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Effect of Upper Face Sheet Material on Flexural Strength of Polyurethane Foam Hybrid Sandwich Material

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Abstract : Sandwich panels comprise a thick, light-weight plastic foam such as polyurethane (PU) sandwiched between two relatively thin faces. One or both faces may be flat, lightly profiled or fully profiled. Until recently sandwich panel construction in Egypt has been widely used in cold-storage buildings, cold trucks, prefabricated buildings and insulation in construction. Recently new techniques are used in mass production of Sandwich Materials such as Reaction Injection Molding (RIM) and Vacuum bagging technique. However, in recent times their use has increased significantly due to their widespread structural applications in building systems. Structural sandwich panels generally used in Egypt comprise polyurethane foam core and thinner (0.42 mm) and high strength about 550 MPa (yield strength) flat steel faces bonded together using separate adhesives and By RIM technique. In this paper, we will use a new technique in sandwich panel preparation by using different face sheet materials in combination with polyurethane foam to form sandwich panel structures. Previously, PU Foam core with same thin 2 faces material was used, but in this work, we use different face materials and thicknesses for the upper face sheet such as Galvanized steel sheets (G.S),Aluminum sheets (Al),Fiberglass sheets (F.G) and Aluminum-Rubber composite sheets (Al/R) with polyurethane foam core 10 mm thickness and 45 Kg/m3 Density and Galvanized steel as lower face sheet. Using Aluminum-Rubber composite sheets as face sheet is considered a hybrid composite sandwich panel which is built by Hand-Layup technique by using PU glue as adhesive. This modification increases the benefits of the face sheet that will withstand different working environments with relatively small increase in its weight and will be useful in several applications. In this work, a 3-point bending test is used assistant professor to measure the most important factor in sandwich materials that is strength to weight ratio(STW) for different combinations of sandwich structures and make a comparison to study the effect of changing the face sheet material on the mechanical behavior of PU sandwich material. Also, the density of the different prepared sandwich materials will be measured to obtain the specific bending strength.

Keywords : hybrid sandwich panel, mechanical behavior, PU foam, sandwich panel, 3-point bending, flexural strength
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