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Recycled Materials in Ancillary Infrastructure

Reference Guide – February 2024

An initiative of Victoria's Big Build



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1. Introduction

The *Reference Guide for Recycled Materials in Ancillary Infrastructure* (this guide) is part of a strategic Victorian Government commitment to optimise the use of recycled and reused materials in road and rail construction.

The guide provides a summary of current industry standards, specifications and documents from the Department of Transport and Planning (DTP), Victorian Rail Transport Operators (RTOs), and Australian Standards in Victoria and Australian standards that support the use of recycled materials in ancillary transport infrastructure.

Victoria's Big Build is continuing to deliver dozens of major road and rail projects, which provides an invaluable opportunity to change how waste is used in Victoria and increase the use of recycled and reused materials in transport infrastructure construction.

Ancillary infrastructure applications are those considered non-service or non-safety critical in the context of rail and road infrastructure. This includes signs and signals, lighting, retaining walls, guardrails, pavement markings and more.

This guide builds upon and complements the considerable work undertaken across the Victorian Government to encourage the use of recycled materials in construction and more broadly. Several valuable resources include:

- [Recycling Industry Strategic Plan](#) (Department of Environment, Land, Water and Planning)
- [Extractive Resources Strategy](#) (Department of Jobs, Precincts and Regions)
- [Social Procurement Framework](#) (Buying for Victoria)
- [Recycling and Resource Recovery Infrastructure Evidence Base Report](#) (Infrastructure Victoria)
- [Victoria's Recycling Infrastructure Plan](#) (Recycling Victoria) - to be published in 2024.

1.1 How to use these guidelines

This guide is intended for use by designers, contractors, department or project sustainability leads, asset owners and others working on major road and rail infrastructure projects during the planning, pre-tender and construction stages.

This guide can be utilised to efficiently identify which recycled materials can be used in certain ancillary infrastructure applications.

The applications outlined within this guide include site clearance, roadside, urban design and landscaping, organics and rail/tram platform ancillary elements. Many of the ancillary applications are not considered safety and/or service critical assets and therefore once compliant with relevant standards are not subject to additional assurance procedures.

Suppliers can use this guide to determine potential areas of development and demand.

This guide does not replace current DTP or RTO standards. It is to be used as a quick reference guide to identify opportunities to use recycled materials and other reuse applications in line with current design and construction standards.

Information in this guide has been drawn from DTP and RTO documentation at the time of publishing and is to be read in conjunction with the latest standards, specifications, contract documents, codes of practice and technical notes.

This guide may also be used in conjunction with the [Reference Guide for Recycled Materials in Road Infrastructure \(road guide\)](#) and the [Reference Guide for Recycled Materials in Rail Infrastructure \(rail guide\)](#) for service and safety-critical applications.

1.2 Using recycled materials

Reuse: There are a variety of well-established reuse applications within road and rail infrastructure that enable the remaining serviceability of products and materials to be utilised on the network. These applications are subject to quality assessment and approvals to ensure asset quality is maintained.

Recycled materials:

Supplementary cementitious materials (SCMs) in concrete, crushed glass, recycled steel, recycled crushed concrete, timber, crumb rubber and plastic are commonly used in construction to supplement traditional virgin materials. These materials can provide quality, cost-saving and availability opportunities and offer long-term environmental and social benefits.

TIPES or Type Approvals:

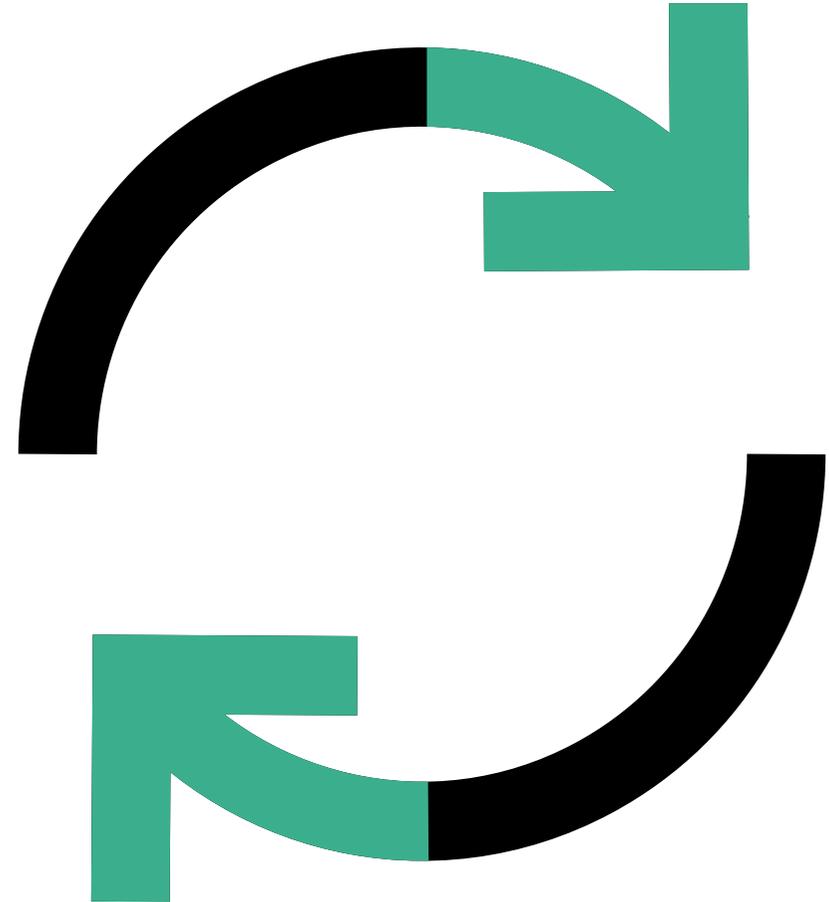
The Transport Infrastructure Product Evaluation Scheme (TIPES) and 'Type Approval' processes are used for certification and

approval of applicable products and materials in road and rail infrastructure respectively.

TIPES is a process developed to provide an independent fit-for-purpose assessment of innovative road construction products. TIPES delivers an independent technical assessment of road pavement construction and maintenance products that fall outside the scope of established standards and specifications.

All products part of safety or service-critical rail infrastructure must undergo 'Type Approval' – a robust assessment process by the relevant RTO – prior to their application on the network. This ensures only products/materials with proven performance are used.

It is to be noted that applications within this guide may not require Type Approval and reference should be made to the rail guide for relevant safety or service-critical rail infrastructure applications.





