Peter Jiki, J Civil Environ Eng 2015, 5:5
http://dx.doi.org/10.4172/2165-784X.C1.002

OMICS International
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World Congress and Exhibition on
Construction & Steel Structure
November 16-18, 2015 Dubai, UAE

Lateral Stability of Damaged Open Thin-walled Beams using Lyapunov's Second method

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Lateral buckling of damaged thin-walled beams of open sections is studied in this work using Lyapunov's direct method of stability analysis. First, a damaged stiffness reduction parameter α is calculated, following which a metric and an energy type Lyapunov functional (function) are proposed for the solution of the stability problem. It is shown that without the use of deflectionfunctions for u, v and β in the equilibrium equations, a simple manipulation of the Eigen-value inequalities yields familiar expressions for the lateral buckling loads (moments) for simply supported and fixed beams. The lateral buckling moments obtained using this method comparewell with those in the literature using deflection functions. When the damaged parameter is applied to these expressions, the reduced lateral buckling loads or moments are obtained. Numerical examples demonstrate the application of the method proposed in the present work. It is concluded that the method is accurate and when combined the proposed load reduction parameter, the extent of damage to the beam can be obtained rapidly.

Biography

Peter Jiki studied Civil engineering in Bolton Institute of Tech (At present; University of Bolton), England and graduated in 1979. He later obtained his MSc in Structures from Cranfield Institute of Tech (At present; Cranfield University), England in 1983. He finally obtained his PhD in Civil Engineering Structures from the University of Lagos in 1997. Since 2011 he has been an Associate Professor in Civil Engineering Structures in the University of Agriculture Makurdi in Nigeria. He has many publications to his credit.

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