



# Effects of Using Silica Fume (SF) in Improving Permeability Properties of Self-Compacting Concrete (SCC)

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## Abstract

Self compacting concrete (SCC) is a highly workable concrete characterized by extreme fluidity that can flow through heavy reinforced and complex structural elements under its own weight and without any vibration. The literature indicates that while many research are available on mechanical property of SCC there are a few studies on durability property of SCC like permeability. Permeability leads to moisture and destructive ions penetration and, thereby, to corrosion of the embedded reinforcement in concrete members. Silica Fume (SF) is an additive material which can improve permeability of concrete. The amount of added SF gives high strength and chemical resistance of concrete. In this research SF is recognized as an accepted concrete additive and the effects of this material on permeability and strength of SCC is comparing with usual SCC samples. Finally best replacement percentage of SF is estimated to achieve best permeability position with the same water to cement ratio.

**Keywords:** Self-Compacting Concrete (SCC), Silica Fume, permeability.

## 1. INTRODUCTION

The development of Self-Compacting Concrete (SCC) has recently been one of the most important developments in the building industry. The purpose of this concrete concept is to decrease the risk due to the human factor, to enable the economic efficiency, more freedom to designers and constructors and more human work. It is estimated that SCC may result in up to 40% faster construction than using normal concrete [1]. It is a kind of concrete that can flow through and fill gaps of reinforcement and corners of moulds without any need for vibrations and compacting during the pouring process. Because of that, SCC must have sufficient paste volume. Paste volumes are usually higher than for conventionally placed concrete and typically consist of high powder contents and water-powder ratios.

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## 2. EFFECT OF USING SILICA FUME IN CONCRETE

Silica fume, also known as micro silica, is a byproduct of the reduction of high-purity quartz with coal in electric furnaces in the production of silicon and ferrosilicon alloys. Silica Fume is also collected as a byproduct in the production of other silicon alloys such as ferrochromium, ferromanganese, ferromagnesium, and calcium silicon (ACI Comm. 226 1987b). Before the mid-1970s, nearly all Silica Fume was discharged into the atmosphere. After environmental concerns necessitated the collection and land filling of Silica Fume, it became economically justified to use Silica Fume in various applications.