Network Technical Guideline

Supplement to Austroads Guide to Road Design (AGRD)

Part 1: Objectives of Road Design (2021)

Version 3.0, April 2021

VICTORIA State Government | Department of Transport

Supplement to Austroads Guide to Road Design Part 1: Objectives of Road Design (2021)

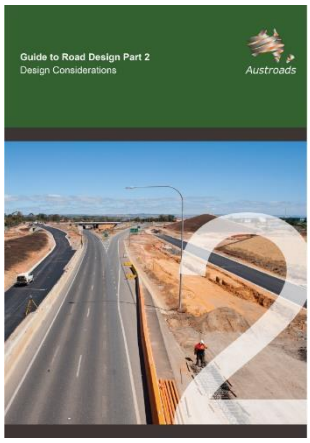
This Supplement must be read in conjunction with the Austroads Guide to Road Design.

Reference to any Department of Transport or VicRoads or other documentation refers to the latest version as publicly available on the Department of Transport's or VicRoads website or other external source.

Document Purpose

This Supplement is to provide corrections, clarifications and additional information to the *Austroads Guide to Road Design Part 1: Objectives of Road Design* (2021). This Supplement refers to the content published in the 5.0 Edition of this part to the guide.

If this Part to the *Austroads Guide to Road Design* is updated, or the information is moved to another Austroads publication, then the content in this supplement should be adopted as supplementary content to the current equivalent Austroads content. Where there is conflicting content in this Supplement with updated content, contact the Department of Transport for clarification as to which content takes precedence.



Version	Date	Description of Change
1.0	July 2010	Development of Supplement
1.1	Sept 2010	Minor updates and edits to text
2.0	Dec 2012	Minor updates and edits to text
3.0	April 2021	Major changes including document title and scope. See below:

Additional notes on current version

This document has been updated to align with recent changes to the Austroads Guide to Road Design. AGRD Part 1, Part 2 and Part 8 have been consolidated into AGRD Part 1; Objectives of Road Design. As such, this supplement has been updated as follows:

VRS Supplement to AGRD – Introduction to VicRoads Supplement (v2.0) has been withdrawn and superseded by this Supplement.

VRS Supplement to AGRD Part 2 – Design considerations (v2.0) has been superseded by this Supplement. Content from VRS Supplement to AGRD Part 2 – Design considerations (v2.0) has been significantly updated, including:

- Additional embedment of Safe System principles
- Inclusion of Movement and Place considerations
- Inclusion of Maintainability considerations
- Various editorial changes.

VRS Supplement to AGRD Part 7 – Geotechnical investigation and design (v2.0) has been withdrawn and superseded by Appendix B of this Supplement. This update aligns with recent changes to the Austroads Guide to Road Design.

VRS Supplement to AGRD Part 8 – Process and documentation (v1.2) has been withdrawn and superseded by this Supplement. This update aligns with recent changes to the Austroads Guide to Road Design. Relevant content has been moved to Section 1.5.3 and Appendix A. Please note, this content is largely unchanged in this edition and will be updated in the next edition of this document.

Table of Contents

1 Scope of the Guide to Road Design

1.1 Introduction

No additional information

1.2 Guide to Road Design Purpose

Additional Information

The Austroads Guide to Road Design (AGRD) allows the Department of Transport (DoT) to develop supplementary material.

Where supplementary information is provided it will take precedence over the Austroads Guide to Road Design. The Department of Transport Supplements (##) have been developed to provide additional clarification to information within the guide and/or information to assist in the designing of roads and associated infrastructure that have not been addressed in the Austroads Guide to Road Design (AGRD).

All DoT Supplements to AGRD are freely available on the website.

V.1.2.1 Updates and Reviews

DoT will review and update the Supplements as required. These updates will be available on the website.

V.1.2.2 Contacts

Information or queries regarding the Supplements to Austroads Guide to Road Design can be obtained by emailing: safesystemengineering@roads.vic.gov.au

Further information about the Austroads Guides can be obtained from the Austroads website: www.austroads.com.au

1.3 Application of the Guide to Road Design

Additional Information

The Supplements must be read in conjunction with the corresponding Austroads Guide(s).

V.1.3.1 Inclusion by exception

Information has been included in the Supplement when DoT believes there is a need to provide local jurisdictional position or guidance, the topic was not sufficiently covered in the Austroads Guides, or further clarification was required.

V.1.3.2 Conflicting directions – precedence

Where a DoT Supplement is provided, it will take precedence over the Austroads Guide to Road Design.

1.4 Parts of the Guide to Road Design

No additional information

1.5 Links to Other Guides

No additional information

1.5.1 Guide to Road Safety

No additional information

1.5.2 Guide to Traffic Management

Additional Information

Refer to the Department of Transport's Traffic Engineering Manual (TEM) Volume 1 for the supplements to the Austroads Guide to Traffic Management.

https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/traffic-engineering

1.5.3 Terminology

Additional Information

Design Brief	A document detailing the scope, content, and the design outputs of a project or design task.
Design Review	The planned and formally documented process carried out at appropriate stages of design where representatives of all functions and specialist disciplines evaluate the total design for function, safety, constructability, project specific requirements, aesthetics and economy.
Distinct Work Package	A design task or section of design for which all design data, acceptance criteria has been obtained, and the extent of the design work can be clearly defined.
Concept Design	A schematic drawing that may show the approximate location of the road alignment, and road configuration but does not necessarily fully consider all design controls or specify any dimensions or geometry set out details. Concept design is used to develop a functional layout.
Functional Design	Is a dimensioned drawing that shows the location of the road alignment, and complete road/lane configuration and may include geometry set out details. Functional design is sufficiently resolved and detailed to enable detail design to proceed without further significant changes to functionality.
Project Leader	Person responsible for managing the project resources and design activities.
Quality Plan	A document setting out the specific quality practices, resources, project responsibilities and sequence of activities, and cross reference to the design brief.
Verification	The formal documented processes carried out at appropriate stages of design by suitably qualified and competent persons to ensure that the design stage output has been accurately produced and meets the design stage input requirements.

1.6 Jurisdictional supplements

Additional Information

DoT provides a Supplement for each part of the Austroads Guide to Road Design.

V1.6.1 Road Design Notes

The Department of Transport's RDN's (previously VicRoads Road Design Notes) are considered part of the Supplements to AGRD. They provide extra information to a specific topic that requires much more detail than can be provided in the Supplement.

RDN's are numbered so that the first two digits correspond to the relevant AGRD part.

V1.6.2 Technical Drawings for Roadworks

Technical drawings are intended to support the DoT Supplements to AGRD.

Guideline drawings

These drawings enhance the information provided in the Austroads and DoT guidelines. They provide a visual representation of specific road design elements to assist practitioners to develop design solutions for contexts being addressed. As such, they will often require site-specific customisation and engineering judgement to be applied in order to develop detailed design drawings.

Standard drawings

These drawings provide construction details commonly used by the Department of Transport. These drawings are highly repeatable and require very little site-specific customisation. They often form part of the tender documents for contracts. They should be used for construction and installation. They should be specified in the design/contract when and where they are suitable for use.

2 Road Design across the Transport Management System

2.1 Road Management Phase Process

No additional information

2.1.1 Road Planning

No additional information

2.2 Network Considerations and Outcomes

No additional information

2.2.1 The Safe System Approach

Additional Information

In accordance with Victoria's Road Safety Strategy and Action Plan, DoT is committed to the Safe System approach and Towards Zero objectives. At the core of this approach are three guiding principles:

- We all make mistakes, but this should not result in death or serious injury on our roads and road environments
- Our bodies can only withstand so much crash force before being seriously injured or killed, with some people being more vulnerable
- Everyone shares the responsibility to make our road system safer

Figure 1: The Safe System Approach

To achieve a meaningful transition towards Safe System, all DoT and Victorian Government road infrastructure projects are required to consider adoption and implementation of outcomes to reduce fatal and serious injuries.

Designing for a Safe System, requires road designers to apply standards, guidelines and best practice information such that those involved in the process acknowledge that the end product contributes to the vision to eliminate fatalities and serious injuries.

Designing for a Safe System is not the same as designing a road which simply meets a set of desirable values. By adopting good design process, road designers should feel confident that their design has optimised safety outcomes and will enable safe operation.

To assist designers, the following Safe System objectives have been developed for assimilation into the design process:

- **Application** – ensure the application of Safe System principles, with prescribed standards and guidelines (but not limited to), are applied such that the ultimate solution aims to eliminate harm in combination with the other Safe System pillars.
- **Shared Responsibility** – ensure that all parties involved in the planning, development, design, construction and operation of the road and/or roadside are aware and acknowledge that they have a responsibility to support wellbeing and provide a transport system that is forgiving when people make mistakes, so they are not fatally or seriously injured.
- **Evaluation** – ensure that post project completion evaluations are undertaken to consider how effective a solution has been in aligning with Safe System principles and to capture any learnings during the planning and delivery stages to evolve and normalise current practice.

2.2.2 Design Considerations

No additional information

2.2.3 Designing for Safety

Road Safety Audits

Additional Information

Road Safety Audits (RSA) are to be undertaken in accordance with the *Austroads Guide to Road Safety - Part 6* and *Part 6a* and DoT's Road Safety Audit Policy and Procedure, by a company prequalified with DoT at the Road Safety Audit Level.

A RSA plan should be created at the beginning of the project's development lifecycle. The RSA plan should include;

- the number of RSA's that should be conducted over the project's development lifecycle
- at what project development stage the audit should be conducted

The RSA plan will depend on the nature, complexity and risk of the project. The RSA plan should also include the reasons for selecting RSA's at various stages of a project. In addition to this, the RSA plan should also include any exemptions to the requirement for Road Safety Audits.

Table 1 indicates when Road Safety Audits must be undertaken:

Table 1: Project Requirements for a RSA

Project Cost	Audit Stages Required
>$10.0m	Audits should be undertaken at all stages
$0.5m to $10m	Risk factors should be considered when determining the stages of audit. In general, at a minimum, audits should be undertaken at one of the design stages.
< $0.5m	Risk factors should be considered when determining the stages of audit that should be carried out.

