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# **VicRoads Supplement to the Austroads Guide to Road Design**

## **Part 2 – Design Considerations**

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**NOTE:**

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

**Reference to any VicRoads or other documentation refers to the latest version as publicly available on VicRoads website or other external source.**

# VicRoads Supplement to the Austroads Guide to Road Design Updates Record

## Part 2 – Design Considerations

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This VicRoads Supplement has been developed by VicRoads Technical Services and authorised by the Executive Director – Policy and Programs.

The VicRoads Supplement to the Austroads Guide to Road Design provides additional information, clarification or jurisdiction specific design information and procedures which may be used on works financed wholly or in part by funds from VicRoads beyond that outlined in the Austroads Guide to Road Design guides.

Although this publication is believed to be correct at the time of printing, VicRoads does not accept responsibility for any consequences arising from the information contained in it. People using the information should apply, and rely upon, their own skill and judgement to the particular issue which they are considering. The procedures set out will be amended from time to time as found necessary.

## References

AGRD – Austroads Guide to Road Design

GTEP – Guide to Traffic Engineering Practice (superseded)

VRD/RDG – VicRoads Road Design Guidelines (superseded)

Austroads (2009). Austroads Guide to Road Design - Part 3: Geometric Design.

Austroads (2009). Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections.

Austroads (2009). Guide to Road Design Presentation. Dr Owen Arndt. Qld Dept. of Transport and Main Roads.

Cox, R L & Arndt, O (2005). Using Extended Design Domain Concept for Road Restoration Projects. Presented at 3rd International Symposium on Highway Geometric Design, June 29-July 1, 2005, Chicago, Illinois.

Queensland Dept. of Main Roads (2009). Extended Design Domain Workshop. Engineering and Technology Group.

TAC (2008). Flexible Design for Sustainable Roads Workshop.

VicRoads (2006). Access Management Policy.

Austroads (latest). VicRoads Supplement to AGRD – Part 3: Geometric Design.

VicRoads (latest). VicRoads Supplement to AGRD – Part 4A: Intersections.



## 1.0 Design Objectives

VicRoads has no supplementary comments for this section.

## 2.0 Context Sensitive Design

### 2.1 Design Domain Concept

VicRoads has no supplementary comments for this section.

### 2.2 Normal Design Domain

The reference in the second paragraph to Section 11.2 of Austroads (2003) (*Rural Road Design: a guide to the geometric design of rural roads AP-G1/03*) is incorrect as the document has been superseded by *Austroads Guide to Road Design - Part 3: Geometric Design*.

### 2.3 Extended Design Domain (EDD)

The decision whether to adopt Extended Design Domain (EDD) criteria is a VicRoads corporate responsibility for projects under its control.

#### 2.3.1 Background

Projects involving road design may range from minor improvements to small sections of existing roads, through 'restoration' projects that improve road cross-sections while retaining existing alignments, to major 'greenfields' design of arterial roads as part of significant regional or interregional development.

Road design guidelines are developed with consideration of the need to achieve a balance between sometimes competing demands or operational requirements, safety, cost and social and environmental impacts. Context Sensitive Design (CSD) is an approach that provides the flexibility to encourage independent designs tailored to particular situations. CSD seeks to produce a design that combines good engineering practice in harmony with the natural environment and built environment, and meets the required constraints and parameters of the project.

Design guidelines tend to use the concepts of absolute minimum and desirable limiting values for each of the different design elements. The desirable limits indicate good practice, while absolute values are located outside of the desirable and are subject to professional judgement. Design guidelines

provide a range of acceptable values for each parameter ('the design domain') from which designers must choose the most appropriate value. The Normal Design Domain (NDD) can be thought of as a range of values that a design parameter may take and be justified in an engineering sense and therefore can have a reasonable level of defence if questioned. Construction cost considerations sometimes lead to minimum values being elected for a single parameter that may or may not be appropriate for the particular circumstances, but is acceptable. However, the use of minimum values for interrelated parameters is generally not recommended.

