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A Study on the Safety Evaluation of Pier According to the Water Level Change by the Monte-Carlo Method

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Abstract : Recently, global warming phenomenon has led to natural disasters caused by global environmental changes, and due to abnormal weather events, the frequency and intensity of heavy rain storm typhoons are increasing. Therefore, it is imperative to prepare for future heavy rain storms and typhoons. This study selects arbitrary target bridges and performs numerical analysis to evaluate the safety of bridge piers in the event that the water level changes. The numerical model is based on two-dimensional surface elements. Actual reinforced concrete was simulated by modeling concrete to include reinforcements, and a contact boundary model was applied between the ground and the concrete. The water level applied to the piers was considered at 18 levels between 7.5 m and 16.1 m. The elastic modulus, compressive strength, tensile strength, and yield strength of the reinforced concrete were calculated using 250 random combinations and numerical analysis was carried out for each water level. In the results of analysis, the bridge exceeded the stated limit at 15.0 m. At the maximum water level of 16.1m, the concrete's failure rate was 35.2%, but the probability that the reinforcement would fail was 61.2%.

Keywords : Monte-Carlo method, pier, water level change, limit state
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