

Editorial

This issue of Heron is devoted to the old subject of shear in concrete structures. People may wonder why in 2015 this topic, on which already so much research has been carried out during decades, is worth to get new attention. The most important trigger to this is the aging of our infrastructure.

Actually there is a new situation. In the last 30 years the focus of research and education was predominantly on the design of new structures. The most important design criteria were structural safety and serviceability. Meanwhile, however, there is a large inheritance of existing structures which do not satisfy those requirements anymore. On the one hand, this is due to deterioration of materials. On the other hand, the design loads, which are nowadays larger than in the past, play a role. Due to the increase in loads many existing structures, at least theoretically, cannot carry the traffic loads with sufficient safety.

Most structures, however, have the disposal of a significant residual bearing capacity. For example, the actual concrete strength is significantly larger than assumed in the original design. Moreover, existing structures often have been designed according to simplified design principles, so that not all reserves have been utilized. And even the actual codes of today have basically been written for new structures. They represent structural behaviour in a simplified way, in order to not bother designers too much with complex theories, which furthermore are prone to errors.

Nowadays, the task of structural engineers is more and more to prove whether older structures still have a sufficient bearing resistance, in order to avoid unnecessary investments in strengthening and retrofitting. That means that now more refined theories, able to take profit of "hidden" residual capacities, are most welcome.

This new situation has also consequences for the set-up of new design recommendations. The fib Model Code for Concrete Structures 2010 distinguishes different Levels of Approximation for any design aspect. Simple models may be used for predesign of structures or structures with low or moderate relevance. More refined models for design and analysis are offered for cases where the bearing capacity should be determined as accurately as possible in order to provide a solid basis for decision making regarding upgrading with sometimes large financial consequences.

A few years ago, provisional calculations showed that the structural safety of about 3600 bridges in the Netherlands, under supervision of Rijkswaterstaat (Department of Public

Works), were possibly not safe enough. In most cases the shear bearing capacity was the most important point of concern.

Therefore, a large-scale research program was started, focusing on discovering behavioural aspects creating residual bearing capacity. This was an open invitation to look again to the old subject of shear bearing capacity and develop more realistic and more accurate models. In this issue of Heron, attention is given to a number of research programs carried out in recent years, aiming at better understanding of the structural behaviour. On the basis of that concrete structures can be better designed and assessment models for shear bearing capacity can be developed.

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