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# Effect of Using Different Fibers on Slab on Grades

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## ABSTRACT

Slab on grade, also called floors on ground, are different from other structural members. First, they are supported directly by soil, and their success or failure may depend more on the soil qualities than on the slab construction. Second, they carry equipment and floor finishes, and any defect in the slab's integrity or moisture resistance affects those elements. A floor slab undergoing drying shrinkage may not only crack, but also break the brittle ceramic tile it carries. Failure may also occur due to overloading. For reducing cracks propagation, control or contraction joints are used. In this research, 225 specimens by fifteen-mix design with different dosage of polypropylene and steel fibers were prepared for evaluating compressive, impact and flexural testing at the ages of 7 and 28 days. As a result, the optimum dosage of polypropylene fibers was 1.6 kg/m3 and at this dosage, impact resistance enhanced about 460% and flexural strength enhanced about 70% in comparison with control specimens. Steel fibers improved impact resistance and flexural strength about 312% and 58% respectively, at the dosage of 30 kg/m3. Results also showed that the compressive strengths of specimens are not significantly increased by using fibers.

**Keywords:** slab on grade, polypropylene fibers, steel fibers, cracking



## 1. INTRODUCTION

Resistance to crack propagation is achieved by fiber-reinforced concrete (FRC) that contain coarse aggregate, and the existence of coarse aggregate in the matrix, brings some difficulties for fiber distribution or dispersion. Thus the volume fraction is highly limited. For fiber reinforced concrete used in practice, the applicable fiber volume fraction range from 0.4 to 2% for steel fiber and 0.06 to 0.5% for polypropylene. Slab on grades are the most important element in industrial projects. Considering to the use of floors are subjected to the damages and with repair and retrofitting need expenditure. The design and construction of a durable concrete floor in the storage, saloon and platforms are important [1]. The industrial floors have two functions; one bearing operational loadings, storages of material, the dynamic load from lift truck wheels and transferring them to the subgrades, secondly, providing a smooth surface for ease of use and safety [2]. It is necessary to enhance the quality of the concrete. Normal concrete is weak in tension about 1/10 of the compressive strength.

Most structural failure in slabs on grade are caused by point loading, wheel loading of cranes and other construction equipment, and heavy stacks of material. Quite often, structural cracking can be traced to loading

It is brittle against the impact loadings. Reinforcement with steel rebar cannot prevent their resistance against cracking, therefore the fibers is introduced. These fibers are separated and are distributed in concrete randomly. The precedence of the use of fibers is backed to the old Egyptians that they used fibers in mud walls. Also, rock wools fibers for reinforcement of clay is used about 5000 years ago [3]. From different kinds of fibers used in concrete the steel and polypropylene are mostly used. This research tried to evaluate two kinds of fibers. The flexural and impact resistance are the most important parameters. Base on this, six prisms specimens were prepared for testing flexural strength, six concrete disks for impact testing and nine cubes for compressive strength tests. In general, slab on grade problems can be categorized as cracking, surface deterioration, curling, settlement or heave, failure of joints, delamination of finishes, water penetration, chemical attack and wearing out [4].