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Analysis of the failure mechanism of the sandwich panel at the supports

Jolanta Pozorska^a, Zbigniew Pozorski^{b*}

^a*Institute of Mathematics, Czestochowa University of Technology, Armii Krajowej 21, 42-200 Czestochowa, Poland*

^b*Institute of Structural Engineering, Poznan University of Technology, 60-965 Poznań, Poland*

Abstract

The paper presents the problem of static structural behavior of sandwich panels at supports. The panels have a soft core and correspond to typical structures applied in civil engineering. To analyze the failure propagation, the numerical 3-D model with non-linear material constitutive relations is applied. The numerical results are compared to the values obtained using simple engineering formulas. The obtained results show that the existing approach of assessing the failure by the level of the core compression is incorrect. The study verifies the assumption concerning the uniformity of normal stress distribution and describes the failure mechanism.

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1. Introduction

The paper considers sandwich panels applied in civil engineering. The panels are used as a building envelope (wall and roof). They consist of two thin external steel facings and a thick and soft core. As a result of the combination of the two different materials, sandwich panels play the role of a structural element and thermal insulation altogether. The complexity of a sandwich structure is revealed by different failure mechanisms, among which include: face yielding, global and local instability, debonding, shear and indentation of the core.

* Corresponding author. Tel.: +48-616652096; fax: +48-616652059.
E-mail address: zbigniew.pozorski@put.poznan.pl