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Numerical study on shrinkage cracking in concrete slabs on grade

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Continuous reinforced concrete slabs on grade have been widely used in several applications such as industrial pavements, highways and airports.

The development of cracks in slabs during service can reduce bearing capacity and promote the fatigue failure velocity. It is well known that concrete shrinkage as well as thermal effects tend to be the principal reasons for the initial crack formation in slabs since these elements present large size, low thickness and high degree of restraint. A numerical study on the risk of cracking due to shrinkage in slabs on grade is presented herein.

The numerical analyses were carried out by considering different size and thickness of slabs in order to evaluate the influence of these parameters on the development of crack patterns. Shrinkage stresses in slabs on grade are considerably influenced by external and internal constraints which counteract the contraction on these elements. Accordingly, several sub-grade conditions have been considered. Moreover, different environment conditions were adopted.

The numerical analyses evidence many features concerning the risk of cracking due to shrinkage with respect to concrete strength class, slab geometry, sub-grade and environment conditions.