



Delineation

Section I - Introduction

The delineation guidelines have been developed to assist in designing and maintaining a quality delineation system.

The guidelines are to comprise 19 sections and an appendix. These are initially being released individually and in no specific order. The sections which are to be released are as follows:

Part	Title
Section 1	Introduction
Section 2	Delineation principles
Section 3	Pavement markings
Section 4	Longitudinal markings
Section 5	Enhanced longitudinal markings
Section 6	Transverse markings
Section 7	Transverse markings - Pedestrian facilities
Section 8	Diagonal and chevron markings
Section 9	Messages on pavements
Section 10	Pavement arrows
Section 11	Pavement markings at roundabouts
Section 12	Pavement markings for bicycle facilities
Section 13	Pavement markings for kerbside parking restrictions
Section 14	Maintenance of pavement markings
Section 15	Raised pavement markers
Section 16	Guide posts and delineation of safety barriers
Section 17	Alignment signs and markers
Section 18	Delineation systems
Section 19	Delineation management and audit
Appendix A	Locating and setting out of dividing (barrier) lines

To determine which sections are currently available go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/delineation_dll.html

The information contained in the various parts is intended to be used as a guide to good practice. Discretion and judgement should be exercised in the light of the many factors that may influence the choice of delineation devices in any situation. The guidelines make reference, where relevant, to current Australian Standards and are intended to supplement and otherwise assist in their interpretation and application.

Delineation

Section I

INTRODUCTION

Special Note:

As from 17 January 2011, the RTA is adopting the Austroads Guides (Guide to Traffic Management) and Australian Standards (AS 1742, 1743 & 2890) as its primary technical references.

An RTA Supplement has been developed for each Part of the Guide to Traffic Management and relevant Australian Standard. The Supplements document any **mandatory** RTA practice and any complementary guidelines which need to be considered.

The RTA Supplements **must** be referred to prior to using any reference material.

This RTA document is a complementary guideline. Therefore if any conflict arises, the RTA Supplements, the Austroads Guides and the Australian Standards are to prevail.

The RTA Supplements are located on the RTA website at www.rta.nsw.gov.au





Roads and Traffic Authority

www.rta.nsw.gov.au

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APPROVED BY:

SIGNED

Phil Margison
General Manager
Traffic Management

SIGNED

Steve Levett
A/General Manager
Safer Roads

AUTHORISED FOR USE BY:

SIGNED

Michael Bushby
Director
Network Management

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For policy and technical enquiries regarding these guidelines please contact:

Traffic Management Branch
Email: technical_directions_publication@rta.nsw.gov.au

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For the latest amendments (if any) to these guidelines go to:

www.rta.nsw.gov.au/doingbusinesswithus/downloads/technicalmanuals/delineation_dll.html

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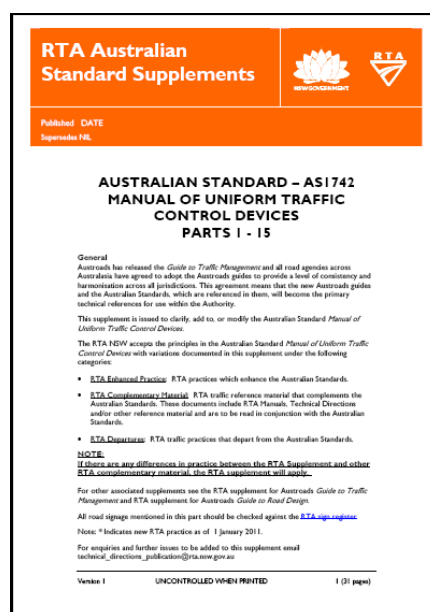
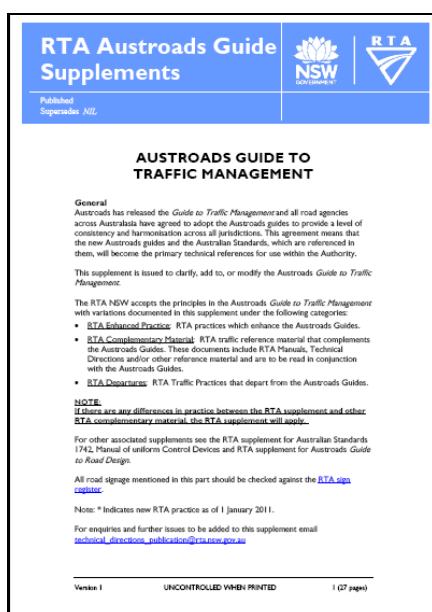
Amendment record

