OPTIMIZATION AND MODERNIZATION OF QUALITY ASSURANCE REQUIREMENTS FOR CONCRETE NUCLEAR CONSTRUCTION

This work analyzes and discusses the efficiency and efficacy of the current regulatory framework for concrete quality assurance in nuclear construction. Key areas for improvement are highlighted and possible methods for improvement are provided. The use of electricity is increasing at a rate not seen in two decades, and the price of electricity is rising. This is happening at the time when data centers are being proposed and built. This landscape places renewed importance on reliable energy production. To power the demands of today and the future, nuclear power is regaining focus. The government began to permit private production of nuclear fuel and energy through Title 10 of the Code of Federal Regulations and the executive branch organizations of the Nuclear Regulatory Commission and the Department of Energy. Further, these title 10 codes spurred the introduction of industry requirements to meet the federal regulations. These codes, namely the American Concrete Institute 349 and 359 are what the nuclear concrete industry relies on today and are the primary subject of this analysis. The codes have avenues for modernization in the testing of concrete constituents, and the new industry technology they fail to include. Advances like self-consolidating concrete, heavyweight concrete, and better production methods have set the conditions for more efficient requirements. Precast steel-plate composites offer technology that greatly increases the quality assurance the nuclear industry needs to meet the rising energy demands. Overall, this study highlights opportunities to modernize nuclear concrete quality assurance by aligning testing requirements with material risk, production consistency, and demonstrated performance.