

RECYCLED PLASTICS



WHAT ARE RECYCLED PLASTICS?

Recycled plastics are polymeric materials derived as waste from commercial and industrial uses. In Australia, most of the plastic waste comes from packaging and some from built environment, automotive industry and electrical and electronics applications. The most common polymers found in these applications are high-density polyethylene (HDPE), low-density polyethylene (LDPE), polypropylene (PP), polystyrene (PS), acrylonitrile butadiene styrene (ABS), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polyurethane (PU), polyamide (PA) and some bioplastics. A small number, predominantly PET, HDPE, LDPE, PA, and PP, are locally reprocessed and repurposed.

WHAT ARE THE BENEFITS OF USING RECYCLED PLASTIC?

The benefits of using recycled plastic in road and rail infrastructure are as follows:

- **Environmental benefits**
 - Reduced use of virgin materials, reduced landfilling of plastics.
- **Performance benefits for asphalt**
 - Waste plastic modified asphalt is likely to be stiffer than conventional asphalt and therefore offers increased resistance to permanent deformation.
- **Performance benefits for railways**
 - Recycled plastic sleepers have been demonstrated to be termite-, UV- and rot-resistant, as well as having a longer design life than regular timber sleepers.

WHERE IS IT USED?

Recycled plastic can be used in ancillary components. These include drainage covers, roadside furniture, bollards, road cones, safety barriers, boardwalks, signage, tree stakes, decking, noise walls, pipes, railway sleepers and modular cycle paths and walkways. Additionally, it can be incorporated into geogrids or geotextiles, to support road and rail structures. Lastly, it can be incorporated into asphalt as a bituminous binder modifier or as a partial fine aggregate replacement.

HOW MUCH CAN BE USED?

Specifications for plastics products tend to be performance-based, i.e. they do not specify limits and instead specify requirements for how the product or material must perform. Dependent on the end application, this means that some products may comprise up to 100% recycled plastics.

Development of performance-based specifications are underway in Victoria, by Major Road Projects Victoria, for the use of recycled plastics in noise walls and pipes.

There are presently no specifications in the asphalt or pavement space that outline specific requirements for recycled plastics, though there are several proprietary products in the market that utilise small percentages of recycled plastics.

WHAT OPPORTUNITIES ARE THERE FOR IMPROVING ADOPTION?

The wider adoption of recycled plastics in ancillary, road and rail infrastructure would be further promoted by more specifications that support and guide their use. Given the high volumes of waste plastic generated in Australia, recycling it into structures such as noise walls, bollards, roadside furniture and pipes, which can absorb large quantities, are presently the most suitable applications.

Additionally, research demonstrating the environmental and workplace health and safety outcomes of using these materials would give further confidence to industry to use it. Main Roads Western Australia and Queensland Department of Transport and Main Roads are currently undertaking a joint research project in these areas, specifically on emissions and fuming, microplastics and the implications of using recycled plastics in infrastructure.



RECYCLED PLASTIC SLEEPERS: QLD AND VIC



Integrated Recycling's recycled plastics railway sleepers, coined Duratrack®, have been trialled in both Victoria and Queensland. The sleepers are designed to replace regular timber sleepers and have a 50-year design life, meaning they last three to four times longer and need to be replaced fewer times. The sleepers use existing equipment and training, meaning the innovative product can be integrated into normal maintenance practices. Performance testing was undertaken at the Institute of Railway Technology at Monash University.

Other benefits of the recycled product include termite, UV, fungal decay and rot resistance; fire tolerance; low water absorption; equivalent installation to timber; and being less energy intensive to produce than concrete or steel sleepers. A key factor is that the sleepers are also recyclable at end of life, offering a genuine circular economy approach to material usage.

Duratrack® is Type Approved by V/Line and Metro Trains Melbourne (MTM) after trials in Wyndham Vale and Richmond. Type Approval in the rail industry certifies that a product meets a minimum level of technical, performance and safety requirements. They have also been successfully installed in Queensland Rail Mainline, between Helidon and Gatton, and Chinchilla and Miles.