Please note that the following updates have been made to this document.

Amendment No	Page	Description	Issued	Approved By
I	Various	RTA, Austroads & Australian Standard references updated.	December 2010	R O'Keefe Mgr Traffic Policies, Guidelines & Legislation

I.1 Introduction

The RTA is legislated under the Transport Administration Act 1988 and the Road Transport (Safety and Traffic Management) Act 1999, as the organisation responsible for the control of traffic on all roads in New South Wales. The Traffic Management Branch is responsible for the centralised management of traffic management policies and guidelines. The Traffic Management Branch develops policies and guidelines and issues these as technical publications.



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Figure I.1: Examples of technical guideline publications

Traffic Management Branch also issues policies and guidelines in the form of technical direction publications, which are interim publications.



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Figure I.1: Example of technical direction publications

Publications assist traffic and transport practitioners in providing consistency of practice and services for road users. The RTA website (<http://www.rta.nsw.gov.au/doingbusinesswithus/guidelines/documentregister/index.html>) gives access to the list of references and electronic copies of all the publications.

1.2 Scope

Delineation is a technical publication which describes the requirements for delineation devices for general use on roads and sets out the way they are applied at intersections, between intersections; and at a number of specific situations including substandard horizontal and vertical curves, changes in pavement width, climbing and overtaking lanes. **Delineation** is intended to assist design, traffic, and maintenance engineering personnel in making determinations about roadway delineation systems, including the appropriate system for a given situation and how to maintain a quality delineation system.

The requirements and application of delineation devices detailed in this document, supplement the *Australian Standard 1742.2, Manual of uniform traffic control devices, Part 2, Traffic control devices for general use*. It serves an interpretative function and provides procedures for the

consistent state-wide application of delineation practices. If this document does not contain any guidelines on a particular aspect of a delineation device, then the Traffic Management Branch must be consulted.

This document contains material, which may constitute mandatory guidelines. If the word “must” or “shall” is used, then the matter forms part of mandatory guidelines. Where other terms such as “may”, “should” or “desirable” are used, then they do not form part of the mandatory guidelines. See Section 1.6 for definitions in this document.

1.3 Application

The delineation devices described in this document are installed for the safety, guidance and use of all road users. This document is applicable to all types of roads. It does not cover roadwork or local area traffic management (LATM) schemes. Separate publications cover these particular areas.

1.4 Aim

Effective delineation improves the efficiency and safety of the existing roadway systems by improving driver information, driving comfort and traffic flow. The aim of this document is to prescribe guidelines pertaining to the use of delineation devices to achieve uniformity of practice across the state of NSW.

1.5 Reference documents

1.5.1 Acts and Regulations

- (a) Road Rules 2008
- (b) Road Transport (Safety and Traffic Management) Regulation 1999

1.5.2 RTA documents

- (a) RTA Supplements for Austroads Guide to Traffic Management
- (b) RTA Supplements for Australian Standards (AS1742 & 2890)
- (c) RTA Supplements for Austroads Guide to Road Design