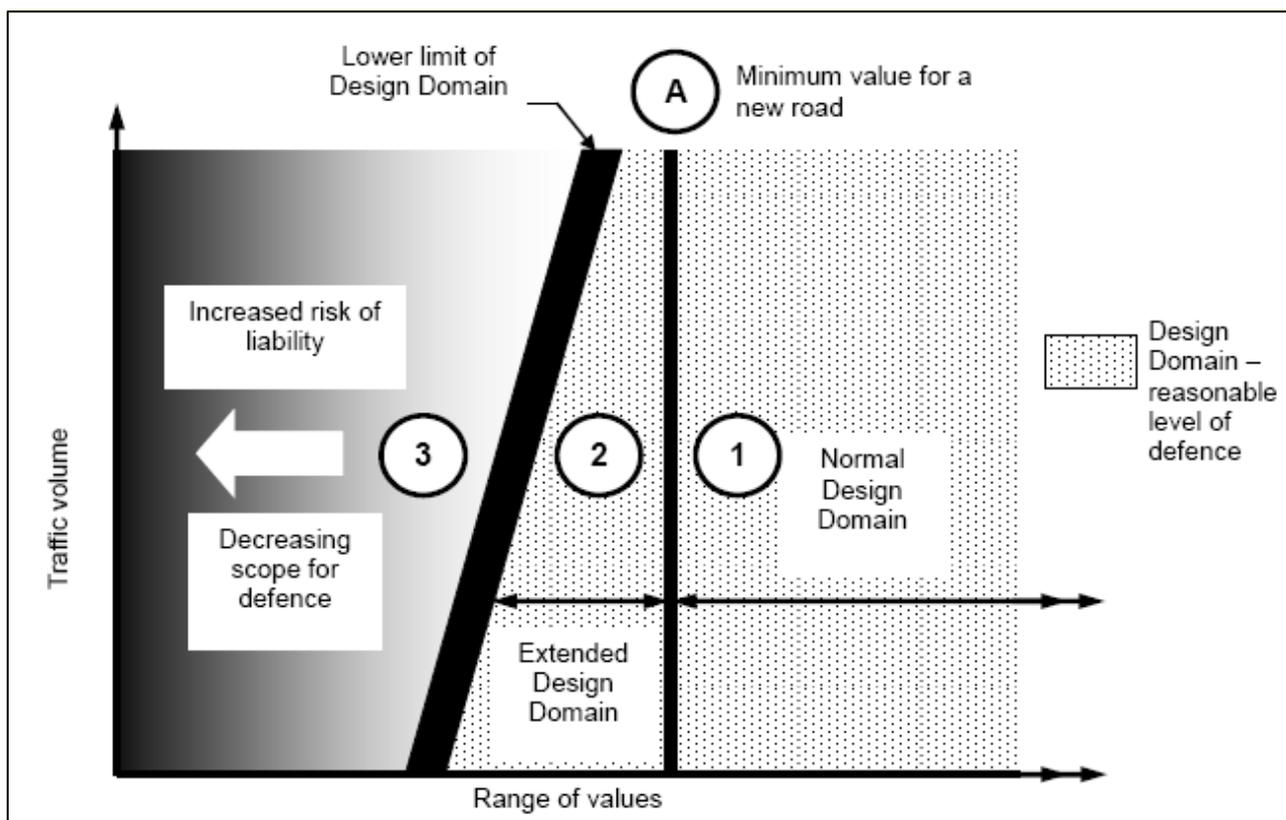
EDD is the use of criteria below the lower bound of the NDD criteria to address project constraints while ensuring that the objectives of the project and safety are still met. These lower values are generally considered less safe or less efficient, but are also generally less expensive than those of the upper reaches of the design domain. The use of design values below the design domain (i.e. below EDD) cannot be justified on engineering grounds. Figure 2.1 shows a conceptual diagram for EDD.

