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Title : BIO-ROOF MATERIAL BASED ON OIL PALM FIBRE

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Nature of roof that covers the very top of the building, has encouraged related research, especially regarding the properties, types, problems and materials for roofs. In recent years, awareness about environmental pollution and sustainability, has driven the demand for roof coverings that are more sustainable. Currently, the use of local raw materials that are easily found, in addition to reducing waste, and reuse of materials is a key features of construction materials. The use of recycled materials based on palm oil can be profitable for the farmers and consumers in general. The objective of this research is to produce an advanced composite material from oil palm empty fruit bunch (EFB) at the same time exploring the mechanical and physical properties of this material as a preparation to develop a substitute's material for sustainable roofing material. The mechanical and physical properties of oil palm EFB as roofing material is originally tested as per American Standard (ASTM) and British Standard (BS). Materials are selected based on normal concrete mix with the addition of oil palm empty fruit bunch fibres in various batches. The oil palm empty fruit bunch (EFB) fibre is obtained from MPOB Research Centre and there is no treatment done to the selected fibre. The selected cement to sand ratio used is 1:2, with six different water to cement ratio (0.32, 0.37, 0.42, 0.47, 0.52 and 0.57). The thickness of the sample is 10mm and percentage of fibre used is 0.5%, 1.0&, 1.5% and 2.0%. Fibre sizes are divided into four categories; OS, LS, MS and SS. The sizes are range from 0.7mm -14.04mm length. The river sand is used as an aggregate with sizes ranging from 0.06 to 2mm which is passing a 2mm to 2.5 mm mesh size sieve. The sample is tested and the impact of the sample on the five different variables which are cement to sand ratio, water to cement ratio, fibre volume, size and weathering condition are analysed. The samples are tested based on the flexural strength, density and water tightness only. Fibre volume of 0.5% is found as the appropriate volume for this mixture design. The highest flexural strength recorded is 6.44N/mm² which exceed from the minimum requirement of ASTM for roofing slates. Flexural strength is increases when using the large size of fibre, it is found that the size of 6.4-14.04mm fibre length, 396-471µm width; achieve the highest flexural strength at 6.44N/mm² for sample C3-15-42. Fibre size is categorised as LS (Large Size) with 0.37 water cement ratio. Weathering condition gave a big effect to the sample as there is an increment in strength for samples mixed with oil palm fiber through the curing process from 7 to 28 days. The highest increment is 63.46% for sample C2-27-52 with 1.0% fibre content. Even though the highest strength is using 0.42 water cement ratio, but 0.47 water cement ratio gave constant result for other samples compares to other variables. The highest density recorded is from the LS fibre (water cement ratio 0.42) with 1.0% fibre volume and 28 days immersion in wet condition. The density of the sample is 2030.99kg/m³. The lowest reading of density is 1247.73kg/m³ with water cement ratio 0.32 (MS fibre), 2.0% of fibre volume and 28 days immersion in dry condition. An average density is also indicated which between 1562.51kg/m³ to 1997.19kg/m³. Unfortunately, all samples failed the water tightness test with 49g water retention which is 44g more compare to the minimum requirement.