

ASSESSMENT OF THE LIFETIME OF THE CONTAINMENT BUILDING OF A PRESTRESSED NUCLEAR POWER PLANT

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Abstract. Nowadays, studies are being carried out on the “Assessment of the remaining life of the posttensioning system of nuclear power plants”. Specifically, a structural analysis of the containment building is carried out to identify the moment when the prestressed system reaches the minimum design stress, even beyond the 40-year life contemplated by existing analysis. The results of this structural analysis make it possible to obtain the aging of the post-tensioning system of nuclear containments, and then incorporate it into the aging management plan. Usually, a structural analysis is required to: - Evaluate the structural behavior for the new period of life requested and verify that the previous states of post-tensioning already carried out are fulfilled. - Demonstrate that the effects of aging can be adequately managed during new periods of operation. This type of study allows us to examine the possibility of extending the operational horizon for the containment buildings of nuclear power plants up to 60 years of life. To meet these requirements, a non-linear finite element study of the containment behavior is carried out, taking into account the effects of damage in concrete, plasticity in passive steel and decay of the stress in tendons of the prestressing system, with the objective to assess the extension of its useful life. The structural analysis starts from the state of the containment immediately after its construction in reinforced concrete including the liner in its place, applying then the initial post-tensioning state. Later on, the stresses of the tendons of the structure changes due to maintenance operations and rheological relaxation stresses effects. All these effects are simulated by means of a non-linear numerical calculation, which makes it possible to obtain the remaining stresses in the tendons at a given instant of time.

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