- (d) Road Design Guide
- (e) NSW Bicycle Guidelines
- (f) QA specification R110 Coloured surface coatings for bus lanes and cycleways
- (g) QA specification R141 Pavement Marking
- (h) QA specification R142 Raised Pavement Markers
- (i) QA specification R143 Signposting
- (j) QA specification R46 Pavement Marking Maintenance (Rural Regions)
- (k) QA specification R131 Guideposts
- (l) QA specification R132 Safety Barrier Systems
- (m) QA specification R161 Fencing
- (n) QA specification R151 Street Lighting
- (o) A specification 3356 Water Borne Road Marking Paint
- (p) QA specification 3357 Thermoplastic Road Marking Material
- (q) QA specification 3360 Two part Cold-applied Roadmarking Material
- (r) QA specification 3358 Aerosol Roadmarking Paints
- (s) QA specification 3359 Profile Thermoplastic Road Marking Material
- (t) QA specification 3400 Manufacture and Delivery of Road Signs
- (u) Specification PBS-RRM Rural Roadmarking Network Performance Requirements

1.5.3 Australian Standards

- (a) Australian Standard 1348.1, Road and traffic engineering – Glossary of terms, Part 1: Road design and construction

- (b) Australian Standard 1348.2, Road and traffic engineering – Glossary of terms, Part 2: Traffic management
- (c) Australian Standard 1742 (All parts), Manual of uniform traffic control devices,
- (d) AS/NZS 1906.1, Retro-reflective materials and devices for road traffic control purposes, Part 1: Reflective materials
- (e) Australian Standard 1906.2, Retro-reflective materials and devices for road traffic control purposes, Part 2: Retro-reflective devices (non-pavement application)
- (f) Australian Standard 1906.3, Retro-reflective materials and devices for road traffic control purposes, Part 3: Raised pavement markers (retro-reflective and non-retro-reflective)
- (g) Australian Standard 4049.1, Paints and related materials – Road marking materials, Part 1: Solvent-borne paint – For use with drop-on beads
- (h) Australian Standard 4049.2, Paints and related materials – Road marking materials, Part 2 Thermoplastic
- (i) Australian Standard 4049.3, Paints and related materials – Road marking materials, Part 3: Water-borne paint
- (j) Australian Standard 2009, Glass Beads for pavement marking material

1.5.4 Austroads documents

- (a) Guide to Traffic Management
- (b) Guide to Road Safety
- (c) Guide to Road Design
- (d) Safety barriers: Consideration for the provision of safety barriers *on rural roads*, 1987

I.6 Definitions & abbreviations

AADT – Annual average daily traffic is the total yearly traffic volume in both directions at a road location, divided by the number of days in the year.

In NSW, AADT is measured as either the number of *vehicles* or the number of *axle pair passes* during a 24 hour period averaged over a year.

See Section 2.5.3 for more details.

Advisory speed – Advisory speed is used at certain locations on highway system, such as horizontal curves or steep down grades where the safe speed on the roadway may be less than the posted speed limit. Although the sign provides a warning to approaching drivers, it is not legally enforceable.

ARR – Australian Road Rules 1999 as referred to in clause 5 of Road Transport (Safety and Traffic Management) (Road Rules) Regulation 1999.

Asphaltic pavement - A pavement consisting of mixture of bituminous binder and aggregate with or without mineral filler, produced hot in a mixing plant, which is delivered, spread and compacted while hot.

Auxiliary lane – A portion of carriageway adjoining the through traffic lanes, used for purposes supplementary to the through traffic lane.



Brightness – Human perception of luminance i.e. how intense a light source or lighted surface appears to human eye.

Carriageway – That portion of a road or bridge devoted particularly to the use of vehicles, that is between guide posts, kerbs, or barriers where these are provided, inclusive of shoulders and auxiliary lanes.

Chevron alignment marker (CAM) – A warning sign, containing a black chevron on yellow background, used to delineate sub-standard curves.

CIL – The Coefficient of Luminous Intensity (CIL) is the ratio of the intensity (brightness of the source) to the illuminance (brightness of light on the surface that is illuminated). The unit of measure is expressed as millicandela per lux.

A measure of retro-reflection for pavement markings and signs is usually expressed in CIL per unit area i.e. millicandela per lux per meter squared or mcd/lux/m²

Classified road – A road declared under Roads Act 1993, Part 5. See also State Road.