(Source: DoT RSA Policy and Procedure, October 2011, Rev 3)

Safe System Assessment

Additional Information

The Safe System Assessment (SSA) process has been developed to assess the extent to which a proposed infrastructure project aligns with Safe System principles and the objective to eliminate fatal and serious injuries. The process allows project options to be compared with a base case (i.e. existing conditions) and with each other.

SSA will identify areas where the risk of Fatal and Serious Injury (FSI) crashes is high and identifies design changes which, if adopted, improves alignment with the Safe System approach. If Safe System principles are being followed and applied correctly, there should be a trend towards zero in the SSA scores when progressing from existing conditions to the initial design options and, finally, to the adopted design.

Safe System Assessments must be undertaken in accordance with DoT's Safe System Assessment guidelines. https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/safe-system-engineering.

Safe System Assessments are also the current methodology for setting and measuring M&P performance indicators and targets for safety (Refer to Section 1.2).

Table 2: DoT Requirements for Safe System Assessments

Project Cost	SSA Requirements	Type of Assessment
>$5m	A SSA must be conducted (including all projects submitted to DoT Governance Working Groups and Committees).	Full SSA for ALL projects
$2m to $5m	A SSA is desirable and is the preferred process to consider alignment of the project and design options with Safe System principles. Where a SSA is not undertaken, documentation of how the project has considered Safe System alignment shall be provided within the Project Review or relevant governance report, design report, or other suitable record.	Full SSA for: • Complex projects • Projects with a significant risk of FSI crashes • Innovative projects Raid SSA for: • Projects with a low risk of FSI crashes • Repeat assessments for projects for which a Full SSA has been undertaken at an earlier stage
< $2m	A SSA is optional. The benefits of conducting a SSA and the risk factors associated with the project should be considered in determining the need for a SSA. Where a SSA is not undertaken, documentation of how the project has considered Safe System alignment shall be provided within the Regional Review Committee (RRC) report, design report or other suitable record.	Rapid SSA where is has been determined that a formal assessment is required.

(Source: DoT's Safe System Assessment Guideline, April 2019)

Undertaking Safe System Assessments (SSA) and Road Safety Audits (RSA)

The *DoT Safe System Assessment Guideline* outlines the appropriate stages of a project to undertake Safe System Assessments and/or Road Safety Audits. SSA and RSA should complement each other to optimise the road safety outcomes of a project.

A SSA will evaluate a project's alignment with Safe System principles and identify ways to improve the alignment with a focus on minimising fatal and serious injuries. It investigates the inherent risk of the infrastructure and includes consideration of road user exposure. SSA also look further to consider solutions or strategies that address all pillars of the Safe System. RSAs usually focus on the likelihood of a crash, regardless of severity, to ensure that no hazards are built into the road environment when a project is implemented.

2.2.4 Nature and Magnitude of Transport Demand

No additional information

2.2.5 Strategic Fit

Additional Information

Strategic fit of a project is vital for establishing design criteria, meeting competing network requirements and aligning with other projects in the wider network. Projects within Victoria must consider the following frameworks, strategies and plans:

Movement and Place (M&P)

M&P is a decision-making framework that outlines the competing interests on the transport links and reports performance in terms of movement, place, environment and safety outcomes. The Framework translates transport and land use plans and frameworks/network functions into 'one integrated network view' to guide projects and operational initiatives in a co-ordinated way. It sets out the classifications and performance levels that are needed to achieve transport network outcomes and objectives, and provides decision making guidance when considering how to balance movement, place, safety and environment.

The Movement and Place Framework is underpinned by four modules that build on one another:

- Module 1 – Network Classification
- Module 2 – Network Performance
- Module 3 – Options Development
- Module 4 – Options Assessment

The Movement and Place Framework is not a policy or planning document and does not set strategy, but rather consolidates the different plans and strategies into one framework. This framework consists of four themes; movement, place, safety and environment.

Each road and street (and sections of roads and streets) have been assigned M&P classifications associated with the vision for road-users and place attributes. These classifications inform "performance indictors" which are then measured using the specified tools to determine how the existing infrastructure aligns with the vision for the road and road environment. M&P performance indicators are also used to assess any options that are developed to determine how it aligns with this vision.

Relevant information can be found on the Department of Transport (DoT) website.

Cycling

Bicycle planning is driven by both Australian and Victorian strategies.

- The National Cycling Strategy
- The Victorian Cycling Strategy, including Strategic Cycling Corridors (SCCs)
- The Principal Bicycle Network (PBN), Metropolitan Trail Network (MTN) and Municipal Bicycle Network (MBN)

Relevant information can be found on the VicRoads website:
https://www.vicroads.vic.gov.au/traffic-and-road-use/cycling/bicycle-network-planning

Walking

The Principal Pedestrian Network (PPN) was developed by the Victorian Government to facilitate network planning for walking. It aims to support and encourage walking by identifying routes that have the potential to carry more pedestrians walking to key destinations.

Relevant information can be found on the Victoria Walks website:
https://www.victoriawalks.org.au/network_planning/

Freight

The *Victorian Freight Plan – Delivering the Goods* is the state-wide plan for freight. It sets out short, medium and long-term priorities to support our freight and logistics system through a period of unprecedented growth in freight volumes and rapid change in the broader environment, while allowing us to embrace new opportunities in the future.

Relevant information can be found on the Department of Transport (DoT) website:
https://transport.vic.gov.au/ports-and-freight/freight-victoria

The heavy vehicle networks maps display roads that have been assessed for heavy vehicle access. These maps are available on the VicRoads website.
https://www.vicroads.vic.gov.au/business-and-industry/heavy-vehicle-industry/heavy-vehicle-map-networks-in-victoria.

Road Design Note 04-01 “Heavy Vehicle Network Access Considerations” (July 2019) provides guidance on the minimum requirements to be adopted to maintain the current and future performance of the network for large and heavy vehicles.

2.3 Multi-Modal Considerations

2.3.1 Freight

Additional Information

Refer to *RDN 04-01 Heavy Vehicle Access Requirements* for additional information about access requirements. https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/road-design

Refer to the VicRoads website for more information about Heavy Vehicle maps and considerations.
https://www.vicroads.vic.gov.au/business-and-industry/heavy-vehicle-industry

2.3.2 Public Transport

No additional information

2.3.3 Provision for Cyclists and Pedestrians

Additional information

DoT’s M&P Framework uses cycling and pedestrian facilities and infrastructure as key inputs to assessing the performance of these modes.

2.3.4 Provision for Motorcyclists

Additional information

Refer to “Making roads motorcycle friendly” for guidance on designing for motorcyclists.
https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/road-design

3 Principles and Objectives of Road Design

3.1 Definition of Road Design

No additional information

3.2 Road Design Principles

No additional information

3.3 Objectives of Road Design

No additional information

3.4 Geometric Consistency

No additional information

3.5 Future Technology Considerations

No additional information

3.6 Performance-based Design

Additional information

Performance-based design is a key feature of the Context Sensitive Design approach (See Section 4.3 of this supplement).

3.7 Community Expectations

Additional information

Meeting community expectations is a key feature of the Context Sensitive Design approach (See Section 4.3 of this supplement).

4 Road Design Application

4.1 Road Characteristics and Use

4.1.1 Functional Classification and Use

Additional Information

Refer to https://www.vicroads.vic.gov.au/traffic-and-road-use/road-network-and-performance/victorias-road-network for further information on the classification of freeways and arterial roads within Victoria. DoT consider key principles in the classification of a range of roads, which are outlines in Section 14 of the Road Management Act 2004.

The M&P Framework is used to define movement and place functionality for both urban and rural roads.

4.1.2 Factors that Influence Design Standards

Additional Information

Human factors

It is important for road designers and traffic engineers to understand the limitations and capabilities of a wide range of road users when interacting with the asset to effectively make appropriate transport decisions when developing design solutions for infrastructure. Consideration of human factors also aligns with the philosophy of the Safe System approach discussed in Section 2.2.1 where it is recognised that humans are fallible and will inevitably make mistakes on the road.

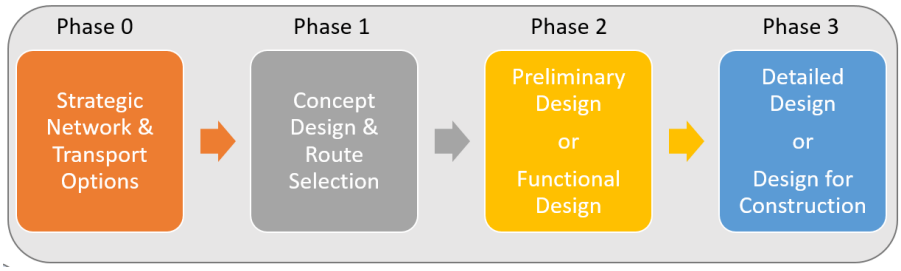
DoT is developing further guidance on the concepts of human factors and specifically the considerations within Road Design.

4.2 Phases of Design

Additional Information

Many projects begin with an assessment of the network requirements through an M&P assessment and strategic planning study. Designers are being engaged to support this early phase of the design development. This phase is noted as 'Phase 0' to align with Figure 4.1.

Figure 2: Phases of Design



4.3 Context-Sensitive Design

Additional Information

Context Sensitive Design (CSD) is an approach which engages road-users and stakeholders to develop a site-specific design that best meets the objectives of the network, corridor or project (as appropriate) while minimising the impact on constraints. For some solutions, this will require designers to explore flexible design options that are not covered or recommended within existing guidance.

All designs are considered 'context-sensitive'. All solutions should be founded on consistent option comparison and decision-making, and must be developed using the following components:

1. Set 'Performance-Based Criteria' where relevant
2. Apply 'DoT Design Decision Making Principles'

3. Explore ‘Flexible Design Solutions’ where appropriate
4. Support ‘Road-user Requirements and Stakeholder Engagement’

The key components of CSD and their application to developing design solutions are introduced below and further detailed in *RDN 01-01 Context Sensitive Design (CSD) for Road Projects*.

