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Progressive Collapse Analysis of Ship's Hull Girder in Longitudinal Bending Using Idealized Structural Unit Method

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Summary: An application of the Idealized Structural Unit Method (ISUM) to analyze the progressive collapse behavior of ship's hull girder in longitudinal bending is developed. A new ISUM stiffened plate model that can cope with local panel buckling, overall stiffener buckling and localization of plastic deformation in local plate panel is employed. Stiffeners and panels are modeled individually by beam-column elements and ISUM plate elements with consideration of their interaction effect. A lateral shape function for plate panels based on their collapse mode is assumed. In the present paper, the effects of welding residual stresses are considered both in plate and in stiffeners. The progressive collapse analyses of a 1/3-scale welded steel frigate model and a single-hull VLCC are performed. High computational efficiency and sufficient accuracy of ISUM are demonstrated through a comparison with test results and large-scale nonlinear FEA.

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