Inflated cushions under uniformly distributed loading

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Abstract

A series of papers [1-3] published at IASS symposium proceedings presented theoretical studies to describe the behavior of inflated cushion structures deployed into arched shapes under active bending to span a particular distance. In [1], it was demonstrated that this behavior was equivalent to the classical *elastica* problem [4]. In [2], the authors extended the methodology of [1] to include the behavior of these structures under a mid-span point load. It was noted in that paper that the methodology was limited to deriving shapes that did not include inflection points, and that a modification of the methodology would be required to derive shapes for forces of greater magnitude which would potentially include them. Such a modification was successfully made in [3], in which the authors noted that the methodology used would have greater potential for future studies.

In this paper, the authors successfully use the methodology of [3] to derive shapes and load data for inflated cushion structures under a uniformly distributed load, such as weight and, to a lesser extent, snow loads. Results indicate that these structures exhibit much stiffer behavior than when under the same total load as an equivalent mid-span point force.

References

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