

Keynote Paper

Computational Development of Design Aids for Anticlastic Membrane Tension Structures

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ABSTRACT

This keynote speech will introduce the computational development process of design aids for anticlastic membrane tension structures attached to edge beams on all four sides of the membrane, which has been done along with a former Master student of the author at Seoul National University, Korea, and the author's collaborators at Semyung University. First, the design of regular anticlastic membrane structures supported between symmetric arches is dealt with. The three parameters are employed: the arch curvature, the width of the membrane, and the scale of the arch. Next, a greater degree of irregularity is considered to produce a wider range of design cases. From the regular anticlastic membranes that are symmetric about the two axes, one of the symmetries is removed. The two new parameters are employed: asymmetry about the transverse axis, creating trapezoid-shaped membranes, and asymmetry about the longitudinal axis, creating inclined membranes. Based on the findings of both case studies of regular and irregular anticlastic membrane tension structures, design aid charts and design equations for rectangular, trapezoid-shaped and inclined membranes are suggested. In the process of the development, computational accuracy has been verified by comparing the design and behavior prediction of the previously constructed membrane structures. The design aids are believed to be useful for professional structural designers, particularly at their preliminary design phase.

Keywords: Tension structure, anticlastic membrane, computational development, design aid, arch, edge beam

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