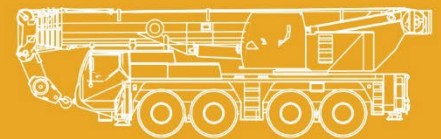




Austroads

Austroads Extended Vehicle Classification Scheme for Traffic and Transport Surveys

Guideline AP-G104-23



Austroads Extended Vehicle Classification Scheme for Traffic and Transport Surveys

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Abstract

Austroads extended vehicle classification scheme builds on the influential 1994 scheme.

The extended scheme provides greater granularity across the 12 classes in the 1994 scheme. It also provides a new classes for:

- active transport to address the need to count people walking and using mobility devices, wheelchairs and scooters
- unmatched vehicles that cannot be matched to any other class.

This guideline briefly summarises the reasoning and characteristics of the Austroads extended vehicle classification scheme and guides the reader in applying the scheme to traffic survey data.

A research report (*Background to the Extended Austroads Vehicle Classification Scheme for Traffic and Transport Surveys*) provides a detailed analysis of the approach to developing the extended scheme.

Keywords

Vehicle classification, vehicle classification scheme, vehicle count, vehicle data, heavy vehicle data, vehicle measurement, axle count, active transport, vulnerable road user, piezometer, WIM, vehicle detector loops, radar, video, LiDAR, ANPR, telematics.

About Austroads

Austroads is the peak organisation of Australasian road transport and traffic agencies.

Austroads' purpose is to support our member organisations to deliver an improved Australasian road transport network. To succeed in this task, we undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.

Austroads provides a collective approach that delivers value for money, encourages shared knowledge and drives consistency for road users.

Austroads is governed by a Board consisting of senior executive representatives from each of its eleven member organisations:

- Transport for NSW
- Department of Transport and Planning Victoria
- Queensland Department of Transport and Main Roads
- Main Roads Western Australia
- Department for Infrastructure and Transport South Australia
- Department of State Growth Tasmania
- Department of Infrastructure, Planning and Logistics Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Department of Infrastructure, Transport, Regional Development, Communications and the Arts
- Australian Local Government Association
- Waka Kotahi NZ Transport Agency.

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This report has been prepared for Austroads as part of its work to promote improved Australian and New Zealand transport outcomes by providing expert technical input on road and road transport issues.

Individual road agencies will determine their response to this report following consideration of their legislative or administrative arrangements, available funding, as well as local circumstances and priorities.

Austroads believes this publication to be correct at the time of printing and does not accept responsibility for any consequences arising from the use of information herein. Readers should rely on their own skill and judgement to apply information to particular issues.

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1. Purpose

Austroads has developed an extended vehicle classification scheme (EVCS) that enables improved understanding and monitoring of the evolving vehicle mix on Australian and New Zealand roads in traffic/transport surveys. This builds upon the existing 1994 vehicle classification scheme (VCS).

The EVCS enables Austroads member agencies to:

- better manage transport demand within and between modes and plan more responsively
- identify changes in transport operational performance and optimise plans more effectively and earlier
- survey active transport and understand how demands integrate with other modes
- have more confidence in the effectiveness of access controls and regulatory restrictions and optimising heavy vehicle (HV) productivity while protecting assets
- utilise advances in sensor technology to support more automation in transport management, freeing experts to optimise and innovate.

This project:

- ascertains the rationale for classification scheme change, particularly for traditional traffic survey data users, but also considers broader applications, including real-time traffic control, vehicle registration, safety analysis, monitoring of freight and HV access, tolls and charges, statistical data and compliance
- provides a scalable, yet backward compatible, VCS that better represents current and likely future vehicles and transport modes¹
- aligns the EVCS with emerging detection capabilities and innovation opportunities
- supports jurisdictional adoption of the EVCS for their traffic/transport surveys.

1.1 Scope

The scope of the project was to:

- review the existing 1994 VCS and retain relevant parts
- identify other relevant existing or emerging VCSs
- determine priority vehicle and active transport attributes for inclusion in an EVCS
- consider new technology developments
- develop a hybrid scheme encompassing current and potential new classes/sub-classes
- provide a degree of flexibility and scalability to accommodate unforeseen challenges in a rapidly changing road network environment
- assess the impact of the EVCS on member road agencies to ensure it can be readily implemented with existing survey technology and transport management processes.