V4.3.1 Performance-based criteria

Road design is rarely unconstrained and decisions must be made to balance the network-wide vision, the project purpose, best practice and site-specific constraints.

When possible, setting clear performance-based criteria for a project will enable the design team to compare multiple options, assess the effect on performance and determine which design option/decision is most suitable.

Performance-based criteria should be established based on Table 3 and adopted for all design projects.

Table 3: Performance-based criteria

Criteria	Key Concepts
Network-wide Design	**How well does the option align with the ultimate vision for the route and the transportation network?** Network-wide objectives may be generic or detailed in nature, based on the current network plan and/or corridor plan.
Project Objectives	**How well does the option meet the project objectives**? Project objectives are typically defined in the scope, from the investment logic map or are the primary reasons for a project being initiated.
Road Design Objectives	**How well does the option meet the road design objectives for safety, mobility, access, economy and environment?** Road design objectives are discussed in Section 3.3 and are contained within relevant Standards and Guidelines. Road design objectives are set to achieve ‘best practice’ for a reasonable range of contexts and are constantly evolving. Road design objectives can be set for an overall design solution (macro) or a specific design element (micro).
Impact on constraints	**What constraints does the option impact; to what extent are they impacted; what is the cost and consequence of the impact?** Every project will have constraints, whether they are physical, cost or time, and the importance of these constraints will vary by project and site.

Unless specified in the Design Brief, the relevant performance-based criteria must be sourced from relevant documents, such as the Client Requirements Document. The criteria should be documented in the Design Report and agreed to by the client. Ideally, there would be descriptors on how the designer should meet the criteria and the methodology for determining whether solutions achieve objectives using both quantitative and qualitative measures.

Refer *RDN 01-01 Context Sensitive Design (CSD) for Road Projects* for additional guidance.

V4.3.2 DoT Design Decision Making Principles

DoT recommends a consistent and transparent principles-based approach to decision making. This encourages solutions tailored to particular situations and in compliance with reasonable engineering principles. Most of the DoT’s decision-making principles have been embedded in the M&P framework.

The following DoT Design Decision Making Principles, shown in Table 4, should be used in the development of designs and used to justify and support engineering decisions that are made.

Table 4: DoT Design Decision Making Principles

Principles	Description
Safe System Principle	The road and road environment must support a vision of zero deaths and serious injury for all road users.
Road Network Efficiency Principle	The efficiency of the transport network will be maintained or enhanced in line with performance objectives including the Movement and Place framework
Community Wellbeing Principle	The wellbeing of the community is not adversely affected
Environmental Sustainability Principle	The environment – both natural and cultural – is not harmed
Utility Services Principle	Access to roadside utilities is preserved
Investment Benefit Principle	The project net benefits outweigh the costs

In addition, many DoT and Austroads standards and guidelines provide guidance for how to deal with a specific decision or exception. Project officers should adopt a holistic approach when applying guidance for, or assessing design details, seeking technical advice from designers where appropriate.

Refer *RDN 01-01 Context Sensitive Design (CSD) for Road Projects* for additional guidance.

V4.3.3 Flexible Design

Flexible Design is a fundamental concept of the Context Sensitive Design approach. It allows the use of design values from any design domain (e.g. NDD or DE) as long as the combination produces a good design and an acceptable level of expected performance. Using a flexible design approach aligns with the aim of CSD to produce acceptable performance while minimising the impact on agreed constraints, and meeting the requirements and expectations of stakeholders and road-users.

Flexible Design discourages the practice of blindly following a standard or guideline without understanding of performance resulting from the design outcome. While a Normal Design Domain option is recommended for consideration on all projects, it is often found that the application of one or multiple values in the Extended Design Domain is the optimal design option given consideration of relevant performance-based criteria, site constraints and DoT Design Principles.

For example, a design option for an urban arterial road may have Stopping Sight Distance values from the Normal Design Domain, lane widths from the Extended Design Domain and offsets to barriers at pinch points that are Design Exceptions. Documentation of justification for the design decisions made and a record of approvals is required to be managed and maintained as part of the design process.

The application of design values is detailed in Section V4.4.3.1.

V4.3.4 Road-user Requirements and Stakeholder Engagement

Understanding the Road-user Requirements is critical to developing a design which is context-sensitive. The project team should document which road users should be prioritised an how their needs will be addressed in the development of options, including the level of service that is required to meet the minimum performance targets (as developed through a Movement and Place Assessment; Section 2.2.5).

The development of the project should occur in parallel with a road-user and stakeholder engagement plan. The development of a stakeholder engagement plan generally involves four components:

1. Identifying stakeholders
2. Consulting and engaging stakeholders at key stages
3. Selecting appropriate engagement techniques
4. Planning for implementation to ensure stakeholders are adequately consulted and support the project

A typical list of stakeholders may include:

- Adjacent property owners (residential, commercial, industrial, institutional—education, religious, government)
- Adjacent property renters (residential, commercial, industrial, institutional)
- Facility users (commuters, heavy vehicle operators, business customers, major regional employers)
- Local jurisdiction elected and appointed officials (city council officers)
- Local jurisdiction transportation or technical professionals (public works directors, traffic engineers, council planners)
- DoT Regional officers
- State transportation professionals (DoT highway designers, traffic engineers, environmental planners)
- Federal transportation professionals
- Transportation service providers
- Neighbourhood organizations
- Business organizations (local and regional Chambers of Commerce, economic development agencies, industry associations)
- Transportation interest groups (public transport, bicycle, pedestrian, motorcycle, heavy vehicles)
- Environmental interest groups
- Historic preservation and scenic conservation groups
- Growth management interest groups

Refer *RDN 01-01 Context Sensitive Design (CSD) for Road Projects* for additional guidance.

4.4 The Design Domain

4.4.1 Normal Design Domain

Additional Information

Road design standards and guidelines such as Austroads Guide to Road Design, the DoT's Supplements and the Department of Transport's Road Design Notes contain a range of values that can be applied in various combinations to best suit the specific project objectives, context and constraints. This range of values are referred to as the Normal Design Domain (NDD). The Normal Design Domain values should be used wherever possible. Many of the values have been developed as a result of research and experience, and demonstrates acceptable performance for safety, mobility and access for a range of infrastructure solutions.

Typically, but not always, higher Normal Design Domain values have higher capital cost and provide greater benefit than lower Normal Design Domain Values (see Figure 3). However, applying Normal Design Domain values in certain circumstances may result in;

- significant impacts to constraints,
- outcomes that limit or prevent project objectives being met
- substantial increases in cost, project scope and project delivery

Options that include design criteria that are below the Normal Design Domain (NDD) may need to be developed (See *RDN 01-01 Context Sensitive Design (CSD) for Road Projects Appendix C*). In constrained and existing built-up environments (sometimes referred to as brownfield projects), implementing design standards may significantly impact constraints such as existing buildings and property, utilities and the environment. These impacts on constraints may produce unfavourable and perhaps unacceptable outcomes for stakeholders and road-users. This will require the development of options which use a range of design values, including values that are below that which is stated in guidelines, to address the objectives that have been identified through a problem definition study.

While it is desirable to use Normal Design Domain values wherever possible, particularly where significant levels if demand are being catered for, it may not always be feasible. Section 4.3 of this supplement and

RDN 01-01 Context Sensitive Design (CSD) for Road Projects outlines a framework and states principles to help designers make good decisions using engineering judgement and a systematic approach.

4.4.2 Extended Design Domain

Departure/Substitution

Figure 3 shows that the Department of Transport considers Extended Design Domain to be a sub-set of Design Exceptions for the purpose of assessing and documenting design risk.

The application of Extended Design Domain criteria should be done in accordance with *RDN 01-02 Design Exception Reports (DER)*.

Designs containing Extended Design Domain criteria are required to complete a Design Exception Report (DER) to document the design with justification and assess the risk of adopting the selected design criteria for the project and context.

The decision whether to adopt Extended Design Domain (EDD) criteria is a Department of Transport's corporate responsibility for projects under its control or where the Department of Transport is the ultimate asset owner.

See V4.4.3.3 Acceptance of Design Criteria for information about the procedures for the acceptance of Design Exceptions including Extended Design Domain criteria.

4.4.3 Application of the Design Domains

Departure/Substitution

As shown in Figure 3, the Department of Transport considers Extended Design Domain (EDD) as a subset of Design Exceptions for the purposes of assessing and documenting risk. Designs which incorporate Design Exceptions are required to have the design documented in a Design Exception Report accepted by the client and ultimate asset owner. See *RDN 01-02 Design Exception Reports (DER)*.

