

SCIENTIFIC NOVELTY OF THE DISSERTATION

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Thesis' title: Investigation of the electrical resistance behavior of self-sensing concrete under elastic compressive loading

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The dissertation on the research and development of self-sensing concrete (SSC) is an advanced research direction with significant scientific importance, not only for the scientific community in Vietnam but also for contributing to the general understanding of this emerging material within the international scientific community. Specifically, the novelty and scientific significance of this research can be summarized as follows:

Firstly, the focus on clarifying the linear electrical resistivity response region of concrete within the elastic compression range represents a new research approach compared with previous studies. This enables SSC to be utilized multiple times and over a long-term period with high accuracy, instead of being used only once and requiring replacement when internal damage occurs within the concrete structure.

Secondly, the modeling of the electrical resistivity behavior of concrete by considering the simultaneous effects of multiple influencing factors represents a novel approach with significant scientific value, as most previous studies have focused on analyzing the independent effects of individual factors. This research

contributes to formulating calibration equations for SSC-based sensing devices while considering the complex influences arising during the service process, thereby bringing this solution closer to practical implementation and broader applications.

Thirdly, this research clarifies the electrical resistivity behavior not only of an individual concrete specimen but also of a system consisting of multiple concrete specimens. This represents a new research approach that has not been widely reported in previous studies. When multiple concrete specimens are installed within the same device and subjected to simultaneous loading, the electrical resistivity response of each specimen may differ depending on the loading condition applied to each specimen. However, the overall response of the entire system remains stable and consistent with the total applied load of the whole system. This finding has important significance for the flexible utilization of SSC in multi-specimen sensing systems.

Based on the obtained results, the practical contributions of this research can be summarized as follows:

(1) SSC can be applied as a sensing device for compressive load measurement. The sensor operates within a low compressive stress range, thereby limiting the initiation and development of microcracks inside SSC during operation. This contributes to improving measurement accuracy and extending the service life of the sensing device.

(2) The research results and findings of this dissertation provide an important scientific foundation for the research and development of next-generation weighing systems using SSC materials with reasonable costs. These contributions contribute to diversifying sensing technologies and improving the effectiveness of applications in smart transportation infrastructure systems.