DESIGN EXCEPTIONS GUIDELINE

Technical Services Branch
Alberta Transportation

September 2018

Design Exceptions Guideline

Recommended:

Bill Kenny

Digitally signed by Bill Kenny
Date: 2018.09.13 11:30:15 -06'00'

Bill Kenny, P. Eng.
Director,
Road Geometric Design

Approved:

Des Williamson

Digitally signed by Des Williamson
DN: cn=Des Williamson, o=Alberta Transportation, ou=Technical Standards Branch, email=Des.Williamson@gov.ab.ca, c=US
Date: 2018.09.13 11:33:55 -06'00'

Des Williamson, P. Eng.
Executive Director,
Technical Services Branch

List of Changes

The following page is reserved for documenting changes to this version of the Design Exceptions Guideline.

Document Revision	Description	Date
1	Add Need Assessment of Design Exception and Revise Design Exception Request Form	September 2018

ACKNOWLEDGEMENTS

The following were members of the Design Exception Task Force. The task force was instrumental in developing and modifying the Alberta Transportation Design Exception process in 2016/2017.

Authors:

Bill Kenny, P. Eng, Alberta Transportation
Peter Mah, P. Eng, Alberta Transportation

Involvement:

Adnan Aamir, P. Eng, Alberta Transportation
Allan Donovan, P.Eng, Alberta Transportation (retired)
Darcy Taylor, P. Eng, Consulting Engineers of Alberta
Des Williamson, P.Eng, Alberta Transportation
Doug Cox, P. Eng, Consulting Engineers of Alberta
John Alexander, P. Eng, Alberta Transportation
Moh Lali, P. Eng, Alberta Transportation (retired)
Ralph Witten, P. Eng, Alberta Transportation (retired)
Robert Quinton, P. Eng, Alberta Transportation
Sheldon Hudson, P.Eng, Consulting Engineers of Alberta
Tamara Soltykevych, P. Eng, Alberta Transportation (previously)
Wing Choy, P. Eng, Alberta Transportation (retired)

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DEFINITION AND BACKGROUND

Design Exceptions (DE) are defined as instances where a designer has chosen or is requested to use a parameter, guideline, principle or product which is different from the currently published standards and/or practices. DEs can be initiated at any stage of a project, and may be initiated by the Consultant or by the Department. DEs accepted at an early stage may be revisited and re-submitted at a later stage if conditions change or new pertinent information becomes available.

The purpose of DEs is to allow for deviations from normal design standards or practices to be made in a thoughtful and consistent way where warranted by the project specific conditions and constraints. This practice allows for innovation, “flexible design” and/or “context sensitive design” to be applied to Alberta highways in a way that gives appropriate consideration to highway safety, risks and mitigation. By following a consistent documented process the Department is aware of common deviations from normal practices and is able to undertake timely reviews of any practices as warranted. This would normally include a review of any effects from the implementation of DEs in the past. The use of a DE process provides a good rationale to support design decisions, which may be useful in the future if the deviation from normal practice is questioned. If there emerges an ongoing recurrence of similar types of Design Exceptions being received, the Department may consider the need to change their standards.

Consultants are encouraged to suggest innovative designs and/or value optimizing adaptations to designs. Examples where flexibility in design has been accepted in the past include:

- Reduced traffic exposure/risk on low volume roads;
- An unconventional barrier layout for intersections near hazards;
- Reduced design speed;
- An unconventional layout to accommodate log haul vehicles at an intersection;
- Median acceleration lanes;
- Stopping sight distance on directional ramps;
- Steep gradients in rolling or mountainous terrain;
- Intersection sight distances and/or stopping sight distances on existing paved roads, etc.

A listing of previously submitted Design Exception summaries is available on the Department’s website at: http://www.transportation.alberta.ca/4921.htm.

Key references for this section include:

- Mitigation Strategies for Design Exceptions, Aug 2007, published by U.S. Department of Transportation, Federal Highway Administration.
- Geometric Design Guide for Canadian Roads, June 2017, published by Transportation Association of Canada.

Concepts, processes and criteria from both of these references have been adopted for use by Alberta Transportation and are reproduced in this Guide

Design Exceptions Triggered by the Department

If the Department triggers a DE, this should be clearly recorded with supporting documentation provided by the Department. The Department may trigger a DE due to a constraint in the budget, schedule, or possibly because the Department is aware of an unconventional solution that should be considered for the project. Therefore, the Department may request unconventional options to be assessed, and/or an option not recommended by the Consultant. The Department should identify contemplated DEs in the Terms of Reference for projects where possible. However, in some cases the need for a DE may not become apparent until later in the process. Some examples of Department-initiated DEs include: using a single lane bridge, deferring construction on an interchange, limiting pavement structure thickness, undertaking a trial project, installing a trial product, allowing overlay of narrow pavement, etc.

