

THE DIAGNOSIS AND PROGNOSIS OF ASR IN DAMS. APPLICATION TO ALTO CEIRA DAM (PORTUGAL)



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ABSTRACT

In the last decades, a significant number of large concrete structures with deterioration problems related to alkali-silica reaction (ASR) have been detected in Portugal and worldwide.

In the case of concrete dams, it is still difficult to perform a complete assessment of the actual condition of an ASR affected structure, an accurate prediction of the deterioration of the mechanical properties and, consequently, an assessment of the dam's safety. This is key to determine the period during which the structure will effectively perform its function and essential for the timely and cost-effective planning of the necessary mitigation/rehabilitation/reconstruction works.

This paper aims to contribute to the ongoing discussion of this topic by the scientific community and, therefore, presents the adopted methodology to assess the condition of an ASR severely affected concrete dam in Portugal, the Alto Ceira dam, in which the concrete was produced with quarzitic aggregates, and that was partially demolished and replaced by a new one in 2014. The results obtained in the extensive experimental campaign (which included chemical, microstructural, physical, mechanical and expansion tests) performed to concrete cores extracted from the structure, and the results obtained from the monitoring system used in dam safety control activities, evidenced the utility of such a methodology on the appraisal of ASR-affected structures.

Keywords: alkali-silica reaction, concrete, diagnosis, prognosis, structural effects.

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