2. Reference Documents

Standards and specifications for ancillary items typically are not prescriptive in their use of recycled materials, however they identify the requirements of the products or applications from performance, operation, maintenance and environmental aspects.

Therefore, allowable applications of recycled products have been validated with a sample of suppliers to confirm opportunities.

Table 1 describes the technical documentation available from DTP and principal RTOs, including the access requirements. The specific technical documents referenced in this guide are further outlined in Appendix A.

Notes:

1. Throughout this guide and in [Appendix A](#), links are provided only for those documents that are public access.

Table 1 – Reference documents

Infrastructure manager	Description / Technical library	Access requirements ¹
Victorian Rail Track Corporation (VicTrack)	Standards to inform the design, construction, commissioning, operation and decommissioning of VicTrack assets and infrastructure. Engineering Standards Library	Limited documents are public access; additional documents may be requested.
DTP	DTP standards form the primary reference for recycled material allowances and material specification requirements within road infrastructure and are appropriate for use for many rail applications, where not documented in RTO standards. Technical publications DTP Drawing Management System	Documents located in the Technical publications library are public access. The Drawing Management System requires authorisation to access, and may require a relevant Government department or agency sponsor.
Metro Trains Melbourne (MTM)	MTM standards, specifications and technical notes. MTM Document Portal	Public access.
V/Line	V/Line standards, specifications and technical notes. V/Line Network Access Portal (VNAP)	User registration required.
Australian Rail Track Corporation (ARTC)	ARTC procedures, specifications and technical notes. ARTC Extranet	Public access.
Yarra Trams	Infrastructure; Operational Control and Management Systems; Rolling Stock; and Engineering Management Systems documents. Standards List	Limited documents are public access, others may be accessed via the DTP Drawing Management System.



3. General Considerations

The following section outlines general considerations that may apply when using reused or recycled materials in the construction of road and rail infrastructure.

Road industry:

The Victorian road network is managed by DTP and is directly responsible for providing and maintaining the infrastructure and to ensure the safety of the road infrastructure.

Rail industry:

The Victorian rail network is managed by five principal RTOs. Each is responsible for providing, maintaining and ensuring the safety of the rail infrastructure.

- **VicTrack:** asset owner for most of Victoria's rail land and infrastructure. The majority of VicTrack's assets

are leased to the rail infrastructure managers and rolling stock operators

- **MTM:** Metropolitan rail network
- **V/Line:** Regional rail network
- **ARTC:** Interstate network (and interstate freight operator)
- **Yarra Trams:** Melbourne light rail tram network

Refer to the rail guide for further details on rail industry agreements.

Safety and environmental management:

- Materials and products must meet the standards and specifications prescribed by the relevant authority/operator and be approved for use
- All activities involving recycled materials (i.e. sourcing, transporting, processing and placing) must meet the relevant statutory and regulatory requirements
- The environmental management requirements of DTP and relevant RTO must be met, as identified in *Table 2*
- Compliance with [EPA requirements](#)

Table 2 – Environmental requirements

Infrastructure manager	Environmental requirement
VicTrack	VT-PO 167 : Environmental Sustainability Policy PR-GL 003: Environmental Management Plan – When Working on VicTrack Land PR-GL 004: VicTrack Soil Reuse Guideline Environmental Sustainability Strategy 2021-25
DTP	Section 176 : Environmental Management (Minor) Section 177 : Environmental Management (Major)
MTM	A7640 : Metro Environment and Sustainability Policy A2020 : Safety and Environmental Requirements for Contractors and Third Parties
V/Line	NIMG-2741 : Third Party Safety and Environmental Management Handbook SAPO-2: Health, Safety and Environment SAMG-39: Construction Environmental Management Plan (CEMP) SAMG-49: Contractor Safety and Environmental Management Handbook SAMG-7: V/Line’s Significant Environmental Aspects and Impacts SAPR-67: Environmental Management of Industrial and Priority Industrial Wastes SAPR-68 : Environmental Management of Earthworks and Soil Disturbance SAPR-9: Safety, Security, Health and Environment Risk Management Process
ARTC	Environmental Policy Inland Rail Environment and Sustainability Policy Inland Rail Sustainable Procurement Policy RSK-PR-001 : Risk Management Environment Protection Licence (NSW-2023) Environment Protection Authority (SA-2019) Southern Sydney Freight Line Environmental Documentation
Yarra Trams	SMS 11.2 : Sustainability and Environment Policy

Whole-of-Life (WoL) carbon emissions:

- Traditional quarried materials often have a large embedded carbon cost from production, to construction and to final recycling/disposal.
- Use of recycled materials to replace or supplement traditional quarried materials may reduce WoL carbon emissions, but consideration should be given to all transportation/processing/recycling requirements (e.g. collection, cleaning, processing and delivery).
- Materials and products sourced locally to a project site can provide benefits to WoL carbon emissions through a reduction in transport carbon emissions.
- End of life material recyclability should be considered in the context of WoL assessments.

Sourcing/Supply:

- Selection and use of recycled materials must consider the source/supply availability of such materials.
- Reuse of on-site materials and the adoption of recycled products can benefit project sites. This includes by reducing transportation requirements and increasing flexibility during construction (e.g. reuse of site won material).
- Sourcing restrictions may be due to project location (high cost of material transport) and/or market availability:
 - Existing markets (e.g. crushed concrete) are readily available and commonly used to supplement/complement traditional quarried materials in road pavement construction.
 - This guide focuses on what is accepted in current standards and market-available products. Further assessment should be made on WoL considerations and opportunities to introduce locally supplied products that utilise Victorian waste streams.

Waste management hierarchy:

- Ideally, production of waste from road and rail infrastructure projects should be avoided; however, this is often not practical. In cases where avoiding waste material generation is not feasible, it is important to minimise waste production, and reuse or recycle valuable construction resources wherever possible.
- This document provides support for addressing the 'reuse' and 'recycle' steps of the Waste Management Hierarchy shown in *Figure 1*.

Figure 1 – Waste Hierarchy (Infrastructure Victoria, 2019)



3.1 Recycled material sources and usage

Table 3 provides a summary of the current recycled material sources and their current areas of use in ancillary infrastructure. Refer to the road and rail guides for further detail of road and rail specific material applications.

