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**An Engineering Approach to Thermal Margin Calculation
Using Two-phase Boundary Layer Model**

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Abstract

As an advanced in-vessel design concept, the COrium Attack Syndrome Immunization Structures (COASIS) are being developed as prospective in-vessel retention devices for a next-generation LWR in concert with existing ex-vessel management measures. Both the engineered gap structures in-vessel (COASISI) and ex-vessel (COASISO) were demonstrated to maintain effective heat transfer geometry during molten core debris attack when applied to the TMI-2 and the Korean Standard Nuclear Power Plant (KSNPP) reactors. This paper presents the first-principle calculation results for the thermal margin for the case of external cooling of the reactor vessel lower head. Adopting the method presented by F.B. Cheung, et al., we calculated the departure from nucleate boiling ratio (DNBR) for the three cases of pool boiling, flow boiling and subcooled boiling.