Cement concrete pavement - A pavement that uses the high modulus of concrete to withstand and dissipate heavy traffic loadings. The wearing surface may be the concrete itself, or a thin asphalt layer.



Channelisation - A system of controlling traffic by the introduction of an island or islands, or markings on a carriageway to direct traffic into predetermined paths, usually at an intersection or junction.

Climbing lane - An auxiliary lane, usually on a long upgrade, primarily for the use of slow moving vehicles allowing faster vehicles to pass (see overtaking lane).

Conspicuity – A measure of the likelihood that the driver will notice a certain target at a given distance against a certain background.

Contrast – The ratio of luminance from a target to the luminance from the target's surroundings.

Cost-Effectiveness – A ratio of a delineation device's service life to the total costs it incurs over its service life.

Curve sign – A warning sign used to inform drivers of an upcoming change in roadway alignment and where the advisory speed is less than the posted speed limit.

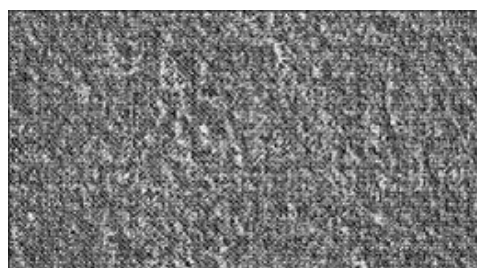
Delineation – Delineation is an organised pattern of information to safely guide vehicular movements over a specific section of roadway, during day, night, dry and wet conditions.

Delineation system – Delineation system refers to a method of providing delineation (defined elsewhere). In this document, Delineation system is defined as an organised network of one or combination of delineation devices over a specific section of roadway, that regulates, warns or provides tracking information and guidance to the drivers to carry out their driving task safely and efficiently.



Delineation device – It is a type of traffic control device (defined elsewhere) to provide delineation. Delineation device provides visual or tactile information to the drivers, to help them in planning and controlling the placement, speed or direction of their vehicle. For the purpose of this document, the following are defined as delineation devices – pavement markings, raised pavement markers (reflective and non-reflective), guide posts, uni-directional hazard markers, chevron alignment markers, curve warning signs and advisory speed signs.

Dense-Graded – Refers to a type of pavement that makes use of a coarse aggregate, such as crushed stone or gravel, mixed with particles of a finer material, such as sand, to create a smooth, dense pavement surface. See also, Open-Graded.



Dividing line – A pavement marking indicating the division of the carriageway between traffic, travelling in opposite directions.

(a) *Broken dividing line* – A pavement marking consisting of a cycle of ‘mark and gap’ segments. Broken lines are permissive and convey the information that the drivers are permitted to cross them.

(b) *Unbroken dividing line* – A pavement marking consisting of an unbroken line used on two-way undivided carriageway to inform the driver of a restricted zone i.e. a driver may not overtake but may be able to cross to enter or leave the road.

Driver Eye Height - RTA Road Design Guide recommends driver eye height of 1.15m for passenger car and 1.8m for commercial vehicle. It also recommends 0.6m as vehicle tail-stop light.

85th percentile speed (V85 km/h) – The speed at or below which 85 percent of vehicles are observed to travel under free flowing conditions past a nominated point. A vehicle is considered to be operating under free flowing conditions when the preceding vehicle has at least a 6 second headway and there is no apparent attempt to overtake the vehicle ahead.

Note: For the purpose of this Document it is normal to include all types of vehicle on the road and to aggregate the results of measurements unless specifically noted otherwise. Where speed measuring devices are not available, the 85th percentile speed can be estimated by travelling the route and attempting to match the average speed of the faster group of vehicles, such speed being an approximation of the 85th percentile speed. Such an estimate may not be reliable where there are substantial differences among observed speeds within this group. Where the document indicates the application of an 85th percentile speed on the approach to a hazard, intersection or other road feature, it should be measured well in advance of the point where the hazard, intersection or other road feature itself, begins to influence travel speeds, e.g. 200 m urban to 500 m rural in advance.

