Concrete Solutions

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The purpose of this project is to utilize mixed plastic regrind in concrete as a practical and environmentally friendly use of waste that would otherwise end up in landfills or worse — the environment. The question posed at the beginning of this research was: What is the relationship between the volume of plastic utilized as aggregate in concrete and the resulting decrease in compressive strength? The goal was to evaluate this trend in order to determine the possible applications of plastic contributed concrete. An experiment was designed in which 20 concrete cylinders were made (4” diameter x 8” height); the 15 cylinders altered by the independent variable contained, on the basis of the total volume of the concrete mix, 10, 20, and 30 percent plastic, with the remaining five falling into a control group. To accomplish this, 40lb bags of Quikrete ready-to-use concrete mix were put through hand sieves and the 1/8 and 1/4 aggregate sizes were removed and replaced with an equivalent size and volume of plastic. After 28 days, the cylinders were tested on a Forney compression machine. The data collected included the maximum load applied and any qualitative observations. The maximum load values were converted to psi and graphed to show the trend in strength loss as it relates to the volume of plastic used. It was found that the loss of strength levels out between 20 and 30 percent plastic contribution, and the cubic polynomial "y = 0.212x^3 – 6.969x^2 – 43.04x + 5013" was developed to mathematically describe the relationship up to a 30 percent plastic usage. With this information, future developers may be able to apply this research, meeting project goals on both safety and sustainability.

Awards Won: