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Analytical Study on Blast Behavior of Unbonded PT Panels

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ABSTRACT

Due to the potential for significant damage to structures from explosive loads, the blast behavior of important infrastructures such as nuclear power plants needs to be considered. The current research was conducted on prestressed concrete structures through nonlinear finite element analysis. Schwer (2016) conducted research on the methods of modeling pretensioned and post-tensioned structures. The study was focused on the implementation of unbonded post-tensioned structures, with comparative analysis performed against real experimental results from Choi et al. (2016). The method of implementing unbonded tendons through Spotweld method with equivalent cross-sectional area of a rod was validated (Fig. 1). In common simplified modeling approaches where constraint conditions of tendons in concrete are determined without sheath, such a tendon behavior can excessively enhance overall structural performance. Furthermore, in actual cases where the vibration of tendons increases due to blast loads, concrete could be damaged more than in modeling. The results of this study demonstrate that while modeling with sheath like actual specimen is the most accurate approach, simplified modeling excluding constraint conditions can be considered when tendon vibration is minimal.

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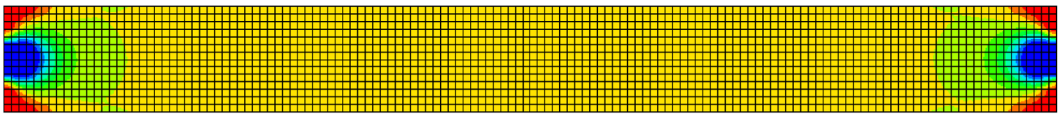
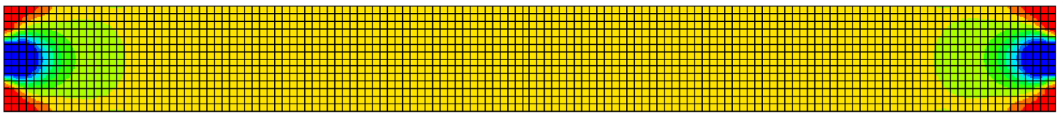


(a) Stress application using equivalent area method



(b) Stress application using actual tendon modeling

Fig. 1 Equivalent area modeling method validation

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