Edgeline – A line marked along the road at or near the far left or far right of the road that indicates the edge of the carriageway. Edge line may also be applied to the incline face of the median kerb.

Epoxy – Resin used in adhesives to bond delineation devices such as a raised pavement marker to the pavement.

Fog Area – Areas where pockets of fog frequently present a hazard.

Glass Beads – Glass beads are small glass spheres used in pavement markings and signs to provide the retro-reflectivity to facilitate night-time visibility. Pre-mix glass beads are dispersed in the binder before application. Drop-on glass beads are applied to pavement marking after the material has been applied to the pavement.



Guide post – A delineation device that consists of retro-reflective material mounted on a post to provide long-range information on roadway alignment.

Kerb – A raised border of rigid material formed at the edge of the carriageway.

Kerbside Line-marking – Yellow line-marking that is placed adjacent to the edge of the road to demonstrate parking restrictions.

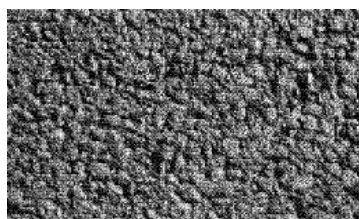
Lane line – A line separating two lanes of traffic travelling in the same direction.

May – indicates the existence of an option, which is not mandatory. Mandatory requirements may, however, apply to a particular option once it is selected.

Must – indicates that the statement is mandatory.

Object Height - RTA Road Design Guide recommends object height of 1.15m for approaching vehicle and 0.2m for stationary object on road.

Open-Graded – Refers to a type of pavement in which only a coarse aggregate is mixed with hot asphalt to create a pavement with rough surface texture. This type of pavement has a high porosity and permeability, reducing the incidence of water logging. See also, Dense-Graded.





Overtaking lane - An auxiliary lane provided for slower vehicles to allow them to be overtaken (see climbing land).

Pavement - Pavements are classified as either flexible (containing unbound granular and/or stabilised materials and/or asphalt) or rigid (concrete pavement with joints and/or steel reinforcement).

Pavement surface - The three types of surface courses most commonly used on roads are spray (or chip) seals, asphaltic concrete and cement concrete. See also asphaltic concrete, spray seals, cement concrete, open graded and dense graded.

PR (Perception and Reaction) time - Time taken to detect, identify, evaluate a stimulus and react to it, e.g. change in signal condition, and the taking of appropriate action, e.g. application of vehicle brakes. RTA Road Design Guide recommends reaction time of 1.5 secs for design speeds less than or equal to 100 km/hr and 2.5 secs where design speed is more than 100 km/hr and access is controlled.

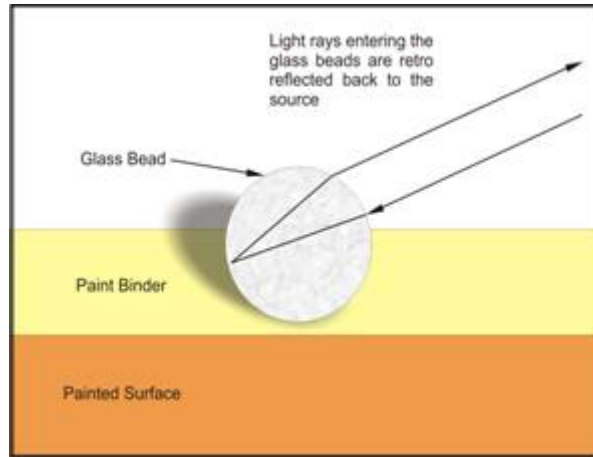
Prescribed Traffic control device – Prescribed traffic control device means a sign, signal, marking, structure or other device to direct or warn traffic on a road or road related area (or part of a road or road related area) that is prescribed by the regulations for the purposes of this definition.. See also Traffic Control Device.