¹ The term 'backward-compatible' refers to the new scheme's data, at the greater granularity, being able to be compared to data collected under the existing scheme.

This guideline briefly summarises the reasoning and characteristics of the Austroads EVCS and guides the reader in applying the scheme to traffic survey data. A research report (*Background to the Extended Austroads Vehicle Classification Scheme for Traffic and Transport Surveys*) provides a detailed analysis of the approach to developing the EVCS. Refer to the research report for details on the EVCS and its development.

1.2 What has Changed in the Extended Vehicle Classification Scheme?

The following four elements make up the changes to the extended vehicle classification scheme.

- **Providing greater granularity** in each of the existing 12 classes particularly in classes 10, 11 and 12 through the provision of a new Level 4 sub-class and defining the measurements used to distinguish between these classes.
- **Reviewing Level 3 length boundaries**, ensuring that the more granular classifications of the proposed EVCS map directly to the existing Level 3 classifications.
- **Providing a new class for active transport** to address the need to count a variety of active transport uses such as pedestrians, skateboards and e-scooters.
- **Providing a new class for unmatched vehicles** that cannot be matched to any other existing classes.

1.2.1 Key Changes

Table 1.1 describes the key changes in the extended vehicle classification scheme from the 1994 scheme.

Table 1.1: Key changes in the extended vehicle classification scheme



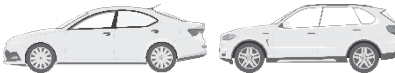






Description	Goal
Change the length boundary between classes 1 and 3 to 3.25m	Captures vehicle length creep and reallocates into the appropriate class.
Class 1 granularity	Greater granularity to reflect diversified vehicles in the fleet.
Class 2 granularity	Granularity in class 2 “Short-Towing” for different trailer types.
Update definition of separate axle groups to max 2.5 m spacing	Currently 2.1 m spacing. Threshold reset to 2.5 m to reflect the fleet, including PBS vehicles.
Class 5 rename Level 3 as four or five-axle truck, bus or crane.	Renames class to capture buses and cranes for greater transparency.
Class 5 concrete trucks allocated Level 4 sub-classes	Subcategory added to reflect the different weight of rigids 4 axle and 5 axle concrete trucks.
Class 6 to 9 granularity	20 subclasses developed for greater survey capability.
Class 10 granularity	12 subclasses developed for greater survey capability.
Class 11 granularity	10 subclasses developed for greater survey capability.
Class 12 granularity	10 subclasses developed for greater survey capability.
Allocation of Class 19 for “unmatched” vehicles	Captures vehicles that currently do not fit any classification.
Allocation of Class 20 for non-road travellers	Captures non-road travellers that were previously not identified (leaving bicycles in Class 1 for backward compatibility).


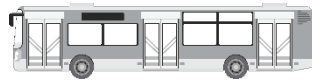



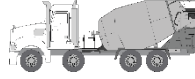

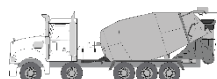



1.3 How Does the Extended Scheme Benefit Vehicle Surveys?
















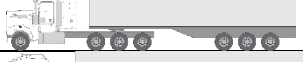





The extended scheme will provide the capacity to survey a far greater range of vehicles moving on the network. Surveys can now be far more comprehensive for network asset management assessment and provide data for network operations. It is designed to provide categories that retain its traditional identification of axles and axle groups and provides for other technologies to be deployed to count vehicles.











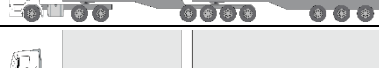
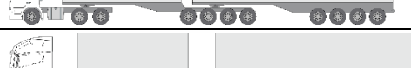









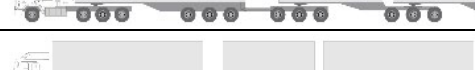
It also recognises the emerging need to understand the relationship between vehicles and other active transport. It has been designed to be used in the same way that the 1994 vehicle classification scheme is used, however, it also includes additional pathways to classification using alternative technologies as they become feasible.

2. Graphical Representation of Extended Vehicle Classification Scheme


Level 1		Level 2		Level 3			Level 4			
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification		
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics	
Short Up to 5.5m	Class 1 (Short) length < 6m	LIGHT VEHICLES								
		2	1 or 2	Short Sedan, wagon, 4WD, utility, light van, bicycle, motorcycle, etc.	1	d1 ≤ 3.25 m Short and axles = 2	1994 Class 1	100	As per 1994 scheme except 3.25 m	
							Bicycle, e-Bike	101	Axles = 2, 0 m < d1 ≤ 1.18 m OR 0 m < d1 ≤ 2.1 m See Note #1	
							Powered motorcycles, tricycles, quadricycles	102	Axles = 2, 1.18 m < d1 ≤ 1.8 m	
							Sedan, wagon	103	Use non-axle technologies to distinguish between these Level 4 classes (e.g. ANPR, Video + AI, etc) If axle detection used, put counts in Class 100. See Note #2	
							SUV	104		
							4WD	105		
							Light Van	106		
		>2	3	Short – towing trailer, caravan, boat, etc.	2	Groups = 3, 2.1 m ≤ d1 ≤ 3.25 m d2 ≥ 2.1 m, and axles > 2	1994 Class 2	200	As per 1994 scheme except 3.25 m	
							Short + 1 axle trailer	201	Groups = 3, axles = 3	
							Short + 2 axle trailer	202	Groups = 3, axles = 4	
							Short + 3+ axle trailer	203	Groups = 3, axles = 5+	

Level 1		Level 2		Level 3		Level 4				
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification		
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics	
Medium 5.5 m to 14.5 m	Class 2 (Medium) 6m ≤ length < 13m	HEAVY VEHICLES								
		2	2	Two axle rigid truck or bus	3	d1 > 3.25 m and axles = 2	1994 Class 3	300	As per 1994 scheme except 3.25 m	
							2 axle rigid truck	301	Use non-axle technologies to distinguish between these Level 4 classes (e.g. ANPR, Video + AI, etc) If axle detection used, put counts in Class 300. See Note #2	
							2 axle rigid bus	302		
		3	2	Three axle rigid truck or bus	4	Axles = 3 and groups = 2	1994 Class 4	400	As per 1994 scheme	
							3 axle rigid truck	401	Use non-axle technologies to distinguish between these Level 4 classes (e.g. ANPR, Video + AI, etc) If axle detection used, put counts in Class 400. See Note #2	
							3 axle rigid bus	402		
		> 3	2	More than 3 axle rigid truck, bus or crane	5	Axles > 3 and groups = 2	1994 Class 5	500	As per 1994 scheme	
							Short 4 axle, 2 group rigid truck	501	Axles = 4, groups = 2, 2.85 m < g1 ≤ 3.35 m	
							Medium 4 axle, 2 group rigid truck (inc 4 axle concrete truck)	502	Axles 2-2, 3.35 m < g1 ≤ 3.85 m	
							Long 4 axle, 2 group rigid truck or 4 axle, 2 group rigid bus	503	Axles = 4, groups = 2, 3.85 m < g1	
							5 axle concrete truck	504	Axles = 5, groups = 2 Use non-axle technology to extract from 505. See Note #2	
							≥5 axle, 2 group rigid truck	505	Axles > 4, groups = 2	
							4 axle crane	506	Axles 2-2 g1 ≤ 2.85 m	
							5 axle crane	507	Axles 1-4	

