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INTERACTION OF DAMAGE MECHANISMS IN SANDWICH BEAMS SUBJECT TO STATIC AND DYNAMIC OUT-OF-PLANE LOADINGS

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The model system of a delaminated beam on an elastic-perfectly plastic foundation is defined to describe the interaction of the loaded skin and the core in a continuously supported composite sandwich beam subject to out-of-plane loadings. The aim of the work is to investigate how the damage mechanisms for delamination crack propagation in the skin and core crushing interact and affect the response of the system to static and dynamic loadings. The delaminated beam is described as an assemblage of Timoshenko beams with contact and cohesive interfaces; the response of the Winkler foundation is defined by a piecewise linear force-displacement law with elastic unloading. The out-of-plane loads are described as concentrated forces. Results show that important energy barriers to crack propagation are present in the static fully elastic regime; the barriers are deeply modified if plastic deformations take place in the foundation and by delamination openings in the free vibration phase under dynamic loadings. Fundamental aspects of the interaction between the considered damage mechanisms in static and dynamic regimes of behaviour are highlighted and related to the geometric and constitutive parameters of the system.