TOWARD USING RECYCLED THERMOSET PLASTIC MATERIAL FOR ROADWAY SURFACE OVERLAYS

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Introduction

Ultra High-Performance Concrete (UHPC) is a new material that is cement based that has been gaining interest in a large-scale use in its application in bridges and other road work projects.

Thermoset Plastic Polymers such as ABS (the plastic that was used for this research) do not change after the material is initially heat set which becomes a problem after the product is not longer in use.

The properties of UHPC could allow for the introduction of plastic material as a filler or a potential replace for some or all the fine aggregate in the mix.

Problem Specification

There is an abundance of Thermoset Plastic Material .that ends up in landfills from the difficulty of recycling and UPHC requires finer aggregate as there is no coarse aggregate within the mixes. This can potentially be resolved with the inclusion of the plastic material in UHPC as wat way of recycling the material and a filler for the concrete.

Methodology

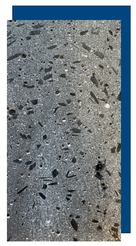
Idea Development
What issues are trying to be addressed with the addition of plastic material in UHPC?

Burning Plastic

Background Research
Looking into the research that has been done with the inclusion of Plastic material in Cement

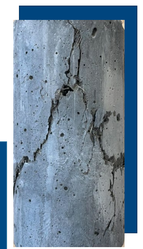
Humboldt Concrete Compression Machine

Mix Designs and Testing Plans
The creation of several mix designs with varying amounts of plastic that will tested and the schedule that will be followed



Cross Section of Sample

Sample Creation and Testing
Mixing the different batches of UHPC and the testing of the samples for compression strength

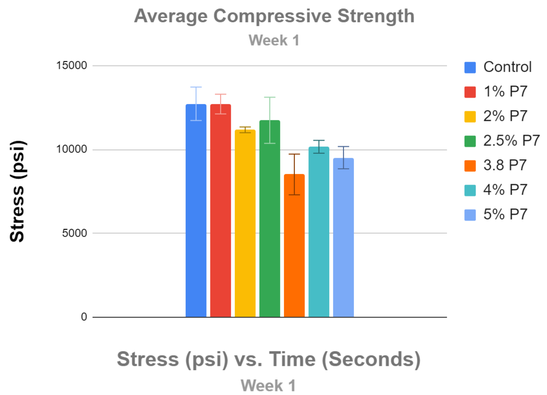


Sample after Testing

Data Interpretation
Averaging the compressive strength of the samples for a comparison of the different plastic amounts

Results and Discussion

- Seven different UHPC mixes were tested with varying amount of ABS plastic material
  - 0%, 1%, 2%, 2.5%, 3.8%, 4%, and 5% ABS plastic by weight.



Summary and Conclusion

Overall, there was a loss of compressive strength with the addition of the plastic material, but from initial testing there were good observations

- Potential ductile failure for the higher percentage plastic mixes.
- Little to no loss in strength in the lower percentage mixes
- No change in the air content or the flow rate of the UHPC

This is the introduction of the addition of plastics into different high performance concrete mixes and further research with different forms of plastics will continued to be done

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