Prohibitory Delineation – Provides information to vehicle driver on where not to go.

Raised Pavement Marker (RPM) – A ceramic or plastic marking device placed on the road to substitute for or act as a supplement to standard pavement markings. Raised pavement markers are comprised of a variety of configurations including retro-reflective (RRPM) and non retro-reflective markers (NRPM), and markers that employ prismatic retro-reflection and those that employ spherical retro-reflection.

Reflective sheeting – Retro-reflective sheet material usually consisting of minute glass beads enclosed in a thin transparent smooth surface plastic matrix, tinted according to the required colour.

Retro-reflectivity – Process of returning the light along a path parallel to the entrance path (to facilitate night-time visibility).



Shall – Indicates that the statement is mandatory.

Should – Indicates a recommendation.

Shoulder – Any part of the road that is not designed to be used by motor vehicles in travelling along the road, for example, any part of the kerb, any unsealed or sealed part of the road outside an edge line.

Sight distance - The distance, measured along the road over which visibility occurs between a driver and an object or between two drivers at specific heights above the carriageway in their lane of travel.

Skid Resistance – The frictional relationship between a pavement surface and vehicle tyres during braking or cornering manoeuvres. Normally measured on wet surfaces.

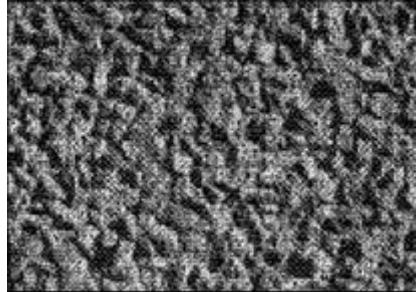
Skid resistance value (SRV) - The value obtained from the British Portable Skid Resistance Tester, adjusted for temperature. The SRV is sometimes referred to as British pendulum number (BPN).

Slip lane - A left/right turn lane separated from an adjacent through lane.

Snow Area – Areas where snow frequently presents a hazard.

Specification – Specification written for pavement marking material that describes what components and what percentage of each component are to be used in the formulation.

Spray (chip) seal - A thin layer of bituminous material (binder) sprayed onto a pavement surface with a layer of aggregate incorporated and which is impervious to water.



STMR – Road Transport (Safety and Traffic Management) (Road Rules) Regulation 1999.

State Roads – Category of roads agreed with Council for administrative purposes. They form the primary arterial network of classified roads in the state and some special purpose classified roads.

Sub-standard curve - A curve is regarded as substandard if the advisory speed of the curve is at least 10km/h less than the sign-posted speed on the immediate preceding section of the road.

Thermoplastic – Pavement marking material, which consists of binder, pigment, aggregate, glass beads and extenders and is applied to the road applied to the pavement using screed or extrusion technique in a heat-softened state, which then hardens on cooling..

Traffic control device –Any sign, signal, pavement marking or other installation placed or erected by a public authority or official body having the necessary jurisdiction, for the purpose of regulating, warning or guiding road users. See also ‘prescribed traffic control device’.

Traffic paints – A pavement marking material that consists mainly of a binder and a solvent. The material is kept in liquid form by solvent (chemical or water), that evaporates upon installation to pavement, leaving the binder to form a hard film. *Water-borne paint* employs water as a solvent, thus not releasing hazardous material into atmosphere during marking operations.

I.7 Specifications

A delineation device, in relation to which the methods, standards and procedures are prescribed in this document, shall meet RTA specifications. For detailed specifications for the materials and manufacture of these devices reference should be made to the relevant document listed in Section I.5.

I.8 Approvals

I.8.1 General

Delineation devices fall within the definition of a ‘traffic control device’ as defined in Section 50 of the STMR. Many of the delineation devices or treatments included in this document are ‘prescribed traffic control devices’ (see Section I.6 for definition) and road users are required by law to comply with them. The responsibility for authorising such devices is vested in the RTA. The RTA retains this responsibility for classified roads. For non-classified local roads, this responsibility is delegated to the local councils.

