UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

**Grant #** 31310021M0006
**Grantee:** Kansas State University
**Title of Grant:** Addressing Technical Knowledge Gaps for Concrete Creep, Creep Recovery, and Creep Fracture
**Period of Performance:** 11/30/2020-11/29/2023 (FY2020 Notice of Funding Opportunity NOFO)

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## Executive Summary

The objective of the proposed experimental and modeling research is to fill technical gaps in understanding relating to concrete creep phenomenology. As identified in NUREG/CR-7153 vol.4, concrete creep and creep fracture were at that time and remain areas of uncertainty for regulatory assessment of nuclear prestressed concrete safety structures. Technical literature relating to creep fracture is particularly sparse. The expected research findings will be beneficial for evaluating subsequent license renewals for existing LWR plants and also for evaluating applications for next generation plant concepts that are expected to make use of high performance concrete in certain safety critical structures. The creep behavior of high-performance concrete is also a technical gap and since these mixtures tend to have higher paste content and smaller coarse aggregate, the creep behavior is expected to be different than normal strength structural concrete.

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## ***Presentations and Publications***

*The list of publications was submitted with the final report after grant expiration.*

| Publication Title | Journal or Conference | Status |
|---|---|---|
| UHPC Creep and the Role of Fibers | SMiRT-27 | Published, March, 2024 |
| Evaluation of nanomechanical time dependent properties of irradiated Portland cement paste | SMiRT-27 | Abstract Submitted |
| Stress relaxation and creep nanoindentation for cement paste | Journal of Materials in Civil Engineering | Published, Jan 2024 |
| Reducing uncertainties in nanoindentation experiments for cementitious materials | Transportation Research Record | Published, Jan 2023 |
| Creep response in ultra high performance concrete | Proceedings of SMiRT-26 | Published, July 2022 |
| Investigation of viscoelastic properties of irradiated cement paste using statistical creep nanoindentation | Proceedings of SMiRT-26 | Published, July 2022 |

**Patents**
N/A