Table 3 – Recycled material sources and general applications for use

Recycled material	Sources	Processing	General applications
Steel 	<ul style="list-style-type: none"> Reclaimed (scrap) steel 	<ul style="list-style-type: none"> Melted in an Electric Arc Furnace (EAF) or Blast Furnace (BF) and cast into sections for rolling into products <p>Refer to <i>Section 4.2.1</i></p>	<ul style="list-style-type: none"> Road safety barriers, guardrails and retaining walls Energy Absorbing Bollards (EABs) Signage and lighting posts and foundations Reinforcing steel Roadside furniture and amenities (e.g. benches and bike racks)
Concrete 	<ul style="list-style-type: none"> Demolition works Returned loads Other infrastructure construction activities 	<ul style="list-style-type: none"> Removal of contaminants, followed by crushing and screening 	<ul style="list-style-type: none"> As crushed rock replacement (various applications) Retaining walls and façades Drainage systems Platforms
Timber 	<ul style="list-style-type: none"> Sawmill scraps and wood waste Site clearance activities, such as: <ul style="list-style-type: none"> Salvaging elements (fences, posts etc) Tree and vegetation clearance 	<p>Wood-plastic composite can be processed by melting plastics with manufacturing aids, then mixing with wood flour followed by extrusion</p>	<ul style="list-style-type: none"> Wood-plastic composites, including: <ul style="list-style-type: none"> Roadside applications Urban design and landscaping
Glass 	<ul style="list-style-type: none"> Container glass cullet 	<ul style="list-style-type: none"> Removal of contaminants, followed by crushing to required grade (e.g. glass fines) 	<ul style="list-style-type: none"> Replacement of fines in concrete mixes Pavement surface treatments and reflective road markings

Recycled material	Sources	Processing	General applications
<p>Crumb Rubber</p> 	<ul style="list-style-type: none"> End-of-life tyres 	<ul style="list-style-type: none"> Ambient mechanical grinding, or Cryogenic mechanical processing (less common) 	<ul style="list-style-type: none"> Miscellaneous roadside applications (e.g. landscaping, retaining walls, playgrounds) Traffic calming devices (e.g. bollards, wheel stops, speed humps)
<p>Supplementary Cementitious Material (SCM)</p> 	<ul style="list-style-type: none"> Waste by-products including Fly Ash, Ground granulated blast-furnace slag (GGBFS), Amorphous Silica 	<ul style="list-style-type: none"> Treated to comply with AS/NZS 3582.1, AS/NZS 3582.2 and AS/NZS 3582.3, respectively 	<ul style="list-style-type: none"> Used to replace a proportion of the cement in Portland cement (e.g. kerbs, general concrete)
<p>Plastic</p> 	<ul style="list-style-type: none"> Commercial, industrial and municipal waste 	<ul style="list-style-type: none"> Sorted into plastic types/categories Shredded and granulated Cleaned/washed Dried, decontaminated and pelletised Reprocessed/reformed into recycled products 	<ul style="list-style-type: none"> Barrier end treatments and bollards Roadside furniture (e.g. pavement markings, wheel stops) Urban design and landscaping (e.g. fencing, signs, boardwalks and decking) Noise walls, retaining walls and façades Traffic management devices (e.g. bollards and cones)
<p>Organics</p> 	<ul style="list-style-type: none"> Commercial and domestic food waste Green waste from landscaping and maintenance 	<ul style="list-style-type: none"> Collection Decontamination Shredding and stacking Composting Screening and grading Recycled organics 	<ul style="list-style-type: none"> Composts, soil conditioners and mulches Erosion control and slope stabilisation
	<ul style="list-style-type: none"> Biosolids – bioproduct from processing sewage 	<ul style="list-style-type: none"> Separating solids from wastewater Biological treatment Naturally air-drying solids 	<ul style="list-style-type: none"> Composting Geotechnical fill

Notes: Products are typically manufactured using a range of materials for differing components and therefore the primary materials for its general application have been adopted.



4. Specified Material Applications

This section provides an overview of reused and recycled material applications currently allowable within DTP and RTO standards and specifications.

A list of tables is provided below to help navigate the material applications and the associated document. Links to documents are provided in [Appendix A](#).

Table 4 provides a quick reference table that outlines the areas of opportunity for component reuse and adoption of recycled materials. In some instances, recycled materials may only be used as supplementary materials, or in specific areas of use.

Table 4 – Material applications reference table

Topic	Sub-section	Reference
Reuse applications	Site clearance	Table 5
	Platforms	Table 8
Recycled material applications	Roadside	Table 6a
	Urban design and landscaping	Table 6b
	Organics	Table 7
	Platforms	Table 8
	Pavements, subsurface drainage, concrete, noise walls, fences	Refer to road guide
	Track structure (heavy and light rail), geosynthetics, subsurface drainage, Combined Services Route (CSR), utility protection, fencing, level crossings, miscellaneous (e.g. platform gap fillers) and other infrastructure (e.g. cladding and barriers)	Refer to rail guide

4.1 Definitions and abbreviations

For the purpose of the following tables, reuse and recycled material are defined as:

- **Reuse:** The non-destructive collection of goods for use within the asset in its primary or secondary forms, such as:
 - **Serviceable asset:** An asset with remaining useful life that may be economically redeployed on the public transport network or transferred to an approved third party
 - **Site-won materials:** Re-processed and placed within the network
- **Recycled material:** Waste materials that are processed to meet the performance requirements of standards to form new products or materials suitable for use
- **Abbreviations:** CC = crushed concrete, CB = crumb rubber, GF = glass fines.

4.2 Allowable limits

Allowable limits for recycled materials within their respective application are not commonly expressed within the current DTP and RTO standards and specifications. Product material composition is subject to the relevant Australian standards (as directed by DTP and RTO standards or procedures) and approvals.

4.2.1 Recycled content in steel

Steel is typically manufactured using a combination of virgin and scrap (recycled) steel. The two primary methods are integrated blast furnace (BF) / basic oxygen steelmaking (BOS) and electric arc furnace (EAF).

EAF primarily uses scrap steel. It is to be noted that both types of steelmaking are complementary processes, with neither one considered superior to the other, as scrap steel EAF steelmaking cannot be produced without scrap steel created via the integrated steel manufacturing process.

Typically, 10–15% of post-consumer steel is recycled through the BF process, whereas the EAF process using scrap steel uses a much

higher content (e.g. 70% recycled steel to manufacture reinforcing steel). Waste reduction can be achieved through early involvement with projects, minimising material use and the need for onsite cutting or modifications.

