# Development of an Ecofriendly and Economic Alternative to Oak Wood in Construction, Utilizing a Composite Prototype of Recycled Polyethylene Terephthalate (PET), Polycarbonate, and Agave Sisalana (Year 4)

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Materials have rapidly become scarce and costly due to several factors, including disease, deforestation, worker strikes, and more. This year-four continuation project improved molding techniques and performed further testing, in the form of compression examinations, on a composite prototype composed of recycled Agave sisalana fibres, polyethylene terephthalate, and polycarbonate that competes with construction-grade lumber, specifically Quercus rubra and Quercus alba (commonly known as Northern Red Oak and White Oak). Four specimens of the composite were tested, following the predetermined recipe (developed from project year two and its results) of 63.53% polyethylene terephthalate, 31.71% polycarbonate, and 4.76% Agave sisalana fibres. This year, the samples underwent compressive examinations (three-point flexural testing examined in project years one/two, tensile in year three) to determine the compressive strengths, fracture points/properties, and compressive displacement of the composite. This year's composite samples, particularly samples 1 and 5, were able to compete with, or outperform, the samples of oak wood. These results are promising, as there have been significant improvements in the consistency and performance of the composite over the project's four years of experimentation. The hypothesis stated that the composite could rival the lumber samples with comparable durability while being reasonably cost-equivalent. The hypothesis was proven correct, as the composite samples tested similarly, or better, than the lumber samples, whilst at comparable costs, easily obtainable levels, and additional positive effects on our environment.

**Awards Won:**