

MIXED AXIOMATIC/ASYMPTOTIC ANALYSES OF REFINED LAYER WISE AND EQUIVALENT SINGLE LAYER PLATE/SHELL MODELS FOR COMPOSITE STRUCTURES

Erasmus Carrera, Alessandro Lamberti, Marco Petrolo

Department of Mechanical and Aerospace Engineering
Politecnico di Torino
Corso Duca degli Abruzzi, 24
10129, Torino, Italy
e-mail: erasmo.carrera@polito.it

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ABSTRACT

This paper presents a novel approach to build refined layer-wise (LW) and equivalent single layer (ESL) plate and shell theories for composite structures. This work is embedded in the framework of the Carrera Unified Formulation (CUF) developed over the last decade by the first author [1]. Within CUF, a so-called Mixed Axiomatic/Asymptotic Approach (MAAA) has been recently developed [2, 3]. MAAA allows us to evaluate the effectiveness of each higher-order term in a refined model. The development of reduced models is carried out through the investigation of the effectiveness of each unknown variable on the solution for a given problem. Reduced models are then built for various structural cases, such as thin and thick shells, layered shells and sandwiches.

Recently, MAAA has been extended to LW models [4]. A typical result from MAAA is shown in Figure 1. A fourth-order LW model based on Legendre polynomials was considered. A three-layer sandwich plate was analyzed. Each term of the refined models is depicted by a triangle. Black triangles indicate those terms which are needed to obtain the same results of the full fourth-order model. The resulting reduced model requires some 50 % less variables to detect the fourth-order model. This means that the computational cost of LW models can be significantly reduced through MAAA.

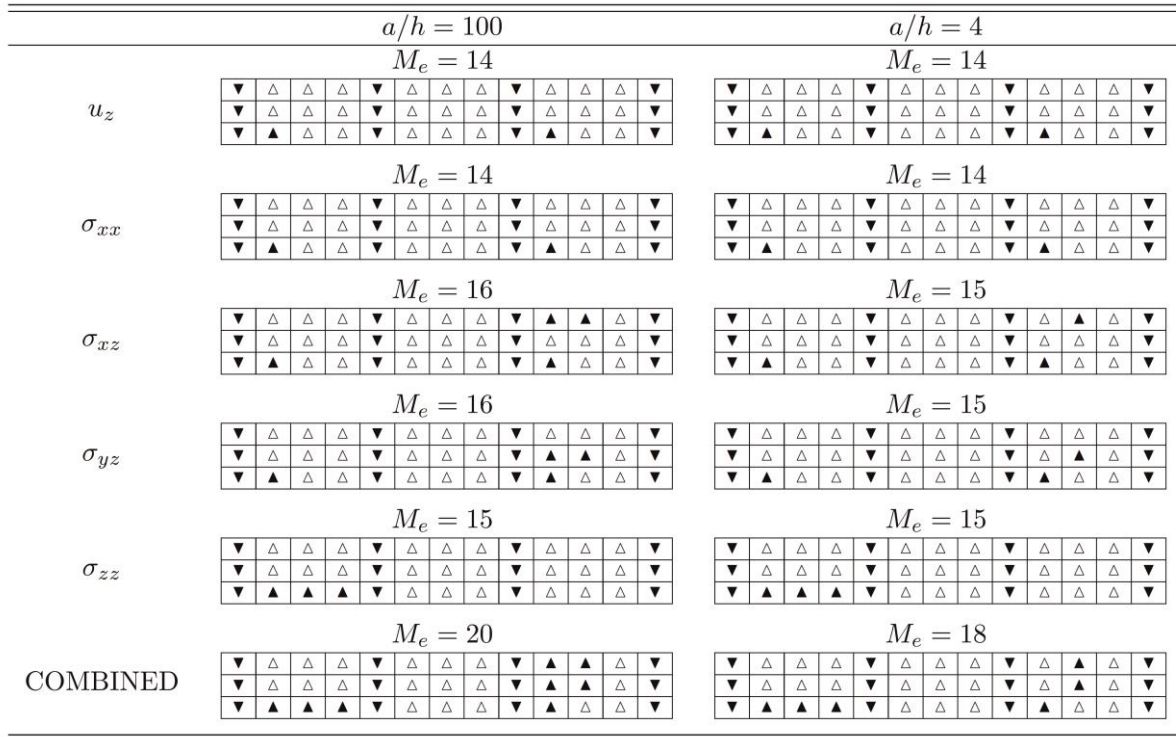


Figure 1: Reduced Layer Wise Models for Sandwich Plates

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