4.3 Limitations

- The standards and specifications identified may not preclude the use of recycled materials, however adoption of any recycled materials/products would be subject to approvals.
- All reuse applications are subject to compliance with relevant DTP and RTO standards and specifications and typically include requirements for condition assessment and approval.
- Current DTP and RTO standards and specifications do not reference Australian standards for plastics or timber-plastic composites. As such this guide features limited standard references to the use of these materials.
- Typically, products are required to be manufactured under a third-party certified Quality Assurance System.

4.4 Applications for reuse

Refer to *Table 5* for material types/products that existing DTP and RTO standards and specifications allow for reuse. Potential secondary reuse applications are encouraged to be investigated in conjunction with approvals processes. Additionally, whilst a standard may not specifically identify reuse as part of the material application, it may not preclude its activity and therefore should be investigated as an opportunity as part of works.

Reuse should consistently keep products, components, and materials at their highest utility and value. This can commonly be achieved through reuse in their original (primary) intended application (i.e. avoid 'downcycling'). This should be considered in a WoL context and infrastructure design life requirements.

Refer to [Section 5.2](#) for reuse in platform applications.

Table 5 – Reusable material types/products within existing standards and specifications

Material	Material application	Standards and specifications allowing for reuse in primary form				Supplementary notes
		DTP	MTM	V/Line	ARTC	
Timber	Marketable timber	☒	☒	☒	☑ ETC-08-04	▪ Setting aside marketable timber
	Chipping and mulching	☑ Section 201 Section 720	☒	☑ NIST-2659	☑ ETC-08-04	<ul style="list-style-type: none"> ▪ Site mulch available from the chipping of on-site indigenous or non-weed vegetation shall be used where possible ▪ Section 720 provides material property requirements for imported topsoil and mulch
	Habitable fauna / ESC	☒	☒	☒	☑ ETC-08-04	▪ Fallen logs and branches suitable for fauna habitat or erosion and sediment control (ESC) to be placed clear of construction activities
Topsoil ¹		☑ Section 204 Section 720	☑ A1392	☑ NIST-2659	☑ ETC-08-02 ETC-08-04	<ul style="list-style-type: none"> ▪ For rail infrastructure - subject to compliance with VicTrack's Soil Reuse Guideline (PR-GL 004) and relevant endorsement ▪ For road infrastructure - site topsoil shall be used wherever possible, in preference to imported topsoil (Section 720) ▪ Non-contaminated topsoil should be stockpiled clear of the work to enable its re-use in landscaping and revegetation

Material	Material application	Standards and specifications allowing for reuse in primary form				Supplementary notes
		DTP	MTM	V/Line	ARTC	
Salvaged items		<input checked="" type="checkbox"/> Section 201	<input checked="" type="checkbox"/> A1392	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> ETC-08-04	<ul style="list-style-type: none"> Salvaged items can include fences, posts, signs, structures and other obstructions Wherever possible reuse of materials generated from clearing and grubbing operations within the works area should be carried out May include for salvage of vegetation
Site won material ¹	Earthworks outside of track / road formation	<input checked="" type="checkbox"/> Section 201 <input checked="" type="checkbox"/> Section 204	<input checked="" type="checkbox"/> A1392	<input checked="" type="checkbox"/> NIST-2659 <input checked="" type="checkbox"/> SAPR-68	<input checked="" type="checkbox"/> ETC-08-04	<ul style="list-style-type: none"> Subject to compliance with VicTrack's Soil Reuse Guideline (PR-GL 004) and relevant endorsement¹ Materials unsuitable for incorporation in the work shall be disposed off-site, unless approved for re-use on site for non-structural purposes. Includes for unsuitable material that has been treated and approved for reuse
Electrical and Intelligent Transport Systems	Conduits and equipment	<input checked="" type="checkbox"/> Section 732 <input checked="" type="checkbox"/> Section 733	Refer to rail guide for CSR			<ul style="list-style-type: none"> Any redundant assets (including foundations, poles, cabinets, etc) that could be re-used may be required to be delivered to a location nominated by the Superintendent and remain DTP property

Notes:

1. Appendix A of VicTrack's Soil Reuse Guideline (PR-GL 004) describes the process for soil reuse on VicTrack assets and the relevant stages where VicTrack require consultation.

4.5 Allowable areas of application for recycled materials

Refer to tables below for material type/products with the potential for recycled material applications.

Percentages for allowable limits of recycled materials are not typically prescribed in standards and specifications. Therefore, engagement was undertaken with a selection of suppliers to understand the opportunities and barriers for manufacturing products with recycled materials and the associated achievable material content. These are included as notes in the tables below.

Use of recycled materials can be restricted by requirements such as material performance specifications, international standards and authority specifications (e.g. DTP product requirements) and achieving consistent compliance. Although a product may not be made from recycled material, its recyclability (in the context of WoL considerations, as detailed in [Section 3](#)) should also be considered during product selection.

Practitioners should consider the appropriateness of their use and seek advice from suppliers to confirm recycled material content.

4.5.1 Roadside applications

Table 6a – Allowable areas of application for recycled materials – Roadside

Material application	Material type/product	Steel ¹	CC	GF	CR	SCMs	Plastic	Reference documents
Guard fence	Steel beam (incl. under-run systems)	✓	✓ ²	✓ ³	✗	✓ ³	✗	Section 703 Section 708 Section 812 RDN 06-04
	Wire Rope Safety Barrier (WRSB)	✓	✓ ²	✓ ³	✗	✓ ⁴	✗	Section 703 Section 711 Section 812 RDN 06-04
	Concrete barriers	✓	✗	✗	✗	✓ ⁴	✗	Section 610 Section 611 RDN 06-04 SD3901-3904
	End treatment	✓	✗	✗	✗	✓ ⁴	✓	Section 703 Section 708 Section 711 RDN 06-04
Bollards	Energy absorbing	✓	✗	✗	✗	✓ ⁴	✗	RDN 06-04 Detail Sheet – Energy Absorbing Bollard
	Non-energy absorbing (i.e. car parking, typical roadside applications)	✓	✗	✓ ³	✗	✓ ⁴	✓	AS/NZS 2890.1

