**Title: High Strength Pervious Concrete**

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Abstract:

Pervious concrete is a type of concrete that has a high porosity and allows water to flow through it easily. This helps reduce the amount of water that enters stormwater systems, regulating flooding, specifically in urban areas, and allows for greater traction. The permeability of the concrete allows for the stormwater to percolate through the concrete and return to the groundwater. Additionally, because concrete is normally placed over a gravel base, the pervious concrete and gravel act as a retention area, providing natural bio-remediation to the polluted runoff improving water quality. Pervious concrete also has the potential to be used in pumped storage systems to store water and energy, one of the applications of this study.

In this study, Ultra-High-Performance Concrete (UHPC) was studied to determine how to increase the compressive strength of pervious concrete while maintaining permeability. UHPC is a cementitious mixture that can hold up to 20,000 psi in compressive strength with additional requirements in durability and toughness. To test for the permeability of UHPC five drainage channels were constructed into a specimen and the change in compressive strength was recorded. Two variables that significantly influence the strength and durability of UHPC are supplementary cementitious materials (SCMs) and the addition of fibers.

These factors were analyzed and included in the testing of traditional pervious concrete. Silica fume is an SCM that strengthens the bond between aggregates and was proven to be beneficial to pervious concrete mixes. The silica fume was included in the mix at varying percentages to determine the greatest compressive strength using this SCM. Polypropylene fibers were then added to the optimal mix containing silica fume to determine the greatest compressive strength possible using a combination of these materials. The permeability of the concrete samples was measured using a modified falling head permeameter.