With thousands of tonnes of flexible plastics and glass fines ending up in landfill each year, Swinburne University and Polytrade Recycling conducted a research project to repurpose this waste. These Victorian-based organisations investigated using flexible plastics and glass fines in concrete footpaths and with positive research results, they will now work with local government to increase the uptake of this recycled content in new footpath construction.

Project Background
In Victoria, approximately 100,000 tonnes of flexible plastics end up in landfill annually, and of the 250,000 tonnes of glass waste produced each year only half of this is recovered for recycling (Sustainability Victoria, 2014). Recycled plastics have been used in protective structures (bollards), masonry and pavement; however, research had not previously been undertaken on using recovered plastics and glass fines in concrete footpaths. In addressing this, Swinburne University of Technology in partnership with Polytrade Recycling, investigated the use of end of life recovered plastics and glass fines in the construction of concrete footpaths. This research project aimed to reduce the use of traditional virgin materials in concrete footpath construction.

What are glass fines and why are they a problem?
Glass fines are the small glass particles (typically between 3-8 mm in size) leftover due to breakage via co-mingled recycling collections. GF are considered unsuitable for re-use in glass manufacturing. This is largely due to the size of the particles being too small for colour sorting and/or are contaminated with other materials like ceramic, stoneware, Pyrex and plastic. As a result of these challenges and the low economic value of glass fines, the majority of volume is either stockpiled or landfilled.

What are recovered plastics and why are they a problem?
Plastic products can be broadly categorised as either flexible or rigid and both can be used in footpath construction. Several challenges for plastic recovery include the lack of available quality feedstocks as well as the price sensitivities of collection, transport and processing into quality products when compared to items made from virgin plastics.

Research Results
Evaluation of the test results showed that the recycled plastics and glass fines could be incorporated into concrete footpaths without compromising the mechanical properties and meeting the standard requirements. The amount of additives should be limited to 10% of any combination of recovered plastics and/or glass fines.

Swinburne University used portland cement, sand, gravel, recovered plastics and glass fines in this study. The study involved adding various percentages of recovered plastics and glass fines to the sample concrete mix. The amount of materials mixed followed a method prescribed by testing material standards (ASTM C192). After 28 days of curing, testing demonstrated that the prescribed concrete mix would meet the minimum compressive strength requirements for a typical Victorian council.

The strength of the concrete mix was tested in numerous ways including water absorption testing that indicated recycled plastics and glass fines have very low sorptivity (measure of the capacity of the medium to absorb or desorb liquid). The wear resistance of the concrete footpath was also tested and this showed similar wear results to the control sample.
Opportunities

This research project indicates that there is significant opportunity to include recycled plastics and glass fines in concrete footpaths. The next step for this project is to work with local government to increase the uptake of recycled content based on the research and undertake performance monitoring and evaluation in a real-world application.

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For further information

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“The use of recovered plastics and glass fines in concrete footpaths will divert significant quantities of these materials from landfill; whilst reducing the demand for virgin construction materials.”

Dr Yat Choy Wong, Senior Lecturer, Swinburne University of Technology