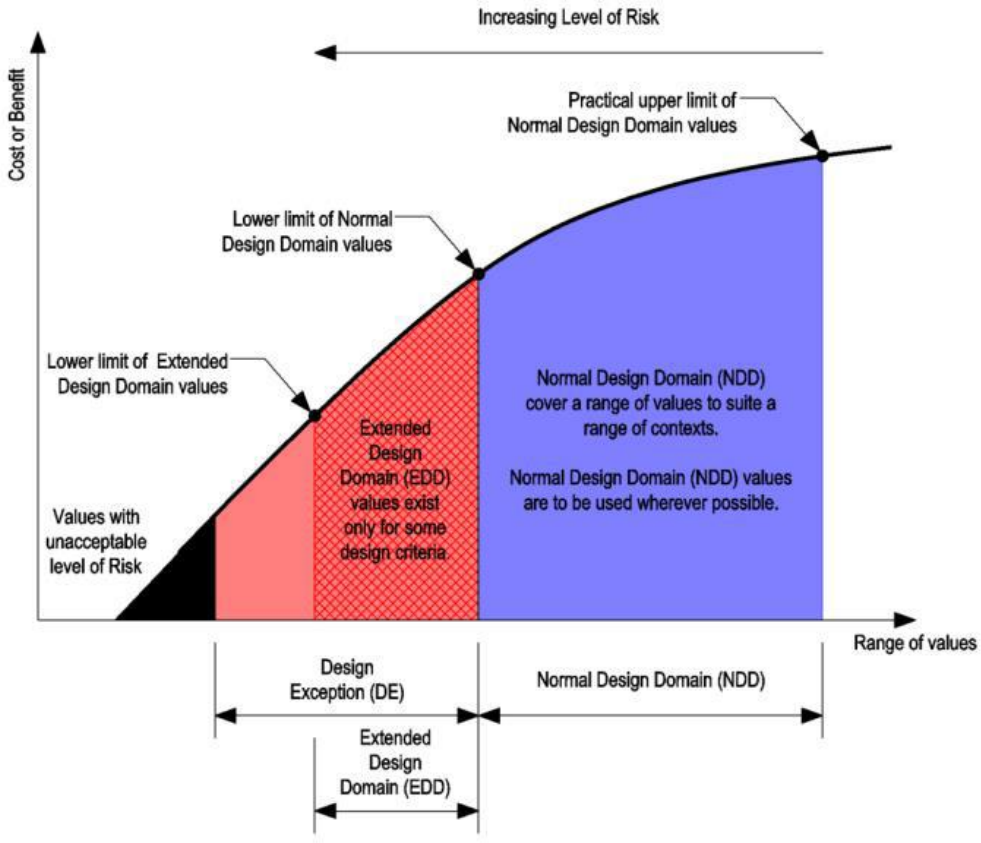


Figure 3: Department of Transport's Design Domain Concept

V4.4.3.1 Selecting design values

Road Design requirements contained in guidelines, such as Austroads Guide to Road Design, DoT Supplements and DoT Road Design Notes, should be followed wherever possible, particularly on new (sometimes referred to as greenfield) projects. Road Design criteria provide a range of values, often labelled as minimum and desirable values, to allow designers to select values that best meet the project objectives and balance the impact on constraints.

When developing a design, the designer is required to select a value for each design element (such as horizontal curves, sight distance, geometric layout, lane width). Values for design elements are selected based on the following parameters:

- The 'design speed' that has been selected for the road or section of road (e.g. 60km/h, 80km/h, 100km/h)
- The anticipated or desired performance (safety, mobility and access, economy and environment) that will result from application of the value
- The performance of the design element in combination with other design elements (e.g. horizontal curve and lane width)
- How well the design option (combination of individual values) aligns with the project objectives
- The impact that it has on constraints (such property boundaries, utilities, environment)

Design options are developed by selecting different values and combinations of design elements. These design options may result in different performance outcomes which will be evaluated by the designer and project team to inform which option to proceed with.

All values used for a design, including justification for their selection, should be documented in the Design Report (see Section 5.2).

Where design values that have been selected are below NDD and have not been previously accepted or agreed by the client and ultimate asset owner (either in the project scope document or accepted at an early phase of design), then the design value must be documented in a Design Exception Report (DER) and accepted by DoT (refer to *RDN 01-02 Design Exception Reports (DER)*). Selecting Design Exception values based only on capital cost or budget constraints is not adequate justification for adopting Design Exceptions.

V4.4.3.2 Project Type and Design Criteria

The project type directly relates to the purpose of the project, which is defined as part of the project scope. The purpose of the project may be to transform the existing road environment, upgrade the road environment, undertake rehabilitation work on the existing road or do maintenance work on existing assets. The project type categorises the typical changes and associated design criteria that could be expected for the project. The decision to concentrate on a particular project type informs the designer of what changes to existing geometry and layout are reasonable to undertake as part of the project. Table 5 is a summary and a guide of the project types and the typical design criteria which could be used;

Table 5: Project Type and Typical Design Criteria

Project Type	Changes to Existing Road	Typical Design Criteria
New Road or Duplication	A new road or duplication involving a new alignment or significant changes to existing geometry and intersections	NDD. EDD if context warrants. DE should be avoided.
Restoration (Major)	A project on an existing road involving major changes to the cross section, intersection layouts and significant changes to sections of targeted geometric improvements	NDD. EDD if context warrants. DE where it is prohibitively expensive to justify NDD criteria.
Restoration (Minor)	A project on an existing road involving minor changes to the cross section and intersection layouts while retaining the majority of existing geometry.	Retain existing design criteria and adopt flexible design criteria to upgrade existing design elements that contribute to poor current and/or future performance.

Project Type	Changes to Existing Road	Typical Design Criteria
Maintenance & Improvement Works	A project involving maintenance and minor upgrades to seal width, barriers, intersection layout, signs and linemarking	Retain existing design criteria and adopt flexible design criteria to upgrade existing design elements that contribute to poor current and/or future performance.

Note: Normal Design Domain (NDD), Extended Design Domain (EDD), Design Exception (DE)

For existing roads, the geometry and layout may not meet current design values (Normal Design Domain). However, this does not mean that all design elements that do not meet current standards have to be upgraded. The analysis of the existing geometry and layout should identify existing design elements that do not meet current standards and/or produce an acceptable level of performance (such as safety, or access and mobility). These design elements should be upgraded as they specifically relate to the project objectives.

It is quite likely that some projects may have a combination of project types for different sections of the project. Where this is the case, different design values may be used for different sections of the project. However, it is desirable to have a consistent road-user experience for a route. Therefore, the application of design criteria should be consistent for the project and route (network-wide design). Consistency of road-user experience is an important aspect of safety as it provides a self-explaining and predictable road environment.

During the early phases of a project (such as the concept design phase), design options may be developed using a main project type to help define the scope and objectives. For example, one option may be to realign the existing road to create a new carriageway. Another option may be to keep the existing carriageway with significant changes to horizontal and vertical alignment. Another option may be to keep the existing alignments and widen on the existing crossfall and superelevation. These options must be developed in line with the network-wide design objectives and the ultimate vision for the corridor (See Section V4.3.1) and documented in the Design Report (See Section 5.2).

V4.4.3.3 Acceptance of Design Criteria

Wherever design values adopted for the preferred design are below either the Normal Design Domain or an agreed standard, the designer is required to have the design criteria accepted by the DoT. Table 6 highlights some of the key design tasks and acceptance of key design elements typically associated with each design phase.

A project team (including the client) should establish gates or hold points throughout the development of the project where the project team and client agree on the design criteria that will be adopted as the project moves forward.

Design values for key design elements (such as horizontal and vertical alignment, typical cross sections, intersection layout and accesses) should be accepted early in the project development phase. When the preferred design includes Design Exceptions, it is important the design be assessed and accepted by the appropriate delegated officers, technical specialists and subject matter experts.

As the project develops it can be extremely difficult (if required) to adopt more conservative design values than those agreed for a previous phase, as this may result in increased project cost and impact on constraints.

For example, a project at the Concept Design phase may have adopted Design Exception values for the horizonal and vertical alignment. Values which were used may not be appropriate for the project or route (network-wide design). At the Preliminary Design phase of the project it may be very difficult to adopt more conservative design criteria than that which was used for the Concept Design as it may increase construction cost, increase impacts on constraints and result in significant changes to the construction timeline and footprint. This scenario may result in requests for decision-makers to make compromised or less than desirable decisions. These types of scenarios can be avoided, or minimised, by involving the right decision-makers and technical experts (with the appropriate delegation and experience) at the appropriate gates or hold points during project development.

For acceptance of the use of Design Exceptions (including EDD), where this criteria has not previously been agreed, the designer is required to document the design in a *Design Exception Report (DER)*. See Section 5.2.1 for more information.

Table 6: Design Phase and Typical tasks and Design Criteria to be accepted

Design Phase	Typical tasks or Objectives	Criteria to be accepted
Strategic Network & Transport Options	• Understand the project in the context of the Transportation Network • Determine the modes of transport that will be prioritised along a route • Understand the ultimate design vision for the route and determine the scope of the project with respect to the ultimate network-wide design • Undertake a M&P assessment of the existing infrastructure and strategic options to determine mode priorities and objectives for the project	• State assumptions and values of key design criteria that have been used to determine the feasibility of strategic options.
Concept Design & Route Selection	• Determine the design criteria based on the project objectives • Analysis of existing geometry and layout against current standards noting areas of poor performance • Engage relevant road-user groups, stakeholders and community to understand their requirements for the project • Map project constraints with available information and undertake specialist studies (environmental, geotechnical, heritage, property, hydrology, utilities) • Explore 'Flexible Design Solutions' based on the project type (New Construction or Duplication, Major Reconstruction, Minor Construction, Maintenance and Improvement works) and major constraints (environment, property boundaries, utilities, structures) • Select the preferred concept design option	• Design Speed • Horizontal Geometry • Vertical Geometry • Typical Cross Sections for major and significant minor roads (for example; lane widths, shoulder widths, median widths, offsets to barriers, hazards and roadside furniture) • Intersection and Accesses type and layout including design and check vehicle swept paths, sight distance criteria • Concepts for major structures such as bridges, retaining walls and culverts • Concepts for major hydrology structures such as detention basins
Preliminary Design	• Develop the preferred concept design based on additional information such as detailed 3D survey, results of specialist studies • Develop using combinations of design criteria and evaluate variations to the design where decisions are required that affect road-user requirements and impact constraints • Assess design variations based on the anticipated performance and determine the level of risk for each option • Finalise the preliminary design	• Detailed development and assessment of sight distance for intersections and accesses • Reduced design criteria at locations where constraints (such as property boundaries, environment, heritage, utilities, drainage and structures) require trade-offs to be made
Detailed Design or Design for Construction	• Develop design details of the preliminary design to prepare the design for construction • Develop minor variations to the preferred option using a combination of design criteria to determine the best outcomes for road-users, stakeholders and impacts on constraints	• Reductions to agreed design criteria where required based on additional details and requirements

4.5 Design Exception Process

4.5.1 Design Exceptions

Additional Information

Design Exceptions are values which are below those published in the body of Austroads Guidelines and additional Department of Transport design guidance (including supplements and RDN's).

DoT's M&P Framework can also be applied to provide context and justification for the application of Design Exceptions.

The use of design values which are Design Exceptions should be done in accordance with *RDN 01-02 Design Exception Reports (DER)* and be documented in a Design Exception Report (DER).

Design Exceptions will require the acceptance of the client and ultimate asset owner.

