

# 3D Printed Sandwich Structural Decks of Dual Corrugate Sheet with Mid Shear Layer (DCMSL) as Core Profile

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## Abstract

Rectangular sandwich decks in an exclusive profile that has an additional shear layer in the mid of its dual corrugate monolithic core, developed on 3D printing, has been highlighted here in this paper. These sandwich decks in construction mix material when 3D printed out having such a monolithic core profile, factually offers getting rid off invariably otherwise required any bonding to attach the two or more components of any sandwich panels. Having observed a consistency in various numerical results as obtained through analyses carried out using 'Advanced Composite Technology(ACT) with that observed from various conducted load tests on these 3D printed hardware, sandwich deck units, are then favourably recommend for their effective deployment in any civil engineering application. A fruitful observation has been made here on a suitable orientation tht need only be maintained in this orthogonal dual corrugate sheets monolithic core profile sandwich for their excellence in performance for service as compare to that of any so far used single corrugate sheet core sandwich profile.

**Keywords:** Monolithic profile, Sandwich decks, Dual Corrugate, Advanced Composites Technology, 3D Printing

## 1 Introduction

Structural Sandwich panels are formed on assembly of two components namely its top and bottom Sheets/Laminates and preferably a deeper core of suitable geometric profile as well as in material of low density compared to that of the overall sandwich panels. The core in the sandwich offers effective area of its two faces to attach with flats Sheets/Laminates usually through bonding. Presence of any deep core essentially facilitates building the required sectional depth that may at time be needed in some situations where these structural sandwich panels are used. Core contributes here in bearing the shear loads that generates all along the depth of section due to flexural bending of these sandwich decks when subjected to any external transverse loadings. These structural sandwich panels, made-up-of Advanced Composites Honeycombs / PU-foams sandwich cores, are already in use, extensively

in aerospace applications. Further, sandwich composite panels as structural deck units as found from the literature, are also deployed in many civil engineering applications as well. An example of one such application of these structural sandwich decks ardently may be sighted here as those several deck units were successfully deployed over an all Advanced Composites Foot Over Bridge (FOB) system which was then designed and developed [1] earlier for pedestrian traffic by the Author and his team, at Composite Research Center of RDE(E), Pune, India. Prior to deployment of these deck units over this FoB, fabricated entirely in Glass Fibre Reinforced Plastics(GFRP), the development phase of these deck units included creating and conducting number of field trials on these decks in different types of sandwich core profiles and with different geometries and of different materials [2-5]. Only, a most suited profile was then so spurred out was a single corrugate FRP sheet core profile, sandwiched between two flat