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Diffraction of extreme waves by elastic underwater breakwater

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The 2-D problem of interaction of extreme waves with the elastic underwater breakwater embedded in bottom is considered. In the first stage of the research the linear problem is to be solved. The problem like that was investigated by Williams at all (1992) using the Green's function method. This technique has well-known analytical and numerical difficulties. That is the reason why the eigenfunction expansion method will be used. The model of the breakwater is a thin impermeable plate clamped on the bottom. The finite depth fluid is considered as ideal and incompressible. The motion of fluid is irrotational. Splitting the whole region into 2 subregions having the common boundary through the plate we obtain two coupled problems. The governing equation is the Laplace's equation. The boundary conditions are well known (impermeability at the bottom and kinematical and dynamic conditions at the free surface). Account must be taken of Sommerfeld radiation condition (the behavior of fluid at the infinity). The continuity of potential function and velocity of fluids through the common boundary must be also considered. The equation of motion of the breakwater is derived like the equation of motion of the beam. Using the orthogonality procedure we will obtain the infinite system of linear algebraic equations. By reducing this system we will find the solution for the potential function and then all of the characteristics of fluid and the breakwater motion. The results of this research are used by designing of wave-protective structures in harbors.