*"EDD extends the lower bound of the Design Domain that is used for a new road, based on what can be justified and defended, on engineering grounds, in certain circumstances. However, a value within the EDD can be used only with explicit, corporate approval of the relevant road authority, supported by a documented risk assessment that fully justifies the use of that value."* (AGRD Part 2, Design Considerations – Commentary F)

The use of EDD requires the engagement of practitioners with high levels of design skill and engineering judgement and requires the application of greater effort to include EDD and manage its use. It is essential that the intent of any standard is still applied when using EDD when considering the overall impact on all elements of the design.

There is less scope to apply EDD on high volume roads where the application of EDD, even with appropriate mitigation, does not allow acceptable safety levels to be achieved. EDD can only be applied to existing roads with no crash history where the existing pavement design and other site constraints may prohibit the upgrade to current design standards. As part of the justification process for the use of EDD, it is essential that all decisions are validated and documented.

**Figure 2.1: EDD Conceptual Design**  
(from AGRD Part 2, Commentary F)



### 2.3.2 Policy

The use of EDD for VicRoads projects should only be applied to brownfield sites where feasible NDD options cannot be implemented. Additional mitigation must be included to offset the lower design values to ensure that the operational and safety standards of the road are maintained.

For VicRoads projects, any use of EDD should be considered at the scoping phase of a project, preferably as part of the TEC approval process.

Approval to the use of EDD criteria shall be highlighted in VicRoads Business Case/Scope Approval/PRC reports as appropriate.

#### 2.3.2.1 Constraints and application of EDD

In line with Austroads Guide to Road Design (AGRD), the application of EDD:

- should only be applied at the scoping stage of a project
- should only be applied to one design criteria, with above NDD applied to other criteria to “off-set” the lower criteria used;
- mitigation/offset measures must be implemented to ensure acceptable overall standards are maintained;

- should not be used for greenfield projects, including the development of duplication proposals, where existing pavement is not part of the construction. EDD can be considered where additional lanes are added to existing pavement - it may be possible to build the new pavement to meet current design standards, however, costs or other site constraints do not allow the existing pavement to be upgraded to fully meet current NDD design criteria.
- cannot be used for any project site with an existing accident/crash history that relates to the parameter being considered for EDD.
- all decisions are thoroughly and transparently documented and justified.

#### 2.3.3 Minimum Criteria - EDD

The AGRD identifies a range of minimum EDD criteria that may be applied to specific design elements. This criterion is identified in:

- AGRD Part 2 – Section 2.3 and Appendix A;
- AGRD Part 3 – Section 1.3 and Appendix A; and
- AGRD Part 4A – Sections 1.4, 2.2.4, 3.4, 8.3.4, 10.4 and Appendix A.

The AGRD identify a range of acceptable EDD values for key design parameters including:

- cross sections for rural two lane, two way roads and urban freeways
- stopping sight distances
- crest vertical curves
- sag vertical curves
- horizontal sight restriction
- intersection sight distance.

### VicRoads Standards

VicRoads reserve the jurisdictional right to set design criteria that must not be contravened or require specific mitigation measures to be implemented. This guidance will be included in the VicRoads Supplements, made available on the VicRoads website as developed or included in tender documentation and contract specifications.

#### 2.3.4 VicRoads EDD Approval Process

An Extended Design Domain Application Form (refer to Attachment A) has been developed and shall be used to apply for EDD approvals.

The use of EDD criteria on VicRoads projects is subject to approval by the delegated VicRoads representative.

Proponents preparing applications shall consult with the appropriate Region's representatives and seek appropriate technical advice prior to submitting an application for approval.

For Projects subject to VicRoads Project Review Committee (PRC) approval, the delegated VicRoads representative is VicRoads PRC.

For Projects not subject to PRC approval, the delegated VicRoads representative is VicRoads Executive Director Policy and Programs (ED-PP).

