Thesis Title	Effect of Axial Deformation on Static Equilibrium Configurations of Marine Cables in Three Dimensions
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Candidate	Mr. Pisek Petchpeart
Supervisor	Prof. Dr. Somchai Chucheepsakul
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Abstract

This thesis presents the effect of axial deformation on the equilibrium configurations of marine cables in three-dimensions. The virtual work-energy functional, which involves virtual strain energy due to stretching of cable and virtual work-done by hydrostatic force, is formulated. Euler-Lagrange equations are obtained by considering the first variation of the functional which is identical to those obtained by equilibrium of forces on a cable infinitesimal segment. Two numerical methods, namely, finite element and shooting methods are employed to solve the problem. In this study, the emphasis is placed on the finite element method. First variation of the functional yields the nonlinear equation and Newton-Raphson iterative procedure is used to solve the problem. The shooting method is used as an alternative method for verification of finite element results. In the procedure, eight first-order differential equations are solved in which the first three equations are from the equilibrium equations, the other three from geometric cable segment relations and the last two from strain definition and the effective tension equations. The results manifest that both methods give the same solution.

Parametric study of variation in elastic modulus is carried out by maintaining uniform current velocity profile in x direction. In the case of specified top tension of cables, the results reveal that for cables having angle θ_0 approximately between 0°-120°, the elastic modulus increases, the total strained arc length increases. However, for cables having angle θ_0 approximately between 120°-180°, the elastic modulus increases, the total strained arc length

decreases. In the case of specified unstrained arc length of cables, the results reveal that when elastic modulus increases, the total strained arc length decreases in every angle of θ_0.