4.5.2 Innovative and Emerging Treatments

Additional Information

The content of AGRD Part 7 relates to new and emerging treatments. These treatments are considered to be outside of EDD (i.e. Design Exceptions) and will require acceptance through the relevant governance processes before being adopted as a solution.

While several of these treatments have been trailed in Victoria, these solutions in this part are considered Design Exceptions unless DoT has published specific guidelines or publications stating saying otherwise.

4.5.3 Application of Guidelines

No additional information

4.6 Design and Legal Liability

4.6.1 Legal liability

No additional information

4.7 Coordination of Disciplines

Additional Information

Planning Factors

Refer to https://mapshare.vic.gov.au/vicplan/ for planning and zoning reports, including right of way boundaries.

Associated Designs

Refer to https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/pavements-geotechnical-and-materials for pavement, geotechnical and material information for applications in Victoria.

Operational Factors

There is an increasing need from enforcement officers to ensure there are adequate areas to safely undertake enforcement activities such as inspecting large vehicles. Access to the roadside is also required to enable maintenance activities to be carried out. These needs must especially be considered where there are long lengths of road with safety barriers installed adjacent to shoulders. Guidance in balancing hazard protection and provision of space to facilitate maintenance and operational tasks is provided in Austroads Guide to Road Design Part 6: Roadside Design Safety and Barriers and the DoT Supplement.

Heavy vehicles

In the heavy vehicle industry, combinations of heavy vehicles prescribed in Austroads Design Vehicles and Turning Path Templates Guide are commonly used on the road network.

The Performance Based Standards (PBS) Scheme was developed to allow complying combinations of these heavy vehicles to operate safely and productively on networks that are designed for their level of performance. This scheme is based on the length of the vehicle, the trailer combination and the turning performance of the vehicle. Design guidance is provided in *RDN 04-01* which provides further information such as intersection design, check vehicles, swept path widths and movement and place framework limitations.

Table 7: PBS Level and equivalent Austroads Design Vehicles (for the purpose of swept path assessment)

PBS Road Class	Austroads Vehicle
PBS Level 1	19m prime mover and semitrailer
PBS Level 2	26m B-double
PBS Level 3	35.4m B-Triple
PBS Level 4	53.5m Type 2 road train

(Source: RDN 04-01, July 2019)

4.8 Delivery Considerations

No additional comments

4.8.1 Mechanism to Deliver Projects

No additional comments

4.8.2 Workplace Health and Safety/Safe Design

The Occupational Health and Safety Act 2004 ("OH&S Act") outlines the standards in health and safety in the workplace to help protect employees. It also aims to protect the health and safety of the public by work activities.

Specifically, designers and consultants must take careful consideration of Section 28 of the OH&S Act:

> *A person who designs a building or structure or part of a building or structure who knows, or ought reasonably to know, that the building or structure or the part of the building or structure is to be used as a workplace must ensure, so far as is reasonably practicable, that it is designed to be safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed. ("Structures" shall be taken to include bridges, tunnels, culverts, roads, footpaths and landscaping).*

Designers and consultants have a duty to meet the obligations outlined in the OH&S Act throughout the design development phase. They must take into account hazards associated with construction, inspections, repair, maintenance and demolition of the completed design. This includes, but not limited to, the following:

- Eliminate the need for traffic management and mechanical devices to maintain assets
- Eliminate risks of falls from heights
- Eliminate or minimise risks of tripping or slipping
- Eliminate risks of overturning plant due to uneven/unstable ground
- Provide safe access to carry out maintenance activities
- Minimise the risk of collisions by traffic; and
- Provide safe access for inspection of structures or any other asset

Designers may be required to engage with constructors and maintainers to ensure that the preferred design can be safely constructed, inspected, operated, maintained and decommissioned. For some projects, this will involve a formal "Safety in Design" workshop and report. However, irrespective of whether a formal "Safety in Design" assessment has been done for the design, it remains the responsibility of the designer to incorporate best practice into a design (and to seek out advice where necessary) to ensure that it is a 'safe design'.

Where OH&S requirements and design principles cannot be met, designers and consultants must provide the following to DoT:

- A report that includes an assessment carried out by the designer explaining the reasons as to why the above requirements cannot be met
- A risk assessment of hazards for the preferred design option including a risk rating and mitigation measures (where appropriate)
- A proposed alternative including how to mitigate any hazards caused by not meeting the above requirements; and
- The whole of life cost where it can be determined (including specific information in relation to the cost of maintenance) resulting from not meeting the above requirements. The cost to be costed on an annual basis for the design life of the asset.

Further information regarding the OH&S Act can be found at
https://www.worksafe.vic.gov.au/resources/summary-occupational-health-and-safety-act-2004-handbook-workplaces

https://www.worksafe.vic.gov.au/resources/designing-safer-buildings-and-structures

4.8.3 Constructability and Maintainability

Designs shall deliver a solution that meet DoT's requirements regarding maintenance:

- Reduce the need for ongoing maintenance by designing maintenance solutions that minimise interventions to maintain serviceability
- Reduce the costs of undertaking maintenance where maintenance is needed
- Eliminate disruption to traffic resulting from inspections and maintenance activities; and
- Innovate to design solutions with longer life and greater availability

Designers must be cognisant of current maintenance practices/procedures and the use of existing type approved products to determine whether they are the best or optimal for the design solution. The designers must consider maintainability within the "function" of the road during development of designs so that the maintainers are able to operate safely and the road user faces minimal disruption.

For each project, the delivery agency shall provide DoT with a maintainability report for each asset being constructed signed by a suitably qualified independent reviewer.

5 The Road Design Process

5.1 General

The Department of Transport's Policy and Programs Network Planning Division generally takes a lead role in the establishment and management of road network strategies and planning processes and should be consulted prior to commencement of studies.

5.2 Design Reports

Design Reports shall be prepared for all projects, irrespective of their size and scope. Documenting the design development process, including the components of CSD related decision making, must be included in the Design Report.

The success of a project depends on the design documentation being accurate and complete. Without these qualities, difficulties are more likely to arise both during the project tendering/procurement process or during construction. *Austroads Guide to Road Design Part 8: Process and Documentation* details the need for design documentation and provides guidance on preparing and developing designs..

To encompass the design development process, a 'Design Report' must be completed in order to:

- Demonstrate that the design has met all relevant requirements, and clearly describes the basis for judgement used during the design process
- Document how Safe System principles have been considered and applied in the design process
- Demonstrate that the design is context-sensitive through describing the application of the components of Context Sensitive Design (See Section 4.3)
- Document all Design Exception design elements, including a risk assessment and any mitigation measures
- Document the options which were explored and their reasons for not being adopted in the preferred design option
- Document any special features of the design that must not be varied in construction
- Document particular features of the design that require specific or "non-standard" maintenance procedures to be adopted
- Document the design criteria used and assumptions made during the design; and
- Record the various reports and other inputs used in completing the design.

A Design Report ensures that all key factors and design decisions are transferred to the next stage of the project and ultimately the operator of the asset. If necessary, decisions can be retraced by other stakeholders at a future date should there be a need to review (for example) project scoping decisions. While the Design Report may include progress updates on the design or construction of a project, this is not the only purpose of the report.

Appendix A – Process and Documentation

NOTE: This Appendix is largely unchanged in this edition and will be updated in the next edition of this Part.

This section has been moved from the now superseded VicRoads Supplement to Austroads Guide to Road Design Part 8 – Process and Documentation.

Those engaged to undertake design works for DoT shall be accredited through DoT Prequalification Scheme. Accreditation through the scheme requires consultants to have an operational quality management system. Refer to the website for further details regarding these requirements.

A.1 Preparation for Design

A.1.1 Overview

No additional information

A.1.2 Design control process – the Relationship to ISO 9001

No additional information

A.1.3 Use of Design Control Aids

This Supplement includes a range of design control aids which may be used to assist in the preparation of a road design. These control aids are included in Appendix D.

A.1.4 Client and Designer Interaction

Additional Information

Project Leader's Responsibilities

The Project Leader should determine the degree of checking and review required for a project based on the assessment of:

(a) the type of project

(b) project complexity

(c) knowledge and skills of the designer(s) involved and

(d) technology being utilised, taking into account the clients requirements.

The Project Leader shall ensure that the control activities are adequately resourced, and sufficient time has been allocated. The verification activities shall be included in the project design program.

Where a verification activity identifies a conflict between the client's requirements and good design standards, principles, road safety, constructability and/or cost the Project Leader shall resolve the conflict with the client.

A.1.5 Scope of the Design

No additional information

A.1.6 Design Development Inputs

Road Safety Audits

Additional Information

DoT maintains a policy to undertake road safety audits throughout the planning, design and construction stages of road and bridge projects. Refer Section 2.2.3.1 – Road Safety Audits

A.1.7 Design Development Output

No additional information

A.2 Design Development

A.2.1 Overview

No additional information

A.2.2 Producing the Road Design

Designer's Responsibilities

Additional Information

A designer shall progressively check his/her own work during development of the design, recording clearly and concisely any design data used, calculations, analysis, considerations and assumption adopted. The design outputs should be in accordance with the project requirements and presentation standards.

A designer on reaching a checking hold point or completion of the design task shall:

- Compile all design data, design outputs and other relevant details
- Sign and date the above design documentation
- Advise the Project Leader that a checking hold point has been reached, or that the design task has been completed.

Where a design discrepancy has been identified either through self checking or by another checker, the designer shall review the implications of an amendment on associated design components.