Material application	Material type/product	Steel ¹	CC	GF	CR	SCMs	Plastic	Reference documents
Signage	Guide posts [55]	✓	✗	✗	✗	✗	✗	Section 709 RDN-06-10 SD3001
	Road signs – category A, B, C and D ▪ Substrate ▪ Retro-reflective sheeting	✗	✗	✗	✗	✗	✓	Section 703 Section 714 Section 860 RDN 06-11 TEM Vol 2 Part 2.17 (<i>Clause 11</i>)
	Post and foundation (excludes sign gantries)	✓ ⁶	✗	✓ ³	✗	✓ ⁴	✗	Section 703 Section 714 RDN 06-09
Pavement markings	Linemarking / roadmarking (incl. audio tactile line marking)	✗	✗	✓	✗	✗	✓	Section 721 RDN 03-10 Section 721
	Raised pavement markers (+adhesive)	✗	✗	✗	✗	✓ ⁷	✗	Section 710 Section 853
	Tactile Ground Surface Indicators (TGSIs)	✗	✗	✗	✓	✗	✓	TEM Vol 3 Part 2.19 RDN 06-05
	Coloured surface treatments incl. safety grip [8]	✗	✗	✓	✓	✗	✗	Section 430 Section 431 AS4586
Pit and pipe abandonment	Infill	✗	✓	✗	✗	✓	✗	Section 201 ETC-08-02 ETC-08-04 L1-CHE-SPE-178 NIST-2659

Material application	Material type/product	Steel ¹	CC	GF	CR	SCMs	Plastic	Reference documents
Kerbs and crossovers (including bedding preparation)		✓	✓	✓ ³	✗	✓ ⁴	✗	Section 703 Section 704
Miscellaneous	Wheel stops ⁹	✓	✗	✗	✓	✓ ⁴	✓ ¹⁰	AS/NZS 2890.1
	Speed humps	✗	✗	✗	✓	✓ ⁴	✓	AS/NZS 2890.1
	Rumble nars / lane separator ⁹	✗	✗	✗	✓	✗	✓	TEM Vol 2 Part 2.12 (Clause 7.2)
Electrical and ITS [11]	Conduits, pits and lids	✓	✗	✗	✗	✓	✓	Section 732 Section 733 AS/NZS 2053

Notes:

1. Refer to [Section 4.2.1](#) for details on recycled content in steel.
2. Crushed concrete may be used as crushed rock replacement in bedding preparation for concrete maintenance strip below guard fence.
3. May contain up to 30% of fine glass (as replacement of total fines in concrete mixes).
4. Fly ash content varies with concrete mix. Refer to Standard [Section 61Q](#) and [Section 703](#).
5. Use of recycled raw materials will not comply with ISO 9001 QMS (material traceability) and state road authority specifications (e.g. shape, colour and performance). However, guideposts can typically be recycled for use in other products
6. Signposts typically manufactured using either aluminium (frangible posts) or hollowed-section steel (rigid posts).
7. 100% as filler in adhesive.
8. Recycled glass (up to 95%) and crumb rubber (up to 80%) may be used for coloured surface treatments. There are many applications, examples include: delineation on pathways and on-road lanes, threshold treatments, rumble bars and urban design applications.
9. Recycled paper used in some applications at low percentages as filler.
10. Wheel stops may be manufactured from 95% wood plastic composite materials (50:50 wood:plastic by mass).
11. Reference to be made to other relevant DTP specifications, drawings, guidelines and technical notes, including approved ITS products. Refer to rail guide for CSR in the rail corridor.

4.5.2 Urban design and landscaping applications

Table 6b identifies opportunities in urban design and landscaping, however is not an exhaustive list. Other materials that could potentially incorporate recycled material, such as steel, glass fines, and crumb rubber should be explored depending on the application.

Table 6b – Allowable areas of application for recycled materials – Urban design and landscaping

Material application	Material type/product	Wood-plastic composite ¹	Plastic ²	Relevant standards and supplementary notes
Urban design	Furniture (e.g. seating)	✓	✓	<ul style="list-style-type: none"> Foundations requirements for concrete footing could include fly ash (refer Section 703) AS/NZS 4586 (Slip Resistance Classification) for boardwalks and decking
	Signage (gateway, wayfinding)	✓	✓	
	Fencing (non-road applications)	✓	✓	
	Boardwalks and decking	✓	✓	
	Blocks and paving	None identified	✓	<ul style="list-style-type: none"> Up to 40% glass fines may be used as a natural sand replacement
	Screening	✓	✓	–
	Retaining walls [3]	✓	✓	<ul style="list-style-type: none"> Concrete requirements as per Section 703 and Section 610, as relevant, for foundation requirement
	Bike stands	None identified	✓	–
Landscaping [4]	Planting edging [3]	✓	✓	–
	Root barriers	None identified	✓	–
	Permeable pavement, erosion prevention, grass reinforcement	None identified	✓	<ul style="list-style-type: none"> Applications include car parking, laneways, grass driveways Up to 100% recycled plastic may be used
	Marker stakes	✓	✓	<ul style="list-style-type: none"> Section 720
	Tree guards	✓	✓	<ul style="list-style-type: none"> NIST-2662

Notes:

1. Manufacturing limits for wood plastic composite (WPC) are typically up to 95% recycled content, comprising a 50:50 ratio of timber and plastic in the total recycled mass (i.e. ~ 48% each of recycled timber and plastics)
2. Plastics consist of recycled HDPE, LDPE, Polystyrene, and Polypropylene plastics. Typically, post-consumer recycled plastics in manufactured products ranges between 48-99%.
3. Timber railway sleepers and posts/beams have been reused successfully for retaining walls and low-risk landscaping features. Subject to appropriate condition assessment and structural design.
4. Recycled crushed concrete and brick recovered from construction and demolition waste and household demolition waste may also be used in decorative landscaping and garden bedding applications.

4.5.3 Organics

Food and landscaping material

Recycled organic products are made from food and landscaping organic material collected from a range of sources including household food and garden waste bins and commercial landscaping operations.

Increasing the recycling and recovery of organic waste means this material is diverted from landfill and reduces greenhouse gas emissions.

