The 2021 World Congress on
Advances in Structural Engineering and Mechanics (ASEM21)
GECE, Seoul, Korea, August 23-26, 2021

Investigation on reduction of conventional rebars in UHPFRC nuclear containment structures

*Seung Heon Lee[1)] and Thomas Kang[2)]

[1), 2)] *Department of Architecture & Architectural Engineering, Seoul National University, Seoul, Korea*
[2)] *tkang@snu.ac.kr*

ABSTRACT

Concrete containment construction has shown increasing numbers of cost escalations, cost overruns and schedule delays due to low labor productivity. In providing the industry with a competitive concrete containment which also satisfies current provisions, the implementation of Ultra High-Performance Fiber Reinforced Concrete (UHPFRC) is being considered to be a possible solution.

The improved compressive strength of UHPFRC enables a higher level of prestressing, which assists in keeping the concrete in compression when subjected to factored loads. UHPFRC also exhibits a notable tensile strength, with ductility being greatly improved due to steel fiber reinforcement. Such improvements in concrete capacity are expected to minimize the use of conventional rebars and steel liners, improving labor productivity and cutting maintenance costs.

This research assesses how UHPFRC minimizes the need for conventional rebars by performing finite element analysis on an axisymmetric containment structure. Structural responses to design internal pressure and safety shutdown earthquakes (SSE) are obtained, and the stress resultants are factored according to Joint ACI-ASME Committee 359 (2019). Sectional rebar design is performed according to the sectional stresses from the load combination, and the required rebar area of a UHPFRC containment is obtained and compared with that of a conventional concrete containment.

REFERENCES

Joint ACI-ASME Committee 359 (2019), ASME Boiler and Pressure Vessel Code, Section III. Rules for Construction of Nuclear Facility Components, Division 2. Code for Concrete Containments, American Society of Mechanical Engineers, New York, NY.

[1)] Graduate Student
[2)] Professor