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Evaluation of the LCC of tubular steel structures in marine environments

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Summary: In this paper, a comparison of Life Cycle Cost (LCC) for steel structure of wharf which is constructed with steel piles with several types of protective coating and concrete deck is presented. The study focuses single pile strength as a basis of evaluation of whole structural strength, and proposes ultimate strength formulae derived from FEM analysis with combined beam-shell model that can cope with local buckling deformation of piles as well as their global deformation. The so-called modeling parameter that accounts for uncertainties in strength formulation is evaluated from a comparison of FEM results with existing test results. Failure mode of single member and whole structural system are studied and the probability of failure of whole system is evaluated. Then failure risk is added onto LCC. The results show that the failure risk of the considered wharf under horizontal seismic excitation is small compared to the total LCC. They also show rational anti-corrosion system for marine steel structures; i.e. cheap anti-rusting system such as epoxy coating for steel structure of wharf is generally economical but heavy duty epoxy coating or anti-corrosion metal coating system tend to be more economical with increase in service period.

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