COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

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for the degree of Doctor of Philosophy (Ph.D.)

"CHLORIDE DIFFUSIVITY AND AGING FACTOR DETERMINED ON FIELD SIMULATED CONCRETE EXPOSED TO SEAWATER"

April 22, 2019, 3:00 p.m.
SeaTech, Room 259
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ABSTRACT OF DISSERTATION

CHLORIDE DIFFUSIVITY AND AGING FACTOR DETERMINED ON FIELD SIMULATED CONCRETE EXPOSED TO SEAWATER

Chloride diffusivity in high performance concrete is influenced by the exposure environment, aside from the concrete mixture properties like, water to cementitious ratio (w/cm) and presence of add-on pozzolans. In this study, a set of concrete specimens (eleven-different concrete mixtures) were cast and exposed to three different environmental conditions (Tidal, Splash and Barge) in which the solution was seawater or brackish water. These exposures simulate environmental field conditions. After the specimens were wet-cured for 32 days (on average), the specimens were exposed to the three field simulation conditions for up to 54 months. The specimens under the field simulated conditions were cored at 6, 10, 18, 30 and 54 months at four elevations and then the chloride profiles were obtained from the cores. The apparent diffusivity values for each profile were calculated based on Fick's 2nd law. Then, the aging factor "m" was calculated by regression analysis of the diffusivity values versus time (days) plotted in the log10-log10 scale. This was done for the three different exposure conditions and then the results were compared side-by-side. First, the "m" values were calculated using the exposure duration. Then, to study the effect of including the curing time on "m" value, the curing time was added to the exposure time and a new calculation and "m" value was obtained and compared with the previous results. Moreover, upon inspecting the chloride diffusivity values versus time plots, it was observed that in some cases, a number of data points showed significantly higher or lower values in comparison with the rest of the data points. It was decided for these cases to only use selected data points instead of all data points (i.e., remove selected data points), in order to have fittings with higher R2 when calculating the "m" values.

In terms of chloride diffusivity value, it was found that the specimens with higher water to cementitious (w/cm) ratio showed higher diffusivity, as expected. Further, the presence of pozzolans had a noticeable impact on the chloride diffusivity by decreasing the diffusion rate due to microstructure changes that occurred with time. In terms of “m” values, the result for the field simulated conditions showed a range of “m” values dependent on the specimen’s mixture, exposure, and the elevation at which the specimens were cored. It was observed that the chloride diffusivity has a decline trend with time and after a certain amount of time (in this research, almost after 30 months) the diffusivity reduction became small and a transition in the slope of the diffusivity trend appeared in a number of cases. After the transition, the diffusivity trend either reached a plateau zone or continued with a significantly lower slope. It was found that the specimens under tidal and splash field simulation conditions that had only fly ash in their mixtures showed higher “m” values when compared with samples that contained fly ash and silica fume or fifty percent slag.

BIOGRAPHICAL SKETCH
Born in: Ahvaz, Iran
B.S., Ahvaz University, Ahvaz, Iran, 2008
M.S., Ahvaz University, Ahvaz, Iran, Florida, 2010
M.S., Florida Atlantic University, Boca Raton, Florida, 2017
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CONCERNING PERIOD OF PREPARATION
& QUALIFYING EXAMINATION

Time in Preparation: 2016 - 2019

Qualifying Examination Passed: Semester Spring 2017

Published Papers:
Raof, F., and Presuel-Moreno, F., (2019): Analysis of Apparent Chloride Diffusivity and Aging Factor Experimentally Determined for High Performance Concrete Exposed to Seawater. CONSEC 2019, Porto Alegre – Brazil, June 2019. (Accepted)