For Projects in the delivery phase (i.e. post contract award), approval to a proposal to adopt EDD criteria shall be obtained from VicRoads Executive Director Policy and Programs (ED-PP).

If the use of EDD criteria is proposed for the project, the Extended Design Domain Application Form with recommendation(s) shall be included in the PRC report or forwarded to ED-PP as appropriate.

VicRoads will review the broader application of EDD to monitor outcomes and ensure

consistent application of the process on a regular basis.

Completed Extended Design Domain Application Forms shall be forwarded to VicRoads Principal Road Design Engineer who will consolidate appropriate reporting for VicRoads review.

Further guidance regarding EDD application will be provided in this Supplement as appropriate following periodic VicRoads review.

## 2.4 Road Characteristics and use

VicRoads has no supplementary comments for this section.

## 3.0 Design Considerations

VicRoads has no supplementary comments for this section.

## References

VicRoads has no supplementary comments for this section.

## Commentaries

### Commentary F EDD

An EDD value can only be used on VicRoads projects with explicit, corporate approval by VicRoads. 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 2.3 of this Supplement for guidance.

### Commentary L Access Control

Reference should be made to *VicRoads Access Management Policy* for further guidance on VicRoads access control practices for the various road classifications.

## Tables

VicRoads has no supplementary comments for this section.

## Figures

VicRoads has no supplementary comments for this section.

# Attachment A - Extended Design Domain Application Form

(Prepared by Technical Consulting – June 2010)

Application prepared by: (Development/Project Engineer)	Technical basis of application reviewed by:
	Endorsed by: (Regional Director/Project Director)
	Approved by: (PRC/ED - Policy & Programs)

**Following approval, a copy of this form and supporting documentation must be forwarded to the Principal Road Design Engineer, VicRoads Technical Services, Level 3, 3 Prospect Hill Road, Camberwell (DX 211365). Tick the box below to confirm that a copy of the form and supporting documentation has been forwarded to VicRoads Principal Road Design Engineer.**

## Purpose of Approval

Extended Design Domain (EDD) is primarily designed to be applied to restoration or upgrade works to existing pavements where site constraints would inhibit any works to be undertaken or required a complete reconstruction of the pavement.

Normal Design Domain (NDD) criteria should be applied where possible. If site constraints restrict the upgrade of the existing geometric alignment to current design standards, while still maintaining acceptable operational and safety levels, the use of EDD can be considered as part of the upgrade works.

This application form is to be used to ensure that all reasonable steps have been undertaken to achieve NDD prior to the consideration of EDD. The use of EDD is limited to only ONE design parameter and must be mitigated and offset by above standard design criteria for other parameters. EDD cannot be applied to greenfield alignments or other upgrade works where retention of the existing pavement or pavement levels is not a key part of the works.

## General principles

- EDD can only be applied where VicRoads is rehabilitating or upgrading an existing facility and there are significant controls on the site.
- Significant investment would be required to ameliorate the constraint and it is unjustifiable in the scope of works.
- The existing facility is likely to have been designed to a lesser standard.
- There is no accident/crash history or operational problems associated with the site, relating to the EDD parameter under consideration.
- EDD must be applied at the scoping stage only.
- EDD can only be applied to one design element and must be accompanied with an off-set element designed above minimum NDD.

## Project Details

### Extended Design Domain Application Form

(This section can be expanded to multiple pages to cover any discussions involved and attachments required.)

#### 1. Road/Project Name

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#### 2. Location

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#### 3. Provide details of the project

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4. Detail the project problem and why EDD is being considered. Include details of the issue/s, data available, design criteria, crash statistics, cross sections, site constraints, etc.

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5. Identify options considered (NDD & EDD) to address the problem.

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6. Discuss the impact and feasibility on the project outcome of the options identified in Q5 above.

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(a)

(b)

(c)

7. Discuss the mitigation measures to address the problem when applying NDD and EDD.

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8. Attach plans, photos, drawings

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9. Other information

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