INTERSECTII
INTERSECTIONS
http://www.ce.tuiasi.ro/intersections
Young Scientists' Researches

Multicriteria Optimization of the Closing Elements for Industrial Buildings

Cristina Liliana Marta[1]
Department of Civil Engineering, Faculty of Civil Engineering, "Gheorghe Asachi" Technical University, Iaşi, Romania

- Date of submission: (12.10.2007)
- PhD. Supervisor: NICOLAE TARANU, Faculty of Civil Engineering, "Gheorghe Asachi" Technical University of Iasi, Romania
- President: THEODOR DUMITRU DORIN MATEESCU, Vice Dean, Faculty of Civil Engineering, "Gheorghe Asachi" Technical University of Iasi, Romania
- Scientific Board:
  - VIRGIL BREABAN, Faculty of Civil Engineering "OVIDIUS" University of Constanta, Romania
  - FLORIN MACAVEI, Faculty of Civil Engineering Technical University of Civil Engineering Bucharest,
  - MIHAI BUDESCU, Faculty of Civil Engineering "Gheorghe Asachi" Technical University of Iasi, Romania

Summary

The present interest concerning the decrease of total weight constructions, use with maximum efficiency of existent construction materials and attraction in the economic circuit of new and modern materials is also materialized by use layered elements of sandwich type. The study of closing elements made from sandwich panels and optimum solutions for rational structure are included in a priority thematic that is actuality in exigencies ensuring imposed to the constructions envelopes. The paper theme has as main objective the rational design of closing elements made from sandwich panels.

In a first phase, there were analyzed the problems conditioning and influencing the sandwich panel utility as closing elements for envelopes of industrial buildings. The author makes a general characterization of sandwich layered elements and exemplifies the function of component layers. There is achieved a study of technical – economical efficiency and a presentation of main utilization areas for

ISSN 1582-3024

INTERSECTII
INTERSECTIONS
http://www.ce.tuiasi.ro/intersections

sandwich panels in construction, indicating specific requirements according to the technical performance conditions imposed by valid legislation. There is also made the presentation of using faces and cores materials and a synthesis of mechanic and thermo – physical properties. There are described the auxiliary materials necessary to achieve an adherence between the component layers which ensure working together of the layered elements.

In ratio with the assemble and structural behavior there are identified several work modalities of sandwich elements: narrow beam with thin or thick faces, narrow beam with faces of different thickness; wide beam with thin or thick faces; sandwich panels with identical faces; sandwich panels with different faces. The work modalities are varied in ratio with the mechanic-geometric characteristics of the component layers, leading to particularly relationships for stress and deflections states. The analysis of stress and deflections states in sandwich panels with continuous core and thin faces are based on hypothesis consideration that characterize the layered nature of cross section. In this way, the panels resting on short sides are considered wide beams subject to cylindrical bending. The only modification in comparison with the normal theory of bending appears from use of longitudinal elasticity module corresponding to the plan stress. The panels resting on long sides are analyzed considering unitary beams parallel to the short side subject to cylindrical bending.

A complex experimental program was performed to behavior analysis from a mechanical point of view for various stress modalities of modern sandwich panels types made from metallic faces with lightly profiled and / or deeply profiled and the continuous core of polyurethane foam. The laboratory tests with standardized samples and for sandwich elements in natural size showed that the sandwich panels have a very good behavior for test processing to values corresponding the acceptable displacements. This behavior is underlined by load – deflections linear, constant bending stiffness and absence of remaining displacements.

The optimization of sandwich elements, theoretical studied was materialized also through real case studies which had final results allowing operative choosing and control of the efficiency with which we must form the sandwich panels with metallic faces and rigid polyurethane foam core used as closing elements for light envelopes execution in buildings for different use.

Keywords: closing elements, sandwich panels with metallic faces and polyurethane foam core, ensuring bending stiffness, decrease of self weight, rational structure by thermal transfer, acoustic insulation efficiency.

.

ISSN 1582-3024