The typical process for the recovery and recycling of garden and food organics, includes:

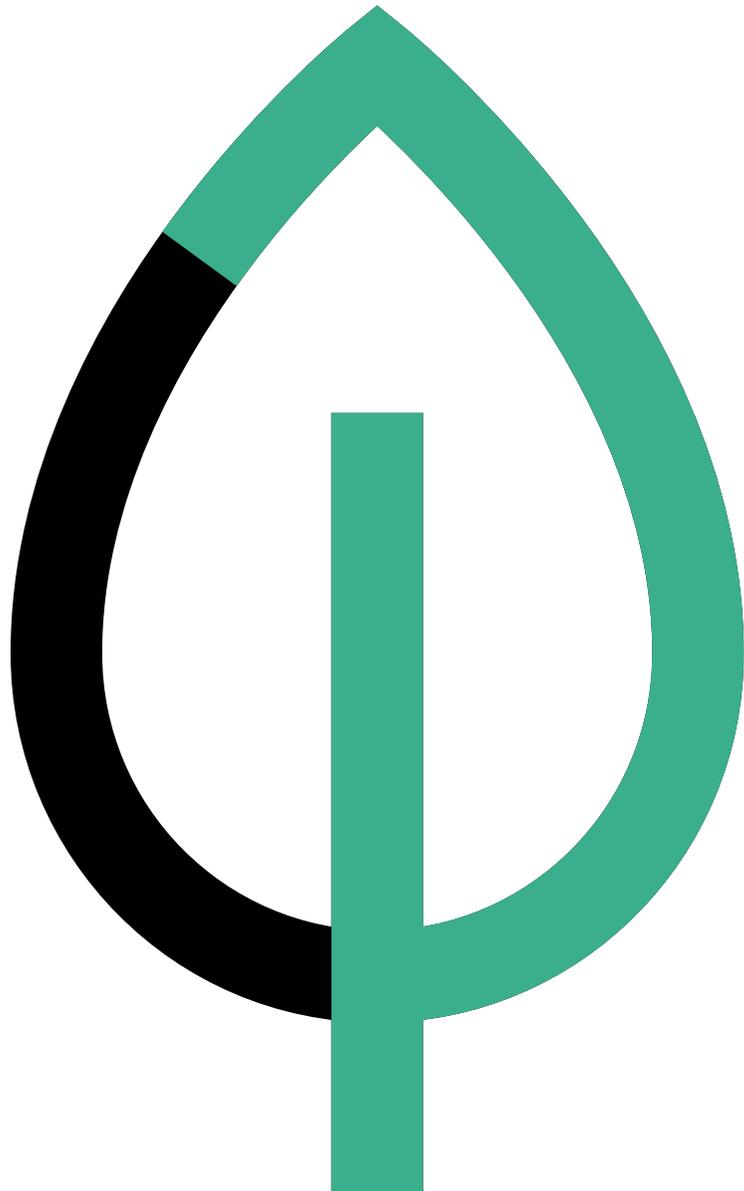
1. Collection
2. Decontamination
3. Shredding and stacking
4. Composting
5. Screening and grading
6. Recycled organics

Use of recycled organic products should be considered as part of landscaping works. Examples of compost in road infrastructure include landscape plantings, wetlands creation, turf establishment, vegetation establishment and erosion control.

The Australian Organics Recycling Association (AORA) is the peak Australian body (and has a Victorian-branch) who looks after composters in Australia. Composter supplier location and costs can vary, although there are a number of composters both in metropolitan Melbourne and regional Victoria.

Table 7 – Agency/RTO standards and specifications for organics

Agency/RTO	Relevant standards and specifications	Notes
Australian Standards	AS 4454	<ul style="list-style-type: none"> ▪ Composts, soil conditioners and mulches ▪ Mulch to comply with AS requirements
DTP	Section 720	<ul style="list-style-type: none"> ▪ Requirements for imported topsoil blend supply properties and shredded or chipped wood mulch
MTM	None identified	–
MRPV	Technical Specification – Processed Solid Organic Waste for Road Infrastructure Applications	<ul style="list-style-type: none"> ▪ Supply and use of processed solid organic waste and raw mulch in roadwork applications, including landscaping, erosion control and stormwater management systems.
V/Line	NIST-2659	<ul style="list-style-type: none"> ▪ Application of mulches for erosion control
ARTC	ETC-08-02 ETC-08-04	<ul style="list-style-type: none"> ▪ Application of topsoil, mulch and reuse of site won timbers only



Biosolids

Biosolids are a solid organic material byproduct of the sewage treatment process.

Once separated from the wastewater in large settling tanks, the material is then biologically treated to break down the organic matter and reduce pathogens and odours. Finally, the solids are naturally air-dried and stored for at least three years before reuse under the Environment Protection Authority (EPA) guidelines.

Application for reuse in road and rail infrastructure is not currently widely adopted, however applications include their use in composting and geotechnical fill material.

Use of biosolids as geotechnical fill

In 2009, EPA Victoria published: [Guidelines for Environmental Management – Use of Biosolids as Geotechnical Fill](#). The guidelines aim to provide an alternative option for biosolids reuse, via a management framework that ensures any chemical and microbiological risks are appropriately managed.

Thorough assessment of applicability of biosolids as geotechnical fill in road and rail infrastructure should be undertaken well in advance of project

commencement to ensure that all relevant legislative and environmental controls can be achieved.

Biosolids should only be used as geotechnical fill if the application has a greater net environmental gain, sustainability and economic benefit when compared with:

- Permitted end uses provided for by [Guidelines for Environmental Management – 943: Biosolids land application](#)

- Energy recovery.

The guidelines set out relevant considerations for:

- Roles, responsibilities and risk
- Biosolids and classification
- Site selection and management practices (including: recommended buffer distances, transportation, storage and design standards)
- Record keeping and information transfer
- Environmental Improvement Plans
- Geotechnical assessment (including: organic content tests, geotechnical testing and EPA approvals).

Note: Geotechnical assessment would require further compliance with relevant DTP or RTO standards and associated approvals. Current specifications do not make specific reference to the use of biosolids and should be investigated as appropriate on the relevant project/application.



5. Platforms

This section provides details on reused and recycled materials applications in rail and tram platforms.

Due to the nature of these networks, the material applications included are relevant to road, rail and ancillary infrastructure. As such, this section refers to the road and rail guides as appropriate.

5.1 Standards and specifications

5.1.1 Heavy rail

The primary RTO's standards and specifications for platforms include:

- **VicTrack** – none identified
 - **MTM:**
 - L1-CHE-STD-013 – Stations and Public Precincts Standard
 - L1-CHE-SPE-159 – Station fixtures, fittings and equipment schedule.
 - **V/Line:**
 - NIST-002.1 – Railway Station design standards and guidelines
 - NIST-2616 – Railway Structures Design Requirements.
 - **ARTC** – none identified
- Standards identified above provide high-level requirements for stations and platforms. Therefore, while product/material selection may not

specifically be identified, applications in this guide may be appropriate.

5.1.2 Light rail (Yarra Trams)

Yarra Trams currently operates the Melbourne light rail network. The primary standards relevant to tram stop platforms include:

- **Standards:**
 - CE-021-ST-0035 – Infrastructure - Tram Track Design
 - CE-021-ST-0012 – Infrastructure - Tram Stop Platform Design
- **Standard Drawings:**
 - Accessed via the [PTV Drawing Management System \(DMS\)](#)
 - Refer to tables in subsequent sections for relevant drawing numbers.