Integrated Recycling note that 1 km of Duratrack railway sleepers use 54 tonnes of waste plastic and 10 tonnes of polystyrene, plus it saves about 150 trees. The sleepers are made from a mix of rigid and flexible plastics and polystyrene that have reached their end of life as pipes, drums, agricultural films and produce boxes. The specific makeup of the product isn't disclosed by Integrated Recycling.



[Engineered Recycled Plastic Railway Sleepers](#)



LOCATIONS

NATIONAL TRANSPORT RESEARCH
CENTRE AND HEAD OFFICE:
80A TURNER STREET
PORT MELBOURNE, VIC 3207

OFFICES IN:
BRISBANE, SYDNEY, ADELAIDE, PERTH, CANBERRA



RECYCLED PLASTIC MODIFIED ASPHALT: PORT ADELAIDE ENFIELD, SA



In 2019, the City of Port Adelaide Enfield trialled the use of a recycled plastic modified asphalt. The product, designed by Fulton Hogan, was first explored in 2014 and is named PlastiPhalt®. The asphalt mix is made with recycled plastic waste, with the trial site using the equivalent of more than 140,000 plastic bags. The plastic was part of 110 tonnes of PlastiPhalt® laid on site, which also included 20% reclaimed asphalt pavement (RAP).

PlastiPhalt® is made by shredding and then granulating waste plastic down to a suitable size to be incorporated into bitumen. The trial with City of Port Adelaide Enfield was the first large-scale trial of a plastic modified asphalt in South Australia. Fulton Hogan reports that PlastiPhalt® can be re-recycled at end of life, offering a circular economy approach. The product has been tested against a number of performance measures to ensure it performs to a suitable standard, alongside more conventional materials.

Fulton Hogan have employed PlastiPhalt® at a number of sites, including across Victoria in St Kilda, Seaford, Lorne and Westfall. Over 4,000 tonnes of PlastiPhalt® have been laid in Victoria, with other projects also taking place in Queensland, South Australia and Western Australia.



[PlastiPhalt: Plastic Recycled Into Asphalt in Adelaide](#)



[Recycled plastic asphalt used in Adelaide](#)



[PlastiPhalt sets new standard for greener roads](#)



[Plastic Bags Recycled Into Asphalt on Local Roads](#)



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RECYCLED PLASTIC NOISE WALLS: MORDIALLOC, VIC



In 2020–21 the Mordialloc Freeway project, as part of Victoria's Big Build, employed recycled plastics to build its required length of noise walls. Around 570 tonnes of plastic waste were used to build the noise walls, which comprised 75% recycled plastic. The amount of plastic used was equivalent to 30 million water bottles, or all the plastic collected from 25,000 Victorian homes in one year. The project was led by Major Roads Projects Victoria (MRPV), with support from Ecologiq, a Victorian Government initiative that aims to optimise the use of recycled materials in major road and rail projects. The installation of the noise walls was headed up by AusGroup Alliance, with their design by Pact Group.

The noise walls comprise a combination of soft plastics, such as low-density polyethylene (LDPE), and hard-to-recycle single-use plastics like high-density polyethylene (HDPE) milk bottles. The recycled content is roughly half LDPE and half HDPE. These types of plastics come from waste consumer plastics, such as milk bottles. The noise walls extend 32,000 sq m and are designed to be recyclable again at the end of their 40-year design life, offering a genuine circular economy approach.

The noise walls have been designed to be easy to install, low maintenance and more cost efficient in the long term than steel or concrete products. Pact Group is considering options to share the technology globally, putting innovative Australian designs on the world stage.

[Pact Group transforms 600 tonnes of plastic waste into recycled noise wall solution for Mordialloc Freeway - Pact Group](#)

[Mordialloc Freeway - Victoria's Big Build](#)

[Mordialloc Fwy Recycled Plastic Noise Walls - A World First](#)

[World-first soft plastics recycling](#)



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