohn
A Wiley Company

Wilhelm Ernst & Sohn – Verlag für Architektur und technische Wissenschaften GmbH & Co. KG, Rotherstraße 21, D- 10245 Berlin, Germany

General Information

Membership journal of the ECCS

European Convention for Constructional Steelwork



Steel Construction

Design and Research

The international journal for steel construction in research and practice

Volume 6, 2013 - 4 issues per year
Editor: Ernst & Sohn, Berlin; Chief Editor: Dr.-Ing. Karl-Eugen Kurrer

Steel Construction - Design and Research
publishes peer-reviewed papers covering the entire field of steel construction research.

Steel Construction - Design and Research
unites in one journal the holistic-oriented steel construction, which interlinks competently - in the interest of resource-saving construction - with other types of construction like concrete-, glas-, cable- and membrane construction to the system-integrated steel construction.

Expert essays in Steel Construction - Design and Research are primary publications.

This journal is therefore aimed not only at academics, but in particular at consulting structural engineers, and also other engineers active in the relevant industries and authorities

In addition, Steel Construction - Design and Research informs about product innovations from the building and construction industry.

An internationally renowned editorial board assures a most interesting selection of topics and guarantees a high standard of the contributions.

Together with the expert journal Stahlbau (Steel Structures), being published in German at the publishing house Ernst & Sohn since 1928, Steel Construction - Design and Research, mirrors the world-wide development and the standard of knowledge in steel construction. Expert essays in both journals are primary publications. Steel Construction - Design and Research and Stahlbau (Steel Structures) are uniquely uniting the steel-construction community from research and practice on national and international levels in two complementary expert journals.

Ernst & Sohn
A Wiley Company

Wilhelm Ernst & Sohn – Verlag für Architektur und technische Wissenschaften GmbH & Co. KG, Rotherstraße 21, D- 10245 Berlin, Germany