DESIGN ADJUSTMENT FACTORS AND THE ECONOMICAL APPLICATION OF CONCRETE FLAT-SLABS WITH INTERNAL SPHERICAL VOIDS IN SOUTH AFRICA

by

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SUMMARY OF DISSERTATION

Design adjustment factors and the economical application of concrete flat-slabs with internal spherical voids in South Africa

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Long span flat slab systems with internal spherical void formers have been used in Europe for a decade now. Cobiax® is the brand name of a successful system, recently introduced in South Africa. It is a bi-axial reinforced concrete flat slab system, with a grid of internal spherical void formers. The main advantage is the possibility of long spans due to the significant reduction in own weight, as well as the fast construction sequence with the use of flat slab formwork systems.

Design requirements of SANS 10100:2000 are affected. Vertical shear capacity is a concern due to loss of aggregate interlock. Research in Germany proved a factor of 0.55 to be a conservative shear resistance reduction factor for Cobiax slabs. Theoretical and preliminary laboratory South African research suggests that a greater factor of 0.85 might be used when considering the shear capacity of the steel cages. These cages' vertical legs also cross the cold joint caused by the two concrete pours required for Cobiax slabs, and proved to provide sufficient horisontal shear resistance if the correct cage diameters are used.

Laboratory tests in Germany supported by theoretical calculations further showed reduced deflections for Cobiax slabs. Although stiffness and own weight are reduced due to the voids, Cobiax slabs had smaller absolute deflections than solid slabs with the same thickness.

Cobiax research factors are safe to apply to SANS 10100-01:2000. The economy of Cobiax slabs was tested against that of coffer and post-tensioned slabs. Different span lengths and loads were considered. Based on 2007 material costs in South Africa, Cobiax slabs subject to the same loads and span lengths will be slightly more expensive than that of coffer slabs and post-tensioned slabs when considering only direct slab construction costs. Cobiax will be most appropriate where a flat soffit is required for high multi-storey buildings, requiring large spans with a light load application.

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