Editorial

In codes for structural concrete it is still mostly assumed that the properties of concrete are sufficiently characterized by expressions, containing the concrete strength as the only variable. Nowadays a new approach to the design of concrete structures is coming up, denoted as "defined performance design". This implies that new concrete structures will not only be designed for safety and serviceability, as was common practice up to now, but as well for various criteria related to service life and sustainability. In this respect it is important to recognize the possibility of designing not only concrete structures, but as well designing the material concrete for optimum behaviour with regard to predefined requirements. In order to create a basis for designing defined performance concrete, at first the relation between concrete composition and mechanical properties should be understood. Three of the six papers presented in this issue of Heron deal with this subject for the case of plain concrete, whereas the other three deal with fibre reinforced concrete.

Starting with plain concrete, the paper of Midorikawa (former guest researcher at TU Delft) et al. focuses on the relation between the thickness and the composition of the paste layer around the aggregate particles in self-compacting concrete and the rheologic properties of this material. In the paper authored by Ye and van Breugel the important aspect of connectivity of pores in concrete is studied, which is one of the key parameters for durability and fire resistance. The paper by Fennis et al. deals with the question whether it is possible to obtain a concrete with equivalent properties, reducing the cement content in combination with optimizing the particle packing. Such a concrete could give a substantial impulse to the reduction of CO_2 emission, due to concrete production.

With regard to steel fibre reinforced concrete it has been noted that already since decades it is tried to optimize the behaviour of this material. Since a few years it is understood that fibres should not only be added to concrete, but that fibre type and fibre volume should be harmonized with the composition of the concrete in which they are embedded. Moreover it is recognized that the way in which fibre concrete is cast may have a substantial influence on its properties and especially on the variation of its properties. In the paper by Grünewald et al. the relation between fibre orientation and the flow of concrete is studied. This aspect is of importance for the derivation of design rules, introducing a fibre orientation factor in order to account for the variation of mechanical properties along the

structural element considered. In the paper by Schumacher et al. the effect of steel fibres on the rotation capacity of reinforced concrete members is studied. It shows on the one hand the effect of improved ductility, but on the other hand the effect of localization of deformations on the rotation capacity. Finally the paper by Yang et al. deals with the behaviour of ultra high strength fibre concrete members, which are not only reinforced with steel fibres but as well with conventional reinforcing bars. Relations are derived both for elements subjected to tension and to bending.

It is hoped that this issue of Heron may contribute both to the introduction of the concept of defined performance design of concrete and to the further development of special types of high performance concrete. The support of STW, which enabled a substantial part of the research presented in this issue of Heron, is gratefully acknowledged.

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