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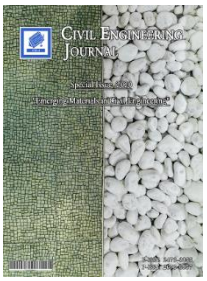

# Fine-grained Concrete Mix Design using Statistical Methods for Ultra-thin Whitetopping Overlay Application

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**Abstract**

Whitetopping is a thin layer structure covering on an existing asphalt pavement to improve resistance to rutting and increase the durability road surface. This thin layer usually made of concrete without coarse aggregate, is used mainly to repair the old damaged asphalt road surface without altering its texture. Due to the high longevity, using this type of concrete for reinforcing and repairing roads in unfavorable climatic conditions as in Vietnam brings technical, economic, environmental effective, and suitable with the trend of sustainable development. This article shows results on mix design of high performance fine - grained concrete used for thin Whitetopping overlays from materials available in Vietnam by using statistical methods. The Design Expert 11.0 software was used to evaluate the influence and relationship between the influencing variables such as the ratio Water/Binder and the Sand/Binder ratio and concrete strength through the regression equation determination by experimental planning method. After checking the compatibility, the maximum value of the compressive strength and optimum mix design were found through solving this mathematical model. The concrete with optimum proportion has good workability, high abrasion resistance; its compressive strength develops rapidly at early age and achieves more than 100MPa at 28 days. Using this Fine-grained concrete will help increasing durability and reduce the maintenance cost in the future.

*Keywords:* Whitetopping; Fine-grained Concrete; Compressive Strength.

## 1. Introduction

Overlays of Portland cement concrete on existing hot asphalt concrete pavement has been considered as a rehabilitation materials for over 80 years. These coatings have already been used in airports; Highways, main roads, even in parking lots to improve the performance, durability and quality of HMA with the deteriorated surface [1, 2]. Whitetopping has a smaller thickness with shorter joint spacing, without tie bars or joint sealing. It has a small joint spacing to minimize stress from wheel load applications as well as the humidity and temperature changes [3, 4]. If properly designed and constructed, Ultra-Thin Whitetopping (UTW) and Thin Whitetopping (TWT) can help minimize the adverse impacts associated with regular HMA pavement repairs and restoration, helping to save the annual maintenance costs [5, 6].

There are three categories of whitetopping overlays depending on the thickness and bond type between the HMA and these overlays and [7, 8]:

- Conventional whitetopping is a concrete overlay with the thichkness of 200 mm or more, designed and constructed without consideration of a bond between the concrete and underlying hot - mix asphalt.

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