KEY DESIGN ELEMENTS FOR DESIGN EXCEPTIONS

It is not practical to evaluate every design detail as a DE. Consequently, Alberta Transportation has chosen 16 principal criteria to be evaluated as they have significance for the operation and safety of a highway. The department may identify additional criteria on particular projects as warranted by the circumstances. The principal criteria are as follows:

- Design Speed
- Lane Width
- Shoulder Width
- Bridge Width
- Horizontal Alignment
- Superelevation
- Vertical Alignment
- Grade
- Stopping Sight Distance
- Intersection Sight Distance
- Cross Slope
- Vertical Clearance
- Lateral Offset to unprotected hazard
- Design Vehicle
- Vulnerable Road User Facilities (width and continuity of trails and sidewalks)
- Access Control

NEED ASSESSMENT OF DESIGN EXCEPTION

DE is not automatically required for every incidence of deviation from normal design standards or practices. The Department's **P**roject **S**ponsor should inform the Subject Matter Experts (SME) in the Department for any proposed deviation from the current standards and guidelines. Based on the initial assessment, SMEs will indicate whether or not a "formal" DE request is required. A list of examples that DE may not be required includes the following items:

- Steeper backslope outside of clear zone due to right of way constraint, requiring no barrier.
- Uses of 90 degree short radius guardrail due to other alternatives being not feasible.
- Pilot projects (for example: Edgeline Rumble Strips) accepted by the department.
- Usage of trial products accepted by the department through the Products List process.
- Non-conventional intersections or interchanges accepted by the department. These may include R-Cut (Restricted crossing U-turn), right in/right out, displace left turn, diverging diamond interchange (DDI), etc.
- Use of 3R/4R sag and crest K values on existing paved roads (instead of new construction values) with acceptable collision historical and/or operational experience.
- For bridge projects, design exceptions need not be completed if the appropriate background and support information is included in the Bridge Conceptual Design Report or the Structure Alternatives Report, and the report is reviewed and accepted by the appropriate SME.

If DE is not required, the Department's Project Sponsor should document the relevant information for future reference. The documentation should include an appropriate level of engineering analysis, evaluation of alternatives, risk assessment, consideration of mitigation strategies and final course of action. The file can be retained with the Project Sponsor and a copy should be provided to the appropriate SMEs. SMEs may require a DE if the documentation is considered worthwhile for a particular project or to support future enhancements to technical standards or practices. Similarly, the Consultant may trigger the need for a DE due to a desire to obtain a more formal acceptance of the deviation from the Department. If a DE is **required**, the Department's Project Sponsor and the Consultant should follow this **Design Exception Guideline** to prepare and submit the formal documentation.

DESIGN EXCEPTION PROCESS

The process to evaluate and document a DE should be thorough and consistent. Figure 1 provides the outline of a good process showing six basic activities, which are explained in the subsections below.

Figure 1 - Design Exception Process

Calculate Estimated Costs and Impacts of Normal Design Standards

A designer or planner should begin by assessing the implications of undertaking a project while meeting normal standards and practices for all of the key design elements. This will provide a benchmark for comparison of any other alternatives that are proposed. The comparison may include agency costs such as the timing and extent of capital costs, operating and rehabilitation costs as well as implications on highway safety, the environment, the local community and the highway network. It is acknowledged that it may not be practical or appropriate to assess all aspects of all Design Exceptions; however, the following should generally be considered and documented:

- Road safety impacts
- Road user costs (including vehicle operating costs, travel time costs etc.)
- Construction costs including right-of-way and utilities
- Deferred rehabilitation costs (the magnitude and timing)
- Sensitivity to context and community values
- Preservation of historical or cultural resources
- Natural environment impacts
- Consistency with the subject highway and the larger network

Develop, Evaluate and Compare Alternatives

It is normal practice to develop a number of alternatives to help in evaluating the implications of adopting a different value for one or more of the key design elements. This will be useful in determining which changes are favourable to achieve the desired effect while minimizing or eliminating any undesirable impacts. This activity, when fully documented, can form the “rationale” to support the decision to accept a DE and therefore is a fundamental component of any DE request. Ideally the AT Benefit Cost Analysis User Guide and Model should be used to evaluate the merits of each alternative and assist in formulating a recommended deviation from standards with minimal adverse effects. If the AT Guide and Model are not practical or necessary as agreed by the Project Sponsor for a particular DE, then the economic argument can be presented in an alternative way however the same economic principles and values should be used. Road safety risks and predicted effects are considered a significant outcome however they should be assessed together with all other outcomes.

