Title: The Effects of Blended Cements on Concrete Porosity, Chloride Permeability, and Resistivity

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Abstract: Reinforced concrete structures exposed to seawater, deicing salts, or other harsh chloride environments are susceptible to corrosion from the ingress of chloride ions. The current test program investigates the porosity, penetrability, and resistivity of concrete proportioned with binary and ternary portland cement blends of Class F fly ash, ground granulated blast-furnace slag, and/or silica fume. Time-dependant data are used to compare the effects of porosity on chloride penetrability and to compare plain port-land cement mixtures, binary blends, and ternary blends with different cement contents, water-cementitious materials ratios, cement sources, and pozzolan and/or ground granulated blast-furnace slag replacements. Chloride penetrability is measured using both the AASHTO T 277 and the Rapid Migration Test methods, porosity is measured through the procedures of ASTM C 642, and electrical resistivity is measured using a Wenner Array type meter. Results indicated that the addition of supplementary cementitous materials increased the porosity of concrete at 28 and 90 days, but significantly decreased the chloride ion penetrability and increased resistivity. In addition, resistivity measurements indicated that characterization of microstructure by electron induced ion flow methods severely underestimated the benefits that silica fume contributes to the microstructural development of the blends.