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Use of Recycled Materials in Civil Engineering Infrastructures

Recycling of waste materials in construction application is currently getting lots of attention due to an increase in the amount of industrial waste causing a heavy disposal cost and the resulting negative effects on the environment. One source of such waste materials is scrap tires. It is estimated that, in the United States, a person scraps 1.1 tires a year, leading to an average of over 300 million scrap tires a year. These scrap tires occupy landfill space as they are non-biodegradable, contaminating the environment as they are considered as toxic waste, and pose a significant fire hazard. Therefore, several states including California have a long term plan of recycling those scrap tires in construction. Another source of waste material is construction scraps such as scrap concrete and pavement materials. Previous work conducted by high school, undergraduate and graduate students at California State University, Fullerton has shown the potential benefits of mixing soil with shredded rubber tires. The previous work looked at different sizes of rubber tire (50-80 mesh tire or 0.178 mm to 0.297 mm sized and 80-200 mesh or 0.075 mm to 0.178 mm size rubber tires) mixed with different percentages of soil between 0 and 10%. The work showed that the addition of rubber tire will increase the strength of the mixture. In this project, students will continue work to examine how the soil type and quantity and size of the shredded rubber tires influences the properties of the soil-rubber tire mixtures. The research will focus on evaluating the possibility of using scrap tires and construction waste into civil engineering applications including backfill of retaining walls, pavement for sidewalks and walkways, and embankment, as well as ground improvement to increase the load bearing capacity of weak foundation soils.