Risk Assessment

It is recognised that the inability to provide the usual design standards or follow the usual practices may increase the risk to operations and traffic safety. This is partly because of the possibility of surprising the road user but also because the customary factors of safety built in to the design criteria may be reduced. Designers should assess any proposed DE to gain a better understanding of the risks including the exposure, likelihood and severity. The following aspects should be included in a comprehensive risk assessment:

- Traffic Volumes – higher volumes lead to greater exposure and higher probability of safety incidents and road user costs in general.
- Traffic Composition – the percentage of all types of vehicles should be considered as well as the presence of any special vehicles such as log haul trucks, Long Combination Vehicles and oversized vehicles and loads.
- Posted Speed – lower posted speeds generally reduce the risk, provided there is good compliance.
- Severity of DEs - small deviations are less significant than large deviations.
- Length of the DE – the effects can differ depending on the length over which the DE is applied.
- Multiple DEs – There can be a compounding effect if two or more DEs are applied together.
- Duration of DE – a short-term duration such as a construction season will result in much less traffic exposure than a permanent DE.
- Other Risk Factors – other geometric or environmental factors may affect the severity of the risk.
- Existing Safety – What is the existing safety record over the previous 5 to 10 years?
- Predicted Safety – What is the predicted collision type, frequency and severity for each alternative based on the best available current models calibrated for the location?

Some of the key design criteria are more critical than others and it is generally found that many elements are less critical at lower speeds such as 70 km/h or less. The following observations have been made regarding design criteria in general:

- Vertical grade is not a very critical criterion in the urban environment especially if there is lighting and somewhat lower speeds e.g. 70 km/h or less.
- Vertical curves, especially sag curves, are often found to be less critical.
- Lateral offset to obstruction is often adequately addressed by provision of the standard shoulder width rather than the lateral offset required to obtain full stopping sight distance, provided that suitable roadside barrier protection is used.

Evaluate Mitigation Measures

On projects that include one or more DEs, designers will have a good understanding of the potential risks to safety and operations. Based on this understanding, designers are required to evaluate appropriate mitigation measures to address the risks. Mitigation may include provision of warning, improvement of other features to compensate for the reduction in a particular feature, modification of certain roadside features to lessen the severity of any adverse results or combinations of some or all of the above.

AT has accepted a series of documents under the umbrella of Methods of Reducing Collisions on Alberta Roads (MORCOAR) which can be found on the Department's website using the keyword MORCOAR. Many of the strategies listed under MORCOAR are for general application to highway, road and street design, however, especially in the case of retrofits, many of these strategies may also be used as mitigation measures for DEs. The MORCOAR Phase 2 Final Report contains listings of collision reduction measures for various roadway elements, common traffic management issues, common collision types and vulnerable road users. The suggested context for each type of measure is shown as well as examples of how they can be applied, typical economic returns on the investment and supporting references.

Table 1 shows some possible mitigation measures for each of the 16 key design criteria. Designers may employ other mitigation measures that are not listed in the table.

