

Teaching creativity in structural design – approaches and problems in Germany

Eberhard MOELLER*, Hans NUNGESSER*

*Karlsruhe University of Applied Sciences
Moltkestr. 30, 76133 Karlsruhe, Germany
Eberhard.moeller@hs-karlsruhe.de

Abstract

With around 1.94 million employees and a turnover of approximately € 237 billion, the construction industry is a significant economic sector in the German economy. The number of persons working in the construction industry is about twice as large as in mechanical engineering, and the turnover of both sectors is almost the same.

While the German Research Foundation DFG approved € 355.9 million funding for “Mechanical Engineering and Production Technology” in the years 2014 to 2016, the sector of “Building and Architecture” only received commitments of € 91.3 million, that is only about one Quarter of the mechanical engineering sector and only 1.1% of the total commitments of the DFG. By contrast, the percentage of gross domestic product used in Germany for construction investment is 9.9%, which is about 10 times higher than the percentage of research fundings for this economically important sector.

These figures indicate a comparatively low level of research, development and innovation in the construction industry. Looking at the field of structural design, Werner Sobek notes that the training of civil engineers, especially in structural engineering, is still today almost exclusively concerned with the analysis of given structures. But in Sobeks opinion it is much more important to design the optimum by means of a suitably qualified structural design, and then to confirm this optimality by a corresponding analysis process. However, this insight is still extraneous to most of the civil engineering faculties of the world.

At least the German construction industry owes significant innovations and research results to Frei Otto, who, as a pure structural designer, has worked almost always creatively together with architects on the one hand and with engineers on the other. Regarding this background and Frei Ottos professional career, the importance of creativity in the study course of civil engineering will be researched. Promising approaches and existing problems in teaching creativity are included in this investigation on the basis of a case study.

References

- [1] I. Meissner and E. Möller, *Frei Otto – a life of research, construction and inspiration*, Munich: Detail, 2015.
- [2] E. Möller, “Invention and Innovation in structural design and construction – Frei Otto and the Munich Olympic Stadium 1972 – a historical case study,” in *ICCH5. Proceedings of the Fifth International Congress on Construction History*. B. Bowen, D. Friedman, T. Leslie, J. Ochsendorf Eds., Chicago, Illinois, 2015.
- [3] E. Möller, “Frei Otto – Lightweight roofs for a modern world,” *Stahlbau*, vol. 84, no. 5, pp. 299-304, 2015.