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Microstructural Analysis on the Effect of Using Recycled Aggregate (RA) in Concrete on its Internal Transition Zone (ITZ) Using Scanning Electron Microscopy (SEM)

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Abstract – In the past few decades, the construction industry has been marked by the emergence of Recycled Aggregate Concrete (RAC) as an environment-friendly substitute to conventional concrete to ensure sustainable development and minimize construction and demolition wastes (CDW). This paper investigates the effect of using concrete as recycled aggregate (RA) in Recycled Aggregate Concrete (RAC) on the microstructure of its Internal Transition Zone (ITZ) using Scanning Electron Microscopy (SEM). A concrete thin section using a representative sample from the demolished Atatürk stadium in Konya-Turkey that served for 68 years between 1950 and 2018 was firstly prepared. Then, a RAC thin section was prepared after size reduction, coning and quartering of the concrete from the above-mentioned source to obtain the concrete that served as RA in the new concrete mix. The SEM images of the obtained thin sections allowed conducting a microstructural analysis on the ITZ connecting the aggregates to the mortar matrix in the original concrete and to monitor its evolution in the recycled aggregate concrete marked by the development of a new ITZ between the recycled aggregates and the new mortar together with the old ITZ bonding the aggregates to the old mortar still attached to them.

Keywords – Recycled aggregate RA, Recycled Aggregate Concrete RAC, microstructural analysis, Interfacial Transition Zone ITZ, Scanning Electron Microscopy SEM