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SUPERELEMENT OF A COLUMN HAVING A RECTANGULAR CROSS SECTION AND CHARACTERIZED BY PHYSICAL NONLINEARITY

The authors provide their summarized nonlinear analysis of the beam structure using the finite element method. Weaknesses of traditional approaches to the analysis of rectangular section columns using one-dimensional finite elements are identified. They cause mistakes in the transfer of forces in specific points and invariability of sizes and types of cross sections of rods in the course of their deformation. The approach to the analysis of rectangular section columns is proposed. The new approach originates from the three-dimensional theory supplemented by the superelement technology. The column is divided into sections and finite elements. The analysis of physically nonlinear structures is executed using the PRINS software. The flow theory is used to identify the characteristics of finite elements. Huber-Mises plasticity criterion is applied. The console beam loaded by concentrated forces on the free end is calculated to verify the element. The limiting load value identified by PRINS software complies with the theoretical values derived using the theory of limit equilibrium.

Key words: building structures, rectangular cross section columns, finite element method, superelements, physical nonlinearity, flow theory.

References


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