Distinguished Speakers'

UEE Seminar Series

Hosted by School of Urban & Environmental Engineering

Durable Railroad Infrastructure: Splitting/Bursting Damage of Prestressed Concrete Crossties

Speaker: Prof. Shin, Moochul
Western New England University

Prestressed concrete crossties have become an important component of the railroad track structure as loading demands have been increasing. However, several premature failure patterns of concrete crossties, including the splitting/bursting failure, are of concern to the railroad community owing to their adverse effect on track integrity and safety. Previous studies demonstrated that small-scale pretensioned concrete prisms had excellent correlations with concrete ties in the bond performance, and similar prisms are being used to establish the splitting/bursting performance of concrete ties. This study focuses on characterizing the splitting/bursting damage of prestressed concrete prisms during the detensioning process with respect to the design parameters of the prisms and the concrete release strengths. In addition, effects of adopting a high strength concrete with a reduced modulus of elasticity are studied with the goal of mitigating some of these failures, since some of the failures are associated with the concrete being too rigid. Main design parameters include: 1) type of reinforcing tendons, 2) indentation type of tendons, 3) concrete cover thickness, 4) center-to-center spacing, and 5) mechanical properties of concrete. Finite element analyses (FEA) are conducted for the pretension release in the prisms, and indicators of concrete splitting/bursting damage are examined. Cohesive elements with a newly developed nonlinear bond-slip model are assigned to the interface between the prestressing wires and the surrounding concrete using a UMAT bond model. Finally, a design guideline for prestressed concrete prisms is recommended, with implications on preferred practices to reduce or prevent the splitting/bursting failure of concrete crossties.

School of Urban & Environmental Engineering

- **When : 2019.07.29. (Mon) 16:00**
- **Where: Bldg.110 (EB4), Room.901**
- **Host : Prof. Pyo, Sukhoon**
  ext. 2827, shpyo@unist.ac.kr