

Vibrations Analysis of Composite Thin-Walled Beams with Open Cross Sections

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ABSTRACT

In the paper, analysis of vibration modes and natural frequencies of thin-walled beams with open cross sections is performed for studying the validity of the cross section contour in-deformability assumption. The thin-walled beam basic assumptions and governing differential equations are presented. Numerical examples have been solved using the finite element package COSMOS/M. Shell element models of these beams were developed to check the results of the thin-walled beam analysis.

Keywords: modal analysis, composite materials, thin-walled beams with open cross sections

References

1. **CHIRICA, I.**, 1991, *A Finite Element Formulation for the General torsional Analysis of Thin-Walled beams*, Ph.D. Thesis, University Dunarea de Jos of Galati.
2. **CHIRICA, I.**, 1997, *Elasticitate - Fundamente. Exemple. Aplicatii*, Editura Tehnica, Bucuresti, ISBN 973-31-1129-5.
3. **CHIRICA, I., BEZNEA, E.F.**, 2004, *Elasticitatea materialelor anizotrope*, Editura Fundatiei Universitare Dunarea de Jos, Galati, ISBN 973-627-176-5.
4. **CHIRICA, I., CHIRICA, R.**, 2005, *Structuri compozite cu pereti subtiri*, Editura Didactica si Pedagogica, Bucuresti, ISBN 973-30-1270-X.
5. **CHIRICA, I., BEZNEA, E.F., CHIRICA, R.**, 2006, *Placi compozite* Edit. Fund. Univ. Dunarea de Jos, Galati, ISBN (10) 973-627-337-7; ISBN (13) 978-973-627-337-7.
6. **CHIRICA I., BEZNEA E.F., GAVRILESCU I.**, 2007, *Metode moderne de calcul al structurilor compozite*, Ed. Cermi, Iasi, ISBN 978-973-667-283-5.
7. **BATHE, K. J.**, 1982, *Finite Element Procedures in Engineering Analysis*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.
8. **GERE, J. M.**, 1954, *Torsional Vibrations of Beams of Thin-Walled Open Section*, Journal of Applied Mechanics, pp. 381-387.
9. **GERE, J. M., and LIN, Y. K.**, 1958, *Coupled Vibrations of Thin-Walled Beams of Open Section*, Journal of Applied Mechanics, pp. 373-378.
10. **GJELSVIK, A.**, 1981, *The Theory of Thin-Walled Bars*, John Wiley & Sons, New York.
11. **KAW, K.A.**, 1997, *Mechanics of Composite Materials*, CRC Press LLC.
12. **LIBRESCU, L., SONG, OSHEOP**, 2006, *Thin-Walled Composite Beams, Theory and Application*, Springer.
13. **TIMOSHENKO, S. P., and GOODIER, J. N.**, 1953, *Theory of Elasticity*, McGraw-Hill Book Company, Inc., New York.
14. **VLASOV, V. Z.**, 1961, *Thin-Walled Elastic Beams*, Second Edition, Israel Program for Scientific Translations, Jerusalem (Translated from Russian).
15. **WU, X.X. and SUN, C.T.**, 1991, *Vibration analysis of laminated composite thin-walled beams using finite elements*, AIAA Journal, vol.29, 1991.