5.2 Reuse

Currently, standards and specifications from the RTOs for platforms do not specifically identify reuse of materials or products. However, it is important to note they do not preclude reuse and therefore opportunities should be investigated as part of works (subject to compliance with relevant standards and associated approvals).

Refer to *Table 8* for material types/products that can be reused in line with existing Yarra Trams standards and specifications for tram stop platforms.

To be read in conjunction with the standards identified in [Section 5.1.2](#).

Table 8 – Reusable material types/products within existing standards and specifications – Tram stop platforms

Material application	Material type / product	Standard allowing for reuse in primary form	Supplementary notes
Tram stop platform	Safety zones, fences, walkways and facilities	STD_T6010 STD_T6100	<ul style="list-style-type: none"> ▪ Removal and relocation may include (but is not limited to): stop flags, prow, fencing, spiked kerb, shelters, floodlights, PID poles ▪ All existing stop flags to be retained and relocated ▪ All existing PIDS to be removed and returned to Yarra Trams for relocation

5.3 Opportunities for recycled materials

Currently, standards and specifications from the RTOs relevant to platforms do not specifically identify reuse or use of recycled materials/products, however, these should be investigated as part of the works (subject to compliance with relevant standards and associated approvals).

Refer to *Table 9* for material types/products with the potential for recycled materials applications in tram stop platforms. Many of these applications are applicable to rail platforms/stations.

Table 9 – Opportunities for recycled materials – Tram stop platforms

Material application	Material type / product	Reference	Standard drawings	Supplementary notes
Platforms, ramps and landings	Asphalt surfacing	Road guide	STD_T6105	▪ Section 407
	Pavers	N/A	STD_T6103	▪ Material not specified (opportunity for recycled glass fines up to 40%)
	Reinforced concrete slab, subbase (crushed rock / mass concrete)	Road guide	STD_T6100, STD_T6101, STD_T6102	▪ Refer to road guide for general concrete
Edging	Concrete / bluestone	N/A	STD_T6105, T6106, STD_T6101, STD_T6111	<ul style="list-style-type: none"> ▪ Precast concrete kerbing (40MPa concrete strength. N12 reinforcement bars) ▪ Typical bedding for bluestone is 32MPa concrete ▪ Refer to road guide for general concrete (opportunities for fly ash, glass fines, crushed concrete)
Guard fences	Steel, concrete barrier, impact attenuators	<i>Table 6a</i>	–	<ul style="list-style-type: none"> ▪ Includes for foundations ▪ Road Design Notes – RDN 03-02, 03-03, 03-05, 03-06, 06-04
Bollards	Energy absorbing	<i>Table 6a</i>	STD_T6106, STD_T6107	
Signage	Road and pedestrian related signs (incl. post and foundations)	<i>Table 6a</i>	STD_T6100	▪ VicRoads Traffic Engineering Manual – Volume 2

Material application	Material type / product	Reference guides reference	Standard drawings	Supplementary notes
Pavement markings	Linemarking (incl. platform safety signage marking)	<i>Table 6a</i>	STD_T6104	<ul style="list-style-type: none"> VicRoads Traffic Engineering Manual – Volume 2 Road Design Notes – RDN 03-02, 03-03, 03-05, 03-06, 06-04
Handrails and fencing		Rail and road guide	STD_T6000 – STD_T6009	<ul style="list-style-type: none"> Fencing galvanised steel or stainless steel specified by Yarra Trams If adopted, central fences must be frangible in nature
Subsurface drainage		Road guide		<ul style="list-style-type: none"> The tram stop designer shall confirm stormwater runoff from the tram stop is captured by existing stormwater drainage pits Drainage designed in accordance with DTP standards
CSR	Conduits, bedding material	Rail guide	STD_T6110, STD_T9010, STD_T9060	<ul style="list-style-type: none"> Recycled glass sand is not currently adopted by Yarra Trams standards as replacement for sand (opportunity)
Tactile Ground Surface Indicators (TGSIs)		<i>Table 6a</i>	STD_T6103, STD_T6105, STD_T6106	<ul style="list-style-type: none"> Directional and warning TGSIs Ceramic tactiles (opportunity for alternative materials e.g. recycled rubber or plastic)
Fixtures, furniture and fittings		N/A	STD_T6105 – STD_T6107, STD_T6113 and STD_6114	<ul style="list-style-type: none"> Elements may include (but are not limited to): rubbish bins, shelters (incl. seating), passenger information displays, storage/lockers, CCTV, timetable cases, post-mounted audio buttons, card vending machines, pole blades, totems, standalone enquiry machines, traffic signal pedestrian push-buttons, driver’s mirrors on poles Products are not directly applicable to infrastructure. Materials should be reviewed with approved suppliers for opportunities for recycled material use

Note: To be read in conjunction with the standards identified in [Section 5.12](#).

6. Disclaimer

This guide is not intended to make any legal representations and does not commit the Victorian State Government to any future course of action. Readers should not rely on these guidelines when making construction, business or investment decisions. The Victorian State Government and its departments and agencies accept no responsibility for any use of this guide, including for any loss or detriment resulting from reliance on or application of this guide.

Notes:

1. *Links have been provided where documents are public access. Refer to Table 1 for more information about access requirements.*

7. Change Log

Version	Summary of updates
February 2024	General updates in accordance with industry changes since last publication (January 2022).

Appendix A – Reference Documents¹

A.1 VicTrack

[VT-PO 167](#) – Environmental Sustainability Policy
[PR-GL 003](#) – Environmental Management Plan – When Working on VicTrack Land
[PR-GL 004](#) – VicTrack Soil Reuse Guideline
[Environmental Sustainability Strategy 2021-25](#)