Level 1		Level 2		Level 3			Level 4			
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification		
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics	
Long 11.5 m to 19.0 m	Class 3 (Long) 13m ≤ length < 21m	3	3	Three axle articulated or rigid vehicle and trailer	6	d1 > 3.25 m, axles = 3 and groups = 3	1994 Class 6	600	As per 1994 scheme	
							2 axle rigid truck + 1 axle pig	601	Axles 1-1-1 d1 ≤ 4.0 m, d2 < 7.0 m	
							3 axle semi	602	Axles 1-1-1 7.0 m ≤ d2	
							3 axle articulated bus	603	Axles 1-1-1 4.0 m < d1, d2 < 7.0 m	
		4	> 2	Four axle articulated or rigid vehicle and trailer	7	g2 ≤ 2.1 m, 2.1 m ≤ g1 ≤ 3.25 m, axles = 4 and groups > 2	1994 Class 7	700	As per 1994 scheme	
							2 axle rigid truck + 2 axle pig or 4 axle semi, single drive	701	Axles 1-1-2	
							3 axle rigid truck + 1 axle pig	702	Axles 1-2-1	
							2 axle rigid truck + 2 axle trailer	703	Axles 1-1-1-1	
							4 axle semi, single drive	704	Axles 2-1-1	
		5	>2	Five axle articulated or rigid vehicle and trailer	8	g1 > 3.25 m, Axles = 5 and groups > 2	1994 Class 8	800	As per 1994 scheme	
							3 axle rigid truck + 2 axle pig	801	Axles 1-2-2	
							5 axle rigid truck and trailer	802	Axles 1-2-1-1	
							5-axle semi, single drive	803	Axles 1-1-3	
							5 axle semi, tandem drive	804	Axles 1-2-2	
		6 >6	>2 3	Six axle (or more) articulated or rigid vehicle and trailer	9	Axle = 6 and groups > 2 or axles > 6 and groups = 3 Axles in a group up to 2.5m apart. See Note #3	1994 Class 9	900	As per 1994 scheme except 2.5m grouping	
							6 axle semi, tandem drive	901	Axles 1-2-3 Use non-axle technology to distinguish between 901 and 902. See Note #2	
							3 axle rigid truck + 3 axle pig	902		
							3 axle rigid truck + 3 axle dog	903	Axles 1-2-1-2	
							4 axle rigid truck + 2 axle pig	904	Axles 2-2-2	
							7 axle semi, tri drive	905	Axles 1-3-3	
							7 axle semi, tandem drive	906	Axles 1-2-4	
							4 axle rigid truck + 3 axle pig	907	Axles 2-2-3	
							4 axle rigid truck + 4 axle pig	908	Axles 2-2-4	
							8 axle semi, tri-drive	909	Axles 1-3-4	
							Twin steer 7 axle semi	910	Axles 2-2-3	

Level 1		Level 2		Level 3		Level 4				
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification		
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics	
Medium combination 17.5 m to 36.5 m	Class 4 (combination) length ≥ 21m	> 6	4	B' Double or heavy truck trailer	10	Groups = 4 and axles > 6 Axles in a group up to 2.5m apart. See Note #3	1994 Class 10	1000	As per 1994 scheme except 2.5m grouping	
							4 axle rigid truck + 3-axle dog	1001	Axles 2-2-1-2	
							3 axle rigid truck + 4 axle dog	1002	Axles 1-2-2-2 (and not Class 1003)	
							6x4 low loader	1003	Axles 1-2-2-2 g2 ≥ 7 m & g3 < 4 m	
							3 axle rigid truck + quin dog	1004	Axles 1-2-2-3	
							4 axle rigid truck + 4 axle dog	1005	Axles 2-2-2-2	
							3 axle truck Tri-tandem B-double	1006	Axles 1-2-3-2	
							4 axle rigid truck and 5 axle dog trailer	1007	Axles 2-2-2-3	
							3 axle truck Tri-tri B-double	1008	Axles 1-2-3-3	
							4 axle truck Tri-tri B-double	1009	Axles 2-2-3-3	
							3 axle truck Quad-tri B-double	1010	Axles 1-2-4-3	
							3 axle truck Quad-quad B-double	1011	Axles 1-2-4-4	
							4 axle truck Twin steer quad-quad B-double	1012	Axles 2-2-4-4	
		> 6	5 or 6	Double road train or heavy truck and trailers	11	Groups = 5 or 6 and axles > 6 Axles in a group up to 2.5m apart. See Note #3	1994 Class 11	1100	As per 1994 scheme except 2.5m grouping	
							3 axle truck A-double tandem dolly	1101	Axles 1-2-3-2-3	
							3 axle truck A-double tri-axle dolly	1102	Axles 1-2-3-3-3	
							3-axle truck Pocket road train	1103	Axles 1-2-2-2-2	
							3 axle truck A-double tri-axle groups	1104	Axles 1-3-3-3-3	
							4 axle truck A-double tri-axle groups	1105	Axles 2-2-3-3-3	
							3 axle truck AB-triple	1106	Axles 1-2-3-3-3-3	
							3 axle truck B-triple	1107	Axles 1-2-3-2-2	
							4 axle truck AB-triple	1108	Axles 2-2-3-3-3-3	
							8x6 AB-triple	1109	Axles 1-3-3-3-3-3	
							6x4 AB-triple tandem dolly	1110	Axles 1-2-3-2-3-3	