The installation of new devices or interference with existing ones without the prior approval of the appropriate authority, responsible for the care and control of the roadway, is an offence as detailed in Part 4, Division I of the Road Transport (Safety and Traffic Management) Act 1999.

I.8.2 Special approvals

Special approvals are required for situations and delineation devices listed below. The reason for such a requirement is that there is a special need to ensure a state-wide uniformity of practice in the use of these applications.

Approval of General Manager, Traffic Management is required for:

- (a) Any departure from warrants, standard delineation devices and systems.
- (b) Use of Enhanced pavement markings as detailed in Section 5.



I.9 Structure of the Document

I.9.1 Description of the Sections

The document is structured to provide guidelines on good delineation practice. Following are the main areas covered in this document:

- (a) **Section 1** introduces the document and outlines the structure of the document.
- (b) Delineation principles are discussed in **Section 2**.
- (c) Individual components of delineation system are discussed in **Section 3 to Section 17**.
- (d) Delineation systems for various geometric situations are discussed in **Section 18**.
- (e) Management of delineation system and methodology for delineation audit are discussed in **Section 19**.

Table I.1 gives the structure of the document and Figure I.3 depicts the contents in flow chart format.

Section	Title	Description
Section 1	Introduction.	Gives the scope, reference documents, definitions, abbreviations and structure of the Document.
Section 2	Delineation principles.	Knowledge of these delineation principles is considered helpful in the understanding and selection of a delineation system.
Section 3	Pavement markings. Colour, retro-reflectivity, types and material	Gives types and materials of pavement markings.
Section 4	Longitudinal markings. Types, dimensions and warrants for use.	Gives types, dimensions and uses of longitudinal markings.
Section 5	Enhanced delineation devices. Types, dimensions and warrants for use.	Gives types, dimensions and uses of enhanced delineation devices, requiring prior approval.
Section 6	Transverse lines. Types, dimensions and warrants for use.	Gives types, dimensions and uses of transverse lines.
Section 7	Transverse lines. Pedestrian facilities.	Gives the application of transverse lines at pedestrian facilities.
Section 8	Diagonal and chevron markings.	Gives types, dimensions and uses of diagonal and chevron markings.
Section 9	Messages on Pavement.	Gives the types and application of pavement messages.
Section 10	Pavement arrows.	Gives types, dimensions and uses of pavement arrows.
Section 11	Pavement markings at roundabouts.	Gives the pavement markings at roundabouts.
Section 12	Pavement markings for bicycle facilities.	Gives the pavement markings for bicycle facilities.
Section 13	Pavement markings for kerbside parking restrictions.	Gives the pavement markings for kerbside parking restrictions.
Section 14	Maintenance of pavement markings.	Gives information on maintenance pavement markings.
Section 15	Raised pavement markers.	Gives types, dimensions and uses of raised pavement markers.
Section 16	Guide posts.	Gives types, dimensions and uses of guide posts.
Section 17	Alignment signs and markers.	Gives types, dimensions and uses of alignment signs and markers.
Section 18	Delineation system.	Delineation systems for various geometric situations are discussed in this Section.
Section 19	Delineation management & delineation audits.	Management of delineation system and methodology for delineation audits are discussed in this Section.
Appendix A	Locating and setting out dividing (barrier) lines.	