A.2 DTP

[Detail Sheet](#) – Energy Absorbing Bollard
[RDN 3-02](#) – Accessible tram stops in medians
[RDN 3-03](#) – Accessible tram stops in safety zones
[RDN 3-05](#) – Accessible Central Islands Platform Stops (CIPS) for trams in mixed traffic
[RDN 3-06](#) – Easy Access Stops (EAS) for trams in mixed traffic
[RDN 03-10](#) Audio Tactile Line Marking
[RDN 06-04](#) – Accepted Safety Barrier Products
[RDN 06-05](#) – Suppliers of VicRoads accepted DDA tactile (TGSI) products
[RDN 06-09](#) – Accepted frangible post systems
[RDN-06-10](#) – Accepted Guide Posts
[RDN 06-11](#) – Accepted retro-reflective sheeting materials
[Section 176](#) – Environmental Management (Minor)
[Section 177](#) – Environmental Management (Major)
[Section 201](#) – Site Clearing
[Section 204](#) – Earthworks
[Section 407](#) – Dense Graded Asphalt
[Section 430](#) – High Friction Surface Treatment
[Section 431](#) – Coloured Surface Treatments
[Section 610](#) – Structural Concrete
[Section 611](#) – Steel Reinforcement
[Section 703](#) – General Concrete Paving
[Section 704](#) – Precast Concrete Kerb
[Section 708](#) – Steel Beam Guard Fence
[Section 709](#) – Guide Posts
[Section 710](#) – Fixing Raised Pavement Markers
[Section 711](#) – Wire Rope Safety Barrier (WRSB)
[Section 714](#) – Sign Installation

[Section 720](#) – Landscape works
[Section 721](#) – Pavement Markings
[Section 732](#) – ITS and Electrical Devices Installation
[Section 733](#) – Conduits and Pits for Underground Wiring and Cabling
[Section 812](#) – Crushed Rock for Pavement Base and Subbase
[Section 853](#) – Hot Melt Bitumen Adhesive for Raised Pavement Marker Installation
[Section 860](#) – Manufacture of Road Signs
[Standard Drawing 3001](#) – Guide Posts
[Standard Drawing 3901](#) – Concrete Barriers - F-Shape Profile
[Standard Drawing 3902](#) – Concrete Barriers - F-Shape Installation
[Standard Drawing 3903](#) – Concrete Barriers - F-Shape Manufacture - Precast
[Standard Drawing 3904](#) – Concrete Barriers - F-Shape Connection - Pin and Loop
[TEM Vol 2 Part 2.12](#) – Supplements to AS 1742.12:2000 Manual of Uniform Traffic Control Devices
[TEM Vol 2 Part 2.17](#) – Supplements to AS 1743:2001 Road Signs Designs
[TEM Vol 3 Part 2.19](#) – Accessibility (DDA) Guidelines for Road Infrastructure

A.3 MTM

[A2020](#) – Safety and Environmental Requirements for Contractors and Third Parties
[A1392](#) – Earthworks and Formation Specification
[A1537](#) – Earthworks and Formation Standard
[A7640](#) – Environment and Sustainability Policy
[L1-CHE-STD-013](#) – Stations and Public Precincts Standard
[L1-CHE-SPE-159](#) – Station fixtures, fittings and equipment schedule

A.4 V/Line

[NIST-2659](#) – Earthworks and Drainage
[NIST-2662](#) – Right of Way
 SAPR-67 – Environmental Management of Industrial and Priority Industrial Wastes
 SAPR-68 – Environmental Management of Earthworks and Soil Disturbance
 SAPR-9 – Safety, Security, Health and Environment Risk Management Process
[NIMG-2741](#): Third Party Safety and Environmental Management Handbook
[NIST-002.1](#) - Railway Station design standards and guidelines
[NIST-2616](#) - Railway Structures Design Requirements
 SAPO-2: Health, Safety and Environment
 SAMG-39: Construction Environmental Management Plan (CEMP)
 SAMG-49: Contractor Safety and Environmental Management Handbook
 SAMG-7: V/Line's Significant Environmental Aspects and Impacts

[SAPR-67](#): Environmental Management of Industrial and Priority Industrial Wastes
[SAPR-68](#): Environmental Management of Earthworks and Soil Disturbance
 SAPR-9: Safety, Security, Health and Environment Risk Management Process
[NIST-002.1](#) – Railway Station design standards and guidelines
[NIST-2616](#) – Railway Structures Design Requirements

A.5 ARTC

[ETC-08-02](#) – Railway Earthworks
[ETC-08-04](#) – Earthworks Construction Specification
[Environmental Policy](#)
[RSK-PR-001](#) – Risk Management
 Environment Protection Licence (NSW-2023)
 Environment Protection Authority (SA-2019)
 Southern Sydney Freight Line Environmental Documentation

A.6 Yarra Trams

[CE-021-ST-0035](#) – Infrastructure - Tram Track Design
[CE-021-ST-0012](#) – Infrastructure - Tram Stop Platform Design
[STD_T6000](#) – [STD_T6009](#) – Platform and Offside Fence Details
[STD_T6100](#) – Tram Platforms General Notes
[STD_T6101](#) – Tram Platforms Concrete Slab Footing Details
[STD_T6102](#) – Tram Platforms Footing Details Adshel Shelters
[STD_T6103](#) – Tram Platforms Paving Details
[STD_T6104](#) – Tram Platforms Safety Signage and Linemarkings
[STD_T6105](#) – Offset Central Platform Typical Layout Type P3.2
[STD_T6106](#) – Central Platform Typical Layout Type P3.1
[STD_T6107](#) – Side Platform Standard Layout
[STD_T6110](#) – Voltage Clamp Design Earthing and Bonding Details
[STD_T6111](#) – Platform Kerbing Standard
[STD_T6113](#) – Galvanised Fence Vertical Bar / Post and Handrail Fence Audio Bollard Details
[STD_T6114](#) – Stainless Steel Fence Audio Bollard Details
[STD_T9010](#) – Typical Track Structures
[STD_T9060](#) – Track Structures Transition
[SMS.1.1.2](#): Sustainability and Environment Policy

A.7 Other

AS/NZS 2890.1 – Parking Facilities, Part 1: Off-street car parking

AS/NZS 2053 – Conduits and fittings for electrical installations

General requirements

AS 4454 – Composts, soil conditioners and mulches

AS 4586 – Slip Resistance Classification

Guidelines for Environmental Management - 943: Biosolids land application (EPA Victoria)

Guidelines for Environmental Management - 1288: Use of Biosolids as Geotechnical Fill (EPA Victoria)

Use of Biosolids as Geotechnical Fill, Melbourne, Victoria, June 2009

Recycling Industry Strategic Plan (Department of Environment, Land, Water and Planning)

Extractive Resources Strategy (Department of Jobs, Precincts and Regions)

Social Procurement Framework (Buying for Victoria)

Recycling and Resource Recovery Infrastructure Evidence Base Report (Infrastructure Victoria)

Victoria's Recycling Infrastructure Plan (Recycling Victoria) - to be published in 2024.

Technical Specification – Processed Solid Organic Waste for Road Infrastructure Applications

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