SUSTAINABLE PAVER BLOCKS: INCORPORATING DEMOLISHED CONCRETE WASTE AND PLASTIC WASTE FOR ENHANCED PROPERTIES AND ENVIRONMENTAL BENEFITS

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Introduction:

The wastes plastic in household is large and increases with time. In each country the waste composition is different, since it is affected by socioeconomic characteristics, consumption patterns and waste management programs, but generally the level of plastics in waste composition is high. The largest component of the plastic waste is polyethylene, followed by polypropylene, polyethylene Terephthalate and polystyrene. The large volume of materials required for construction is potentially a major area for the reuse of waste materials. Recycling in concrete has advantages since it is widely used and has a long service life, which means that the waste is being removed from the waste stream for a long period.

CREASED concern for environmental protection and for promotion of the principles of sustainable development has led some governments to introduce legislation to encourage the use of recycled aggregates. A favoured method is to lower the selling price of recycled aggregates in relation to natural aggregate, and this is largely achieved by increasing landfill costs. Demolition sites and restoration schemes are sources of large amounts of solid waste, which today is being used as mere landfill. On the other hand, building practices are such that reusable materials also become mixed with rubble, stone and soil, reducing their value and making recycling difficult or uneconomical. This waste material too, is rendered suitable only as infill for construction work, or as landfill.

Objectives:

1. To assess the mechanical properties of paver blocks with varying percentages of demolished crushed concrete waste & plastic waste.
2. To evaluate the environmental impact of using demolished crushed concrete waste and plastic waste in paver blocks compared to traditional manufacturing methods.

3. To investigate the long-term performance of demolished crushed concrete waste and plastic-infused paver blocks.
4. To find the optimum mix design for enhanced properties.

Methodology:

Material Selection

1. Demolished crushed concrete waste: Using the tested concrete cube waste from Material testing laboratory and crushing them into small & finer particles.
2. Choose appropriate types and percentages of plastic waste (e.g., PET, HDPE) for incorporation into the paver block mix.
    - Waste Plastic (HDPE)
    - Sand

Manufacturing: *Produce paver blocks using the developed mixtures and compare them with traditional blocks.*

Tests on Paver Blocks

- Mechanical Testing
- Environmental Impact Assessment
- Durability Studies

Conclusion:

Based on the experimental study

1. Reuse of demolished crushed concrete waste and hence sustainable paver block
2. Reuse of waste plastic in production of paver block is productive way of disposal of plastic waste.
3. Cost of present paver block can prove to be lesser than concrete paver block.
4. The compressive strength may be low of equal to the traditional paver blocks and hence it can be used in garden, pedestrian path, cycle way.
5. The compressive strength of the paver block is found to range between 30 N/mm^2 - 40 N/mm^2 for different proportions. (Some tests are pending)

Innovation in the project:

Incorporating demolished concrete waste and plastic waste into pavers presents an innovative approach with several benefits:

1. ***Waste Reduction and Recycling:*** Utilizing demolished concrete waste and plastic waste in paver production reduces the amount of waste sent to landfills, contributing to waste reduction and recycling efforts. This approach promotes a circular economy by repurposing materials that would otherwise be discarded.
2. ***Improved Durability and Strength:*** Demolished concrete waste, when crushed and used as aggregate in pavers, can enhance their durability and strength. The

recycled concrete aggregate (RCA) can act as a sustainable alternative to traditional aggregates, providing similar or even improved mechanical properties in pavers.

3. ***Enhanced Flexibility and Crack Resistance:*** Incorporating plastic waste, such as shredded plastic bags or bottles, into the paver mix can improve its flexibility and crack resistance. The plastic particles act as a reinforcement, dispersing stress and reducing the likelihood of cracking, especially in areas with heavy traffic or temperature variations.

4. ***Reduced Carbon Footprint:*** By using recycled materials like demolished concrete waste and plastic waste in paver production, the carbon footprint associated with manufacturing new materials is significantly reduced. This contributes to environmental sustainability by conserving natural resources and minimizing greenhouse gas emissions associated with traditional manufacturing processes.

5. ***Customizable Aesthetics:*** Pavers made from a blend of demolished concrete waste and plastic waste can offer unique aesthetic options. Depending on the composition and color of the recycled materials, pavers can have a distinctive appearance that adds visual interest to outdoor spaces. This customization potential allows for creative design possibilities while promoting sustainability.

6. ***Water Permeability:*** Certain types of pavers can be designed to allow water to permeate through them, reducing stormwater runoff and minimizing the risk of flooding. By incorporating porous materials like crushed concrete and plastic waste into these permeable pavers, the environmental benefits are further amplified, as they contribute to better water management and groundwater recharge.

Scope for future work:

Incorporating demolished concrete waste and plastic waste into pavers not only enhances their properties but also contributes to environmental conservation and sustainable development goals. This innovative approach demonstrates the potential for waste-to-resource solutions in the construction industry, paving the way for more sustainable practices in infrastructure development. The incorporation of demolished concrete waste and plastic waste into pavers holds promise for advancing sustainable construction practices, promoting circular economy principles, and addressing environmental challenges in the built environment. Continued research, innovation, and collaboration across the construction industry are essential for realizing the full potential of recycled-content pavers and maximizing their environmental and economic benefits.