A.2.3 Matters Specific to Each Design Phase

No additional information

A.2.4 Design Control

No additional information

A.2.5 Design Self Checks

No additional information

A.2.6 Design Interfaces

No additional information

A.2.7 Workplace Health and Safety/Safe Design

DoT, along with all agencies, consultants and contractors involved in the procurement and maintenance of assets, is required to consider the designer duties under Section 28 of the Occupational Health and Safety Act 2004. Refer Section 4.8.2 - Workplace Health and Safety/Safe Design

A.2.8 Constructability and Maintainability

No additional information

A.2.9 Quantities

No additional information

A.3 Design Review, Verification and Validation

A.3.1 Overview

No additional information

A.3.2 Independence in the Process

No additional information

A.3.3 Design Review

No additional information

A.3.4 Additional Aspects to the Review Process

No additional information

A.3.5 Design Interface Review

No additional information

A.3.6 Incorporating the Review Response

No additional information

A.3.7 Dealing with Design Non-conformance/Departures

No additional information

Design Departures/Exceptions

Additional Information

Should a design exception be identified during the development of a road design, it is incumbent upon the designer to notify the client of this non-conformance within the design report. The client shall accept the design exception where they have the delegated authority to do so.

Refer Section 4.5 – Design Exception Process.

A.3.8 Dealing with Variations

No additional information

A.3.9 Design Development Verification

No additional information

A.3.10 Design Development Validation

No additional information

A.4 Design Audit Process

A.4.1 Overview

Documentation

Additional Information

The completed audit checklists provide a summary of the depth of design process review. Supportive evidence of the satisfactory completion and compliance with the control process needs to be maintained and would generally include:

- Minutes of meetings and discussions,

- Record of design variations,
- Record of design discrepancies,
- Correspondence (including e-mail and faxes) seeking clarification or requests for information.
- Program of works
- Checking documentation
- Design files, including package files.
- Corrective Action Requests.

A.4.2 Design Process Audit

No additional information

A.4.3 Design Product Audit

No additional information

A.5 Presentation of Outputs

A.5.1 Overview

DoT presentation requirements are available in DOT Final Drawing Presentation Guidelines, available on the website.

Checking Aids

Additional Information

The checking aids provided in Appendix VD are in two parts, (a) Designer Aids and (b) Co-ordination Review.

Designer Aids: provide a series of items that may assist a designer in questioning, identifying and tracking design issues that need to be considered. The use of these design prompts sheets is optional.

Co-ordination Review Aids: represents a generic design checklist that must be reviewed for appropriateness for each work package prior to adoption. Where more design check items are necessary they shall be added for completeness. The checklist should be used progressively throughout the development of the design by the designer and checker, rather than at the completion of the design in order to prevent significant redesign work due to errors.

A.5.2 Typical Sheets Contents

No additional information

A.5.3 Organisation of CADD Data

No additional information

A.5.4 Preparation of CADD Drawings

No additional information

A.5.5 Phase 2 – Design Composition

No additional information

A.5.6 Phase 3 – Design Composition

No additional information

A.5.7 Standard Feature labels for Data Groups

No additional information

A.5.8 Standard Symbols

No additional information

A.5.9 Supplementary Design Elements and Criteria

No additional information

Appendix B – Geotechnical Investigations and Design

Additional Information

Refer to https://www.vicroads.vic.gov.au/business-and-industry/technical-publications/pavements-geotechnical-and-materials for test methods, codes of practice and technical documents to be applied in Victoria.

Appendix C – Contract Review Checklist

NOTE: These checklists are unchanged in this edition and will be updated in the next edition of this Part

These checklists have been moved from the now superseded VicRoads Supplement to Austroads Guide to Road Design Part 8 – Process and Documentation.

Contract Review Checklist - Client Relationship

Project Name:			
Project Section:		**Chainage: from**	**to**
Drawing No:			
Reviewer:		**Checker:**	

REFERENCE	CHECK ITEMS	CHECK DATE	COMMENTS
	Scope and extent of work		
	Availability of the following information:		
	Project concept report		
	Environmental Effect Statement		
	Materials investigation reports		
	Design (concept) status report		
	Traffic engineering reports		
	Safety review report		
	Availability of design data files:		
	Survey files		
	Design files		
	Drawing files		
	Utility services (existing & proposed)		
	Design (concept) criteria specification:		
	Listings of design guides		
	Reference materials		
	Standards adopted		
	Environmental studies:		
	Cultural Heritage site surveys		
	Flora & fauna surveys		
	Noise studies/surveys		
	Community issues		
	Community consultation involvement		
	Time to be allowed		
	Municipal and Planning Authority reqts:		
	Environmental controls		
	Conservation areas		
	Historical buildings		
	Planning permits		
	Planning scheme classification		
	ROW concerns/controls		

REFERENCE	CHECK ITEMS	CHECK DATE	COMMENTS
	Access controls		
	Project staging requirements		
	Project control requirements:		
	Hold points		
	Design reviews		
	Road safety review		
	Proof engineering		
	Responsibility for Service Information:		
	Contacting authorities		
	Obtaining agreements/approvals		
	Responsibility for decision making:		
	Who is involved		
	Who makes decisions		
	List of project contact/liaison officers		
	Project superintendent		
	Project Quality Representative		
	Process for design variations approval and variations		
	Can the design concept be varied or alternative proposed		
	What type of after service will be provided		
	Type of documentation required:		
	Hardcopy – Number of		
	Electronic – Format		
	Presentation of design:		
	Colour photocopying		
	Drawing size A3		
	Other		
	Project time frame		
	Budgetary / constraints		
	Type of contract:		
	Limiting fee		
	Lump sum		
	Fees for additional work		
	Progressive payment		
	Contract Conditions:		
	Security deposit		
	Retention money		
	Liquidated damages		
	Insurance policies		

Contract Review Checklist - Technical Relationship

Project Name:			
Project Section:		**Chainage: from**	**to**
Drawing No:			
Reviewer:		**Checker:**	

REFERENCE	CHECK ITEMS	CHECK DATE	COMMENTS
	Concept and Functional Layout Review;		
	Have the following design issues been considered:		
	Road side features, e.g. landscape, environmental aspects		
	Rest area and service centre locations		
	Traffic volumes and turning movements		
	Traffic composition		
	Traffic lane widths		
	Public transport lanes		
	Emergency lanes		
	Land acquisition		
	Cross section elements		
	ROW boundary constraints		
	Vertical clearances along the project		
	The operating speed along the project is consistent with:		
	Topography		
	Adjacent development		
	Road function		
	Cross section		
	Road classification		
	Road users expectation		
	Functional Layout Review		
	Alignment approaches to structures adequate with respect to:		
	Horizontal & vertical curves		
	Superelevation development		
	Sight distance		
	Horizontal and vertical alignments consistent with visibility requirements:		
	Along the road and at junctions		
	Access points		

REFERENCE	CHECK ITEMS	CHECK DATE	COMMENTS
	Pedestrian and cyclist crossings		
	Is the frequency of crossing either too high or too low in relation to:		
	Safety access		
	Impact on surrounding/adjacent or superseded lengths of road		
	Disruption to traffic movements		
	Access of emergency vehicles & public transport		
	Are all road users, including pedestrians and non motorised users provided for		
	Do the proposed connections to the existing road occur at hazardous locations		
	Future Development:		
	Will the approved concept provide consistent design standards in relation to adjacent road standards		
	Will future upgrading of the approved concept be possible without compromising safety and practices		
	Has stage construction been addressed:		
	Traffic operation		
	Construction safety		
	Side track connections		
	Drainage		
	What regulatory and statutory requirements affect or need to be addressed as part of the design		
	Critical design control identified & information on cost of replacement, location adequately verified		
	Design Data		
	Site visit details verity design inputs and design controls		
	Design input data adequacy:		
	Environmental effect statement/EIS		
	Materials investigation reports		
	Design (concept) status reports		
	Traffic engineering reports		
	Safety review report		
	Environmental studies		
	Structure details		
	Survey files		
	Design files		
	Drawing files		

REFERENCE	CHECK ITEMS	CHECK DATE	COMMENTS
	Utility services (existing & proposed)		
	Listings of design guides		
	Reference materials		
	Standards adopted		
	Other Details		

Appendix D – Design Checklist and Aids

NOTE: These checklists are unchanged in this edition and will be updated in the next edition of this Part

These checklists have been moved from the now superseded VicRoads Supplement to Austroads Guide to Road Design Part 8 – Process and Documentation.

The checklists have been structured into several columns covering:

a) Reference: to provide a list of design references, or documentation that can be used to locate applicable standards and/or policy.
b) Checklist Item: to provide a list of prompts that can be used as a reference during development of the design and independent checking.
c) Designer Date: to assist in the tracking of the design checks by the designer and to record the depth of the checking. The column must be initialled and dated to verify that the check was completed.
d) Check Date: to assist in the tracking of the design output checks and recording the depth of the review. The column must be initialled and dated to verify that the check was completed. (Note: This column has not been providing on the design prompt sheets).
e) Comments: to provide for recording the outcomes of checks or responses that require further follow up. Supervisor agreements must be recorded or cross referenced in this column.

Legend:

AGRD – Austroads Guide to Road Design

AGTM – Austroads Guide to Traffic Management

GTEP – Austroads Guide to Traffic Engineering Practice (superseded)

RDG – VicRoads Road Design Guideline Part 7: Drainage (all other RDGs are superseded)

RDN – VicRoads Road Design Note (available on VicRoads website)

Task Brief – Design Specification

TEM – VicRoads Traffic Engineering Manual

VRS – VicRoads Supplement to AGRD (available through VicRoads website at its online bookshop)

Horizontal Alignment Checklist

AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief Contract Review	The selected horizontal alignment addresses:			
AGRD & VRS Part 3-3, 3-5, 3-8	Operating speed			
	Existing terrain			
	Approach to bridge structures			
	Acquisition of land			
	Minimises conflict with services			
	Clearances to row boundaries			
Task brief Contract Review	Cross Section fits within the Right of Way and is consistent with:			
AGRD & VRS Part 3-5, 3-6	Operating speed			
AGRD & VRS Part 3-5	Traffic composition			
These RDNs no longer exist	Services constraints			
Task brief Contract Review	Selection of curves and spiral transitions address:			
AGRD & VRS Part 3-3.8	Radii and required lane width			
	Lateral friction factors			
	Distance between tangent points is adequate for superelevation development			
	Spiral lengths requirements			
	Isolated curves of small radius have been avoided			
	Effect of road curvature on stopping sight distance			
	Consistency of radii adopted along the alignment			
AGRD & VRS Part 3-3.6, 3-7.7	Superelevation development length			
	Appropriate for the design speed and curve			
	Adequate for the development within straight or spiral			
	Been correctly located			
	Clear of bridge abutments			
AGRD & VRS Part 3-5, 3-7	Sight distance requirements have been addressed:			
	Lateral sight distance			
	Entering sight distance			
	Approach sight distance			
	Safe intersection sight distance			

AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief Contract Review AGRD & VRS Part 6B RDN 06-01	Noise wall locations			
AGRD & VRS to AGRD Part 6-4.2, Part 3.5 RDN 06-02	Location of safety barriers:			
	Terminal locations			
	Objects being protected			
	Clear zones			
	Run-out areas			
Task brief Contract Review AGRD & VRS Part 6B & Part 3-6.3	Landscape requirements			
	Batters slope			
	Land forming requirements			
AGRD & VRS Part 3-6	Co-ordination of horizontal and vertical geometry			
AGRD & VRS Part 3-6	Other horizontal criteria			

Vertical Alignment

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief AGRD & VRS Part 3-8.5	Maximum and minimum grades			
	Minimum			
	Maximum			
AGRD & VRS Part 3-7.7, 3-8, 3-8.5	Location of horizontal curves and superelevation development			
AGRD & VRS Part 3-8.2, 3-7, 3-8	Vertical curves meet the design standards and requirements for:			
AGRD & VRS Part 3-8.6,	Sag curves			
AGRD & VRS Part 3-8.6	Crest curves			
	Provide appropriate vertical sight distance			
	Level of driver comfort			
	Use of straights and curves to provide a smooth gradeline without hidden dips			
	Co-ordination of horizontal and vertical curves			
Task brief Contract Review	The vertical grading addresses:			
	Flood levels			
AGRD & VRS Part 3-7.7, 3-8	Existing pavement levels			
	Superelevation requirements:			
	Rotation of pavement			
	Future overlay levels			
	Future overlay structures			
	Matching to bridge levels			
	Pavement depth on bridge structure been considered			
	Driver safety, comfort and vertical alignment appearance is satisfactory			
Task brief Contract Review AGRD & VRS Part 3-8	Clearance to services and structures overhead			
	Underground			
	Lateral clearance			
Task brief Contract Review	Resheet / overlay controls			
Task brief Contract Review AGRD & VRS Part 3-5	Depth of cuts/fills:			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Batter slopes can be constructed taking into consideration the soil type/condition			
	Height of the batters not excessive			
	Batter slopes driveable			
	Benching required			
	Protection requirements			
	Erosion controls measures needed e.g. Beaching, catch drains			
AGRD & VRS Part 3 AGRD & VRS Parts 4, 4A, & 4B AGTM/VRS Part 6	Grades through intersections adequate for:			
	Sight distance			
	Stopping			
	Merge and diverge areas visible and of adequate length			
	Turning movements are not affected by adverse crossfall			
AGRD & VRS Part 3-8 AGRD & VRS Part 5 RDG Part 7-3, 7-4	Adequate drainage provided at:			
	Vertical sag curves in cut			
	Large vertical crest curves in cut			
	Superelevation level points			
Task brief Contract Review AGRD & VRS Part 3-9	Adequacy of overtaking provisions			
AGRD & VRS Part 3-8.7	Earthwork quantities in balance			
	Other vertical grading criteria			

Coordination of Horizontal and Vertical Geometry

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Horizontal control criteria			
Task brief Contract Review AGRD & VRS Part 3-8, 3-6.3	Minimum lateral clearance to non relocatable			
	Structures			
	Services			
	Features (monuments etc)			
Task brief Contract Review	Minimum clearance to row boundaries			
AGRD & VRS Part 3-3	Operating speed			
AGRD & VRS Part 3-7	Horizontal curve criteria			
AGRD & VRS Part 3-7.7, 3-7.3	Superelevation requirements			
AGRD & VRS Part 3-9	Overtaking provisions			
AGRD & VRS Part 3	Cross Section requirements			
Task brief Contract Review	Location and type of grade separation interchange			
	Overpass			
	Underpass			
Task brief Contract Review AGRD & VRS Part 4 & 4A AGTM & VRS Part 6	Median, outer separator and emergency opening locations			
Task brief Contract Review	Public transport requirements			
Task brief Contract Review	Stage construction requirements			
Task brief Contract Review AGRD & VRS Part 3 AGRD & VRS Part 6A	Pedestrian and bicycle requirements			
Task brief Contract Review	Other horizontal controls			
	Vertical control constraints			
Task brief Contract Review	Structure clearance controls			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Structural depth			
	Bridge deck levels			
Task brief Contract Review	Clearances to services			
	Underground			
	Overhead			
Task brief Contract Review	Control levels			
	Building lines			
	Access level			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-1, 7-3, 7-4, 7-7 RDN 05-01 RDN 05-02	Drainage controls			
	Flood levels			
	Culvert controls			
	Sub surface controls			
	Location of low points			
Task brief Contract Review AGRD & VRS Part 3	Crossfalls			
	Medians			
	Footpaths			
	Pavements			
Task brief Contract Review	Resheet/overlay controls			
	Other vertical controls			
	Coordination of horizontal and vertical geometry			
AGRD & VRS Part 3-8, 3-6	Does the geometry conform with the terrain			
AGRD & VRS Part 3-7	Grade changes minimised			
AGRD & VRS Part 3-8, 3-9	Use of compound curves been avoided, if not are the curves of suitable radii			
AGRD & VRS Part 3	Have adequate lengths of straight been provided			
	Between curves			
	For passing opportunities			
AGRD & VRS Part 3-7, 3-8	Horizontal and vertical geometry in phase:			
	Alignment appearance has no kinks or hidden dips			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Does the alignment provide a consistent standard free from sudden changes			
AGRD & VRS Part 3-9	Have sufficient passing opportunities been provided in accordance with all route requirements			
Task brief Contract Review	High vehicle detour been provided where there is conflict with vertical clearance			
AGRD & VRS Part 3-7	Location of adverse superelevation and curve radii			
AGRD & VRS Part 3-8.7, 3-10	Alignment approaches to structures are adequate with respect to:			
	Cut and fill			
	Bridge location clear of horizontal and vertical curves			
Task brief Contract Review AGRD & VRS Part 3-3	Operating speed for:			
	Main carriageways			
	Entry ramp			
	Exit ramp			
	Side roads			
	Access roads			
	Is the operation speed consistent for the alignment			
AGRD & VRS Part 3-7, 3-5, 3-6	Effect of horizontal and vertical geometry on sight distance taking into account:			
	Stopping sight correction factors			
	Horizontal and vertical approaches to curves			
	Design vehicles			
	Intersection			
	Property access			
	Structures			
	Pedestrians			
	Cyclists			
AGRD & VRS Part 3 AGRD & VRS Part 4 AGRD & VRS Part 6A	Geometric design of the side road approaches have adequate sight distance to:			
	Intersection e.g. Traffic islands, linemarking & signage			
	Pedestrians			
	Cyclists			
AGRD & VRS Part 3-7	Superelevation rotation location with respect to:			
	Structures			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Intersections			
	Lengths of spirals			
	Sag and crest curves			
	Grading of outer edges of carriageways, kerb and channel, table drain			
AGRD & VRS Part 3-10.3	The reduction in effective crossfall due to sleep down grades at horizontal curves			
AGRD & VRS Part 3-7, 3-8, 3-10	Application of superelevation for each curve:			
	Super development			
	Relative grades			
	Longitudinal grades			
	Water flow depths			
	Location of flat spots			
	Crowing details			
Task brief Contract Review AGRD & VRS Part 3-4	Design levels controls have been addressed:			
	Building lines			
	Low points			
	Crossfall			
	Access points			
Task brief Contract Review AGRD & VRS Part 3-4, 3-6	Clearances horizontal and vertical boundaries address:			
	Services location and address			
	Batter location			
	Footpath			
	Bicycle path			
	Noise attenuation requirements			
	Landscape requirements			
Task brief Contract Review AGRD & VRS Part 3-4.1	Construction staging controls have been addressed:			
	Operating speed for the departure and approach to the proposed design			
	Driver visibility to the change in road environment			
Task brief Contract Review	Other geometry coordination considerations:			

