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EFFECT OF VARIOUS END MOMENTS ON LATERAL BUCKLING OF CANTILEVERED CIRCULAR ARCHES

Y.B. Yang[1,*], and Yazhou Liu[1]

[1] School of Civil Engineering, Chongqing University, Chongqing, China 400045
[*]E-mail: ybyang@cqu.edu.cn

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A bending moment is called a quasi-tangential moment if it is generated by a rigid lever with two perpendicular direct forces acting in opposite directions. The superposition of two quasi-tangential moments with two rigid levers forming a cross shape is called a semi-tangential moment. Both quasi- and semi-tangential moments are conservative moments [1-4]. In this article, the lateral buckling of cantilevered circular arches under various end moments is studied using an analytical approach [5]. Three types of conservative moments are considered, i.e. the quasi-tangential moments of the 1st and 2nd kinds, and the semi-tangential moment. The induced moments associated with each of the moment mechanisms undergoing three-dimensional rotations are included in the Newman boundary conditions. Using the differential equations available for the out-of-plane buckling of curved beams, the analytical solutions are derived for a cantilevered circular arch. It will be demonstrated that the buckling loads obtained for each type of moments are different. The present solutions can be used as the benchmarks for calibration of other methods of analysis.

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