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# Mechanical Properties of Steel Fibers Lightweight Aggregate Concrete

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**Annotation:** The high self-weight of concrete led to an increased dead load of the structures, which increased the applied loads on the foundation and soil. Several studies have been conducted to address this issue and reduce the self-weight of structures, leading to the development of a new type of concrete known as lightweight concrete LWC. Lightweight aggregate LWA can be used in the concrete industry to produce lightweight aggregate concrete LWAC. The low modulus of elasticity and brittle nature of LWC, due to its components' low modulus of elasticity, results in a faster rate of crack development in reinforced concrete members. This issue can be addressed to some extent by inserting discrete fibers such as steel fibers SF into the concrete to control crack development due to their ability to restrict cracks and change the brittle mode of concrete. In this research, the parameter will be investigated which is the volume fraction Rf of SF. Hooked-End steel fibers HE with Rf of (0, 0.75, 1.0, 1.5 and 2) % were used in this research. The mechanical properties (slump test, compressive strength, split tensile strength, and flexural strength) of LWAC with varied Rf of SF are presented. The results concluded that incorporating SF into LWAC restricts the relative movement of the different constituents of concrete and thus reduces the workability. This report's optimum percentage of SF was 2% for the hooked-end SF that provided the highest compressive strength, splitting tensile strength, and flexural strength at 28 days.

**Key words:** Lightweight concrete, Lightweight aggregate concrete, Steel fiber, Volume friction, Compressive Strength, splitting tensile strength, and flexural strength.

## 1. Introduction

Concrete is the most common construction material in the industry. The high self-weight of concrete led to an increased dead load of the structures. Several studies have been conducted to reduce the self-weight of structures, leading to the development of a new type of concrete known as lightweight concrete LWC [1]. Usually, the concrete is reinforced with steel reinforcing bars, it is becoming increasingly popular for most applications with tiny and randomly distributed fibers to strengthen the concrete [2]. The low modulus of elasticity and brittle nature of LWC results in a faster rate of crack development in reinforced concrete members. This issue can be addressed by inserting discrete steel fibers SF into the concrete to control crack development due to their ability to restrict cracks and change the brittle mode of concrete. Steel fibers were produced in various shapes, sizes, and surface structures. Steel fibers produced have a variety of mechanical properties, including tensile strength, stress distribution capability, and absorption [2]. As a result, the concrete properties have widely different degrees of influence. This research aims to determine the compressive strength fcu., splitting tensile strength ft, and flexural strength fr of steel fibers lightweight aggregate concrete SFLWAC to compare the effect of varying steel fibers percentages on concrete characteristics and evaluate the workability of fresh concrete with different ratios of steel fibers.