Table I.1: Structure of the Document

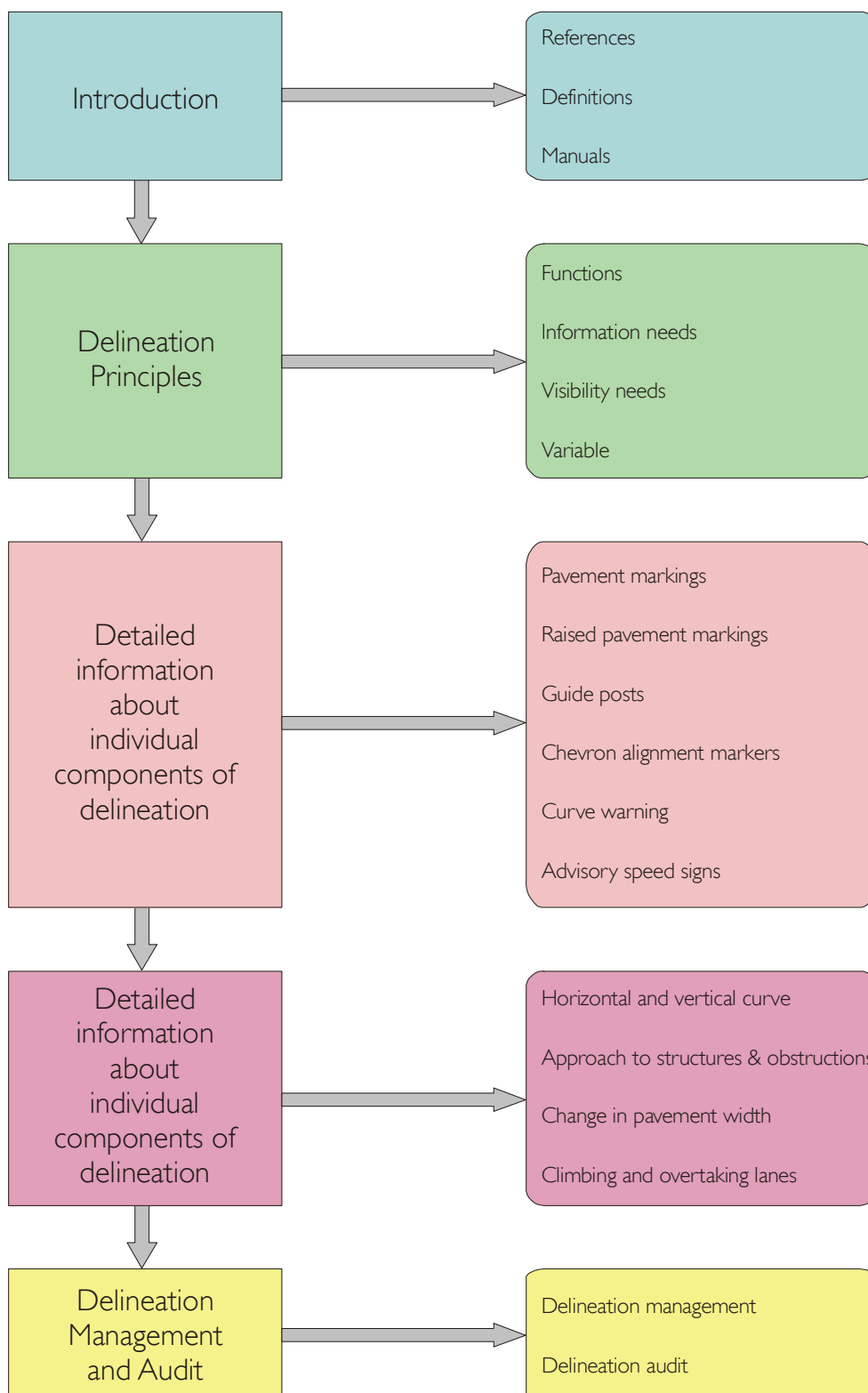


Figure I.2: Structure of the document

I.10 How to use this Document

The matrix on how to use the document is given in Table I.2.

Situation	Where to look for information
For general information, reference documents, definitions, abbreviations and layout of the Document.	Section 1
For better understanding of delineation principles.	Section 2
To find the detailed information on a specific delineation device (component of a delineation system). For example: pavement markings, raised pavement markers, guide posts, chevron alignment markers, curve and advisory speed signs.	Section 3 to Section 17
To check the delineation system for a specific geometric situation, for example, for a sub-standard horizontal curve.	Section 18
Delineation management and delineation audit.	Section 19

Table I.2: How to use this Document

For further enquiries

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