

Research on Wave Force Calculation Method for Honeycomb-type Sea Sand UHPC Arc Crown Wall

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Abstract

To address the insufficient wave overtopping resistance of traditional coastal protection structures, wave load experiments were conducted on a novel honeycomb-shaped sea sand ultra-high performance concrete (UHPC) arc crown wall. By comparing the force responses of different structural configurations under multiple wave conditions (wave height 0.1-0.3 m, period 1.0-2.0 s, water depth 0.4-0.6 m), this study revealed the force transmission mechanism, impact mechanical characteristics, and peak impact pressure distribution of the structure. Based on a finite element model validated with experimental data, a parametric analysis examined the influences of wave height, period, water depth, honeycomb opening ratio, and wall thickness on wave forces. Sensitivity analysis indicates that wave height and opening ratio are the dominant influencing factors, followed by water depth and period. An empirical wave force calculation method applicable to this new wave wall was subsequently proposed. These findings provide a theoretical basis for the wave impact resistance design of coastal protection structures and are of advancing innovative coastal engineering infrastructure in China.

Keywords

Honeycomb-shaped Breakwater, Sea Sand Uhp, Arc Crown Wall, Wave Load, Numerical Simulation, Wave Force Calculation Method