Table 1 - Key Design Element Mitigation Measures

Design Element	Objective	Potential Mitigation
Design Speed	Reduce 85th percentile speed to design speed.	Gateway treatments; cross-section elements modified
Lane Width and Shoulder Width	Optimize safety and operations by distributing available cross-section width.	Select optimal combination of lane and shoulder width based on site characteristics
	Provide advance warning of lane width reduction.	Signing
	Improve ability to stay within lane.	Recessed pavement markings; centreline rumble strips; painted edgeline rumble strips; recessed lane delineators (cat's eyes)
	Improve ability to recover if vehicle leaves lane.	Shoulder rumble strips; safety edge on pavement
	Reduced crash severity if vehicle leaves the road surface.	Remove-relocate fixed objects; shield fixed objects & steep slopes; use traversable slopes; use crash-worthy or break-away devices on roadside hardware
	Provide space for enforcement or disabled vehicles.	Pull-off areas
Bridge Width	Provide advance warning and delineation of narrow bridge. Improve visibility of narrow bridge, bridge rail and lane lines.	Signing; object markers; reflectors on approach guardrail and bridge rail; post-mounted delineators; high-visibility bridge rail; bridge lighting; enhanced pavement markings
	Maintain pavement on bridge that will provide safe driving conditions.	Skid-resistant pavement; anti-icing systems
	Reduce crash severity if vehicle leaves the roadway.	Crashworthy bridge rail and approach barriers
	Provide space for disabled vehicles or emergencies on long bridges.	Pull-off areas in special cases
	Provides quick response to disabled vehicles or emergencies on long bridges.	Real-time traffic monitoring
Horizontal Alignment and Superelevation	Provide advance warning.	Signing; dynamic curve warning systems; pavement marking messages
	Provide delineation.	Chevrons; reflectors on barrier; post-mounted delineators
	Improve ability to stay within the lane.	Widen the roadway; lighting; skid-resistant pavement; enhanced pavement markings; centreline/shoulder rumble strips; painted edgeline rumble strips
	Improve ability to recover if vehicle leaves the lane.	Shoulder rumble strips; flatter than usual pavement edge and/or sideslopes
	Reduce crash severity if vehicle leaves the roadway.	Remove or relocate fixed objects; traversable slopes; breakaway safety hardware; shield fixed objects and steep slopes
Vertical Alignment and Grade	Provide advance warning.	Signing
	Improve safety and operation for vehicles ascending/descending steep grades.	Climbing lanes; downgrade lanes
	Capture out-of-control vehicles descending steep grades.	Escape lanes
	Improve ability to stay within lane.	Enhance pavement markings; delineators; centreline rumble strips; shoulder rumble strips; painted edgeline rumble strips
	Improve ability to recover if vehicle leaves lane.	Shoulder rumble strips
	Reduce crash severity if vehicle leaves the roadway.	Remove or relocate fixed objects; traversable slopes; breakaway safety hardware; shield fixed objects and steep slopes
	Address drainage on flat grades.	Provide special gradient on ditches; adjust gutter profile on curbed cross-sections
Stopping Sight Distance and Intersection Sight Distance	Mitigate sight distance restrictions.	Signing and speed advisory plaques (crest vertical curves); lighting (sag vertical curves and intersections); cross-section elements to manage speed; adjust placement of lane within the cross-section (horizontal restriction)
	Improve ability to avoid crashes.	Wide shoulders; wider clear recovery area
	Improve driver awareness on approach to intersections.	Advance warning signs; rumble strips in lane on approach to stop or yield condition; dynamic warning signs; larger or additional STOP/YIELD signs; intersection lighting; pavement marking message such as "STOP AHEAD" etc., as warranted
Cross Slope	Provide warning of slick pavement.	Signing
	Improve surface friction.	Chip seal
	Improve drainage.	Chip seal
Vertical Clearance	Advance warning.	Signing
	Reduce impacts with low structures.	Over-height detection systems with flashing lights; alternate routes; large vehicle restrictions
Lateral Offset to Unprotected Hazard	Improve visibility of objects near the roadway.	Delineate objects; lighting
	Improve visibility of the lane lines and shoulder lines.	Enhanced pavement markings
Design Vehicle	Advise drivers of restricted use.	Signing; gateway treatments to restrict height and/or width; consult and agree with other road authorities as needed
Vulnerable Road User Facilities	Advise users of restricted width or discontinuity.	Signing; provide alternate routes
Access Control	Achieve the desirable spacing and geometrics of access for the function of roadway.	Reduce the element of surprise for road users through the use of Gateway Treatments, signing, delineators or other features in advance and at accesses

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Document, Review and Accept or Reject

Documentation should clearly describe the location and nature of the DE. This includes identification of the implications of building within normal standards and practices versus any other alternatives that are considered or recommended. Discussion should include functional aspects, unique context, consideration of alternative solutions, evaluation of risk and exposure to risk. The impacts and effects should be weighed against each other, preferably using analytical tools such as collision prediction models and the Department's Benefit Cost Analysis Model which can be found at: http://www.transportation.alberta.ca/5847.htm. The designer must be able to support the recommended action based on the analysis in the current context. It is critical that the documentation provides a rationale to support the recommendation and identifies appropriate measures to mitigate the potential risks associated with the DE.

AT uses a standardised documentation protocol and decision process (for acceptance or rejection) to provide consistency and repeatability in decisions. Table 2 shows the typical items that should be considered at a minimum. Other items and issues may need to be included depending on the nature of the DE and the context.

Requests may be submitted with the DE form available at: http://www.transportation.alberta.ca/Content/docType233/Production/FormSept2017DesignException.docx . The form is also shown in Figure 2a-b. It can be modified as required to suit the request. Regardless of the format used for the submission, the important thing is that the issues referenced in the process are addressed by the party preparing the DE request.

It is prudent that the proponent of a DE have a dialogue with the appropriate person in TSB and the Project Sponsor in advance to ensure that the submission addresses pertinent