Intersection Functional Layouts

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Design criteria			
Task brief Contract Review	Traffic details			
	Volumes			
	Composition			
	Peak hour volumes			
	Traffic direction			
Task brief Contract Review	Pedestrian volumes and movements			
AGRD & VRS Part 4	Design requirements			
AGRD & VRS Part 6A	Bicycle volumes and movements			
Task brief Contract Review AGRD & VRS Part 4-5 AGRD & VRS Part 6A	Design requirements			
Task brief Contract Review	Traffic turning movements			
	Left turns			
	Right turns			
Task brief Contract Review	Design vehicles			
	Semi trailer			
	Restrictive access vehicles			
	Buses			
	Other			
Task brief Contract Review	Public transport requirements:			
	Bus stop locations			
	Mid block			
	Departure side of intersection			
	Approach side of intersection			
	Property access requirements and location			
Task brief Contract Review	Horizontal clearances to:			
	Row boundaries			
	Services			
	Structures			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief Contract Review AGRD & VRS Part 3-5	Operating speed on approach legs to intersection			
Task brief Contract Review	Intersection Cross Section:			
AGRD & VRS Part 5	Through lane widths			
AGRD & VRS Part 3-4	Number of lanes			
	Auxiliary lane width			
	Median widths			
Task brief Contract Review	Right turn lane treatment:			
AGRD & VRS Part 4A	Lane width			
AGRD & VRS Part 4A-3	Right turn lane storage length			
AGRD & VRS Part 3-9.9 AGRD & VRS Part 4	Taper lengths			
	Deceleration length			
Task brief Contract Review	Left turn lane treatment			
	Free flow			
AGRD & VRS Part 3-4.3 AGRD & VRS Part 4-4.5 AGRD & VRS Part 4A-4.6, 4A-4.5, 4A-8.3	High angle			
	Lane width			
	Left turn lane storage length			
	Deceleration length			
	Acceleration length			
AGRD & VRS Part 3-9.9 AGRD & VRS Part 4	Taper length			
Task brief Contract Review	Pavement taper lengths			
AGRD & VRS Part 4A-6	Merge			
AGRD & VRS Part 3-9	Diverge			
Task brief Contract Review	Median treatment details:			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
AGRD & VRS Part 4-7	Median widths			
	Island length			
Task brief Contract Review	Parking requirements:			
AGRD & VRS Part 4	Number of bays			
AGRD & VRS Part 3-4	Parking			
AGRD & VRS Part 3-8	Vertical grades through intersection			
	Major road			
	Minor roads			
AGRD & VRS Part 3-8, 3-Table 8.1	Vertical clearances to:			
	Structures			
	Services			
AGRD & VRS Part 3-4 AGRD & VRS Part 4-10	Vertical grading controls			
	Existing pavement levels			
	Pavement resheet depths			
Task brief Contract Review	Other design criteria			
	Intersection design checks			
AGRD & VRS Part 3-5 AGRD & VRS Part 4A	Approach alignment to the intersection			
	Clearly visible			
	Lane configuration not confusing			
	Safety roads clearly visible			
	Driver decisions kept to a minimum			
AGRD & VRS Part 3 AGRD & VRS Part 4	Alignment through the intersection not confusing to the driver			
AGRD & VRS Part 3 AGRD & VRS Part 4	Intersection departure alignment not confusing to driver			
AGRD & VRS Part 4 & 4A	Intersection area clearly defined			
AGRD & VRS Part 3	Intersection sight distance requirement been met on all approaches:			
AGRD & VRS Part 4 & 4A	Safe intersection sight distance			
	Entering sight distance			
	Approach sight distance			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Lateral sight distance			
AGRD & VRS Part 3	Driver sight cone satisfactory			
AGRD & VRS Part 3 AGRD & VRS Part 4A	Check truck stopping distance			
AGRD & VRS Part 3	Truck clearance time for crossing the intersection			
	Visibility of:			
	Islands (constructed and painted)			
AGRD & VRS Part 3-9	Auxiliary lane treatments			
	Lane diverge treatments			
	Lane merge treatments			
AGRD & VRS Part 3-8	Clearances to services above ground and underground:			
	Gas mains			
	Electricity lines			
	Telephone lines, pits			
	Water mains			
	Sewage mains			
	Drainage pipes, pits			
	Oil pipelines			
AGRD & VRS Part 3-8.2, 3-10	Clearance to structures			
	Bridge abutments			
	Building verandas			
AGRD & VRS Part 4 & 4A	Island details and layout:			
	Meets minimum size			
	Size appropriate for storage of pedestrian signals and signs, pits			
	Approach nose radii			
	Departure nose radii			
	Island provides appropriate driver direction			
	Shape discourages way movement			
	Traffic lane offset clearances			
AGRD & VRS Part 4A-4	Auxiliary lane treatments:			
	Approach to treatment vehicle to driver			
	Island nose shape appropriate for design vehicle turns			
	Turning templates for turns been checked			
Austroads Turning Templates	Turning movement for design vehicles provide for clearances:			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Pedestrian standing areas			
	Sign locations			
	Traffic signal locations			
	Other intersection geometry checks			

Drainage

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Drainage control checks			
Task brief Contract Review	Drainage strategy			
Task brief Contract Review	Legal considerations			
Task brief Contract Review	Drainage authority requirements			
	Council			
	Melbourne water			
	Planning authorities			
	Developers			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-2	Plans cover the entire catchment area and surface features relevant to drainage			
Task brief Contract Review	Drainage reserves			
Task brief Contract Review	Adjacent property use			
AGRD & VRS Part 5 RDG Part 7-2, 7-4, 7-7	Overland flow paths			
Task brief Contract Review	Environmental sensitive areas such as:			
AGRD & VRS Part 5 RDG Part 7-6	Erosion controls			
	Vegetation area			
Task brief Contract Review	Geological report			
	Ground water table level			
	Stratum layers			
Task brief Contract Review	Service location, size and depth of:			
	Electricity, water, sewage, gas, telephone			
Task brief Contract Review AGRD & VRS Part 3-8	Clearance to services			
Task brief Contract Review	Location of outfalls and responsible authority			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-1, 7-4	Area affected by floods and flood levels			
Task brief Contract Review	Details on the existing drainage system:			
AGRD & VRS Part 5	Design discharge			
	Pipe sizes			
	Time of concentration			
	Average recurrence interval			
	Minimum pipe grading			
	Drainage site inspection constraints/controls			
Task brief Contract Review	Design criteria			
AGRD & VRS Part 5 RDG Part 7-3, 7-4	Average recurrence interval for the design and hydraulic gradeline check			
	Coefficient of runoff for design and hydraulic gradeline check			
	Flow width			
	Freeboard requirements			
	Minimum and maximum			
	Pipe sizes			
	Pipe grading			
	Water velocities			
Task brief Contract Review AGRD & VRS Part 6A	Cyclist and pedestrian requirements			
Task brief Contract Review	Bridge design responsibilities			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-3	Construction staging			
Task brief Contract Review	Other drainage controls			
	General drainage checks			
Task brief Contract Review	The grading of the road with respect to:			
AGRD & VRS Part 5 RDG Part 7-3, 7-4, 7-7	Flood levels			
	Ground water levels			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	The flow across superelevation development			
	Acceptable flow width			
	Acceptable flow velocity			
	Outlet conditions			
	Subsurface drainage requirements			
	Landlocked sags			
Task brief Contract Review	Drainage diversions such as:			
AGRD & VRS Part 5 RDG Part 7-6	Table drains			
	Catch drains			
	Noise attenuation mounds			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-1, 7-4	Strategic assessment of the contributing catchment and construction requirements			
Task brief Contract Review	Does the strategic location address:			
AGRD & VRS Part 5 RDG Part 7-1, 7-4	Maintenance and construction Requirements			
	Network drainage checks			
AGRD & VRS Part 5 RDG Part 7-4, 7-6, 7-7	Appropriate pits types are provided at all low points in the:			
	Roadway			
	Median			
	Catch drains			
	Table drains			
	On the low side of superelevation in accordance with guidelines			
	Pit locations are not in conflict with:			
	Driveways			
	Pram crossings			
	Services			
AGRD & VRS Part 5 RDG Part 7-7	Pavement surface flow widths are in accordance with the design criteria guidelines			
	Selection of the pipe network adopted is:			
	Visually cost efficient			
	Constructible			
	Road crossings are minimum			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
AGRD & VRS Part 5 RDG Part 7-4	Check pipe calculation components:			
	Area calculations including partial area affect			
	Discharge calculation			
	Grading			
	Size			
	Water velocity			
	Cover/clearances, e.g. Road, services			
	Settlement criteria			
	Ground water table level			
	SSDs outlet levels			
AGRD & VRS Part 5 RDG Part 7-4.9	Check data used in hydraulic gradelines calculations			
AGRD & VRS Part 5 RDG Part 7-4.9	Check hydraulic gradeline on drainage longitudinal plot			
AGRD & VRS Part 5 RDG Part 7-3, 7-4.7	For each segment of pipe: Calculation for:			
	50 year Q			
	Pipe roughness			
	Reynolds No.			
	Selection of appropriate case A, B, C, or D			
	Estimation of pipe fiction losses			
	Fiction factor “f” from moody diagram			
	For each segment of pipe:			
	Level of the hydraulic gradeline in the downstream end of pipe			
	Water level in the upstream pit			
AGRD & VRS Part 5 RDG Part 7-4.1.3	Provision for major storms			
AGRD & VRS Part 5 RDG Part 7-6	Outfall protection treatment:			
	Beaching			
	Grading			
	Litter and debris traps			
	Detention storage			
	Culvert design checks			
AGRD & VRS Part 5 RDG Part 7-3	Culvert shape suits natural waterways			
AGRD & VRS Part 5 RDG Part 7-3	Check culvert calculation components			
	Area calculations including partial area affect			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
	Ground water table level			
	Discharge calculation			
	Grading			
	Size			
	Determination of			
	Allowable headwater			
	Tailwater			
	Critical depth flow			
	Outlet velocity			
	Drawdown affect			
	Application of inlet and outlet control nomography			
	Cover/clearances, e.g. Road, services			
	Settlement criteria			
Task brief Contract Review	Beaching requirements			
AGRD & VRS Part 5 RDG Part 7-6	Energy dissipater requirements			
	Catch and table drain checks			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-6	Catch drain and table drain checks:			
	Level of the water compared to the top of bank			
	Level of water compared to the subgrade level of the road			
	Flow velocity values to prevent scouring			
	Level of water compared to the ssdp outlets			
	Debris control measures			
	Sub surface drainage checks			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-5	Pavement depth compared to ssdp drain depth			
	Formation drain depth compared to ssdp drain depth			
	Cut and fill transition locations			
	Ground water levels			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-5.2	The relative permeability of the pavement materials and the surrounding materials			

New AGRD/VRS Reference	Checklist Item	Design Date	Check Date	Comments
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-5.2	Use of impervious collector pipes from subsurface drains			
Task brief Contract Review AGRD & VRS Part 5 RDG Part 7-5.2	Sub surface pipe grading			
AGRD & VRS Part 5 RDG Part 7-5	SSDs provide for:			
	Flat pavement			
	Cut/fill lines			
	Pavement widening trenches			
	End of structures			
AGRD & VRS Part 5 RDG Part 7-5	Sub surface inlet and outlet			
	Spacing			
	Preliminary levels			
	Drainage pit levels			
	Table drain levels			
	Location			
	Quality extraction			
Task brief Contract Review	Quantity and costs:			
	Pits			
	Special pits			
	Pipe length			
Task brief Contract Review	Other drainage checks			

Commentary 7

Additional Information

An EDD value can only be used on DoT projects with explicit approval by DoT. Applications for approval shall be supported by a documented risk assessment that justifies the use of the value and a proposal for the use of appropriate mitigation measures/devices. Refer to Section 4.5.1 of this Supplement for guidance.