# Utilizing Class F Fly Ash to Offset Non-Ideal Aggregate Characteristics for Concrete in Chloride Environments

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Primary aggregate resources are under increasing pressure as construction activity continues to consume very large quantities world-wide. As a result planning authorities are increasingly reluctant to allow new quarries to open and, in turn, concrete producers are looking to use aggregates, such as porous and recycled, that may have non-ideal characteristics.

Of the exposure conditions to which reinforced concrete is subjected, arguably the chloride environment is the most severe. Generally the ingress of chlorides is dominated by the paste phase and thus can be controlled by selection of the cement type, content and/or water/cement ratio.

Historically, therefore, engineers have utilized dense, low porosity aggregates and as a result the properties of aggregate per se are not usually specified. Recent work, however, suggests that aggregate interconnected porosity can have a significant influence on the rate of chloride ingress and ultimately the intensity of reinforcement corrosion resulting.

The use of fly ash in concrete is universally accepted as enhancing resistance to chlorides. Based on this, the premise of the research described in this proposed paper was to determine whether fly ash could be used to allow the effective and economic use of aggregates with non-ideal properties for reinforced concrete in chloride exposures.

The project tested aggregates with a wide range of properties and measured their effect on the concrete microstructure and its ability to resist chloride diffusion in the cover zone. It will be shown that fly ash can indeed be used in this manner and, furthermore, the rate of reinforcement corrosion is also reduced. The paper will also consider the practical implication of the results in relation to concrete specification for durability.

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