

## Numerical Simulation of Precast Concrete Panels for Airfield Pavement

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**Abstract :** Numerical analysis software belong to the main tools for simulating the real behavior of various concrete structures and elements. In comparison with experimental tests, they offer an affordable way to study the mechanical behavior of structures under various conditions. The contribution deals with a precast element of an innovative airfield pavement system which is being developed within an ongoing scientific project. The proposed system consists a two-layer surface course of precast concrete panels positioned on a two-layer base of fiber-reinforced concrete with recycled aggregate. As the panels are supposed to be installed directly on the hardened base course, imperfections at the interface between the base course and surface course are expected. Considering such circumstances, three various behavior patterns could be established and considered when designing the precast element. Enormous costs of full-scale experiments force to simulate the behavior of the element in a numerical analysis software using finite element method. The simulation was conducted on a nonlinear model in order to obtain such results which could fully compensate results from the experiments. First, several loading schemes were considered with the aim to observe the critical one which was used for the simulation later on. The main objective of the simulation was to optimize reinforcement of the element subject to quasi-static loading from airplanes. When running the simulation several parameters were considered. Namely, it concerns geometrical imperfections, manufacturing imperfections, stress state in reinforcement, stress state in concrete and crack width. The numerical simulation revealed that the precast element should be heavily reinforced to fulfill all the demands assumed. The main cause of using high amount of reinforcement is the size of the imperfections which could occur at real structure. Improving manufacturing quality, the installation of the precast panels on a fresh base course or using a bedding layer underneath the surface course belong to the main steps how to reduce the size of imperfections and consequently lower the consumption of reinforcement.

**Keywords :** nonlinear analysis, numerical simulation, precast concrete, pavement

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