Level 1		Level 2		Level 3			Level 4		
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification	
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics
Long combination over 33 m		> 6	> 6	Triple road train or heavy truck and three trailers	12	Groups > 6 and axles > 6 Axles in a group up to 2.5m apart. See Note #3	1994 Class 12	1200	As per 1994 scheme except 2.5m grouping
							8x6 super quad road train	1201	Axles 1-3-3-3-3-3-3-3
							8x6 AAB-quad road train	1202	Axles 1-3-3-3-3-3-3-3
							6x4 triple road train tandem dollies	1203	Axles 1-2-3-2-3-2-3
							8x6 triple road train tri-axle dollies	1204	Axles 1-2-3-3-3-3-3
							8x6 triple road train tri-axle dollies	1205	Axles 1-3-3-3-3-3-3
							6x4 AAB-quad road train	1206	Axles 1-2-3-3-3-3-3-3
							10x6 quad-axle triple road train	1207	Axles 2-3-4-3-4-3-4
							10x6 AAB-tri road train	1208	Axles 2-3-3-3-3-3-3-3
							8x4 triple road train	1209	Axles 2-2-3-3-3-3-3
							8x6 quad-axle super quad road train	1210	Axles 1-3-3-3-4-3-4-3-4
Unmatched	N/A	Any	Any	Vehicles which do not fit into any of the above	19	Vehicles which do not fit into any of the above	Unmatched	1900	Data for each object in "Per Object" data
Non-road Travellers	N/A	NON-ROAD TRAVELLERS							
		N/A	N/A	Not covered by Austroroads 1994	20	N/A	Non-road travellers	2000	Used where insufficient measurements for classification.
							Pedestrians	2001	Length=0.3-1.1 m, Width=0.3-0.6 m, Height=0.7-2.0 m, 85% Speed = 1-10 km/h OR Video + AI
							Skater, skateboard, segway	2002	Length=0.3-1.1 m, Width=0.3-0.6 m, Height=0.7-2.0 m, 85% Speed > 10 km/h OR Video + AI
							Scooters, e-Scooters	2003	Length=0.7-1.25 m, Width=0.3-0.6 m, Height=0.7-2.0 m, 85% Speed = 1-25 km/h OR Video + AI
							Mobility scooters, wheelchairs	2004	Length=1.1-1.8 m, Width=0.5-1.0 m, Height=1.0-1.8 m, 85% Speed = 1-16 km/h OR Video + AI
							Animals (horses, dogs, etc)	2005	Length=0.2-0.7 m, Width=0.1-0.6 m, Height=0.3-1.0 m OR Video + AI

Level 1		Level 2		Level 3			Level 4			
Axle length (indicative)	Classification by vehicle length	Axles and axle groups		Vehicle type	Level 3 classification		Traveller type	Level 4 classification		
Type		Axle	Groups	Description	Class	Parameters	Description	Class	Characteristics	
							VRU cluster	2009	Any moving non-road object not in any other class.	

Scheme Notes:

1. For data collection in a non-road environment, the maximum length of bicycles is permitted up to 2.10m because of the absence of motorcycles and short cars.
2. Classes 103 to 106 have the same axle length specification. Where axle detection is used, the count for these classes is to be stored in Class 100 with the count for Classes 103 to 106 set to NULL. The NULL indicates that the count technology was not able to distinguish between these classes. If alternate detection technology is used (e.g. ANPR, Video + AI, etc) then a non-NULL count may appear in Classes 103 to 106. If no vehicles detected, the value will be 0 not NULL, which indicates that the technology was able to count the class, but no vehicles were detected.

The same principle applies to the following Level 4 Classes:

- Classes 301 and 302, using Class 300 for these counts where only axle detection used

– Classes 401 and 402, using Class 400 for these counts where only axle detection used

– Classes 504 and 505, using Class 500 for these counts where only axle detection used

– Classes 901 and 902, using Class 900 for these counts where only axle detection used
3. An axle group exists for vehicle classes where axles are closer than 2.1m apart, except for Level 3 Classes 9 to 12 where the rule is:
- If two adjacent axles are less than or equal to 2.10m apart, continue to use 2.10m for the following axles, otherwise

– The group spacing is reset (to 2.50m) for subsequent groups (but rule ‘1’ still applies).

Definitions:

Axles: number of axles (maximum axle spacing of 10m)

Groups: number of axle groups

Measurement characteristic formula terminology:

- d1: distance between first and second axle

• d2: distance between second and third axle

• dN: distance between Nth and (N+1)th axle

• g1: distance between first and second group

• g2: distance between second and third group

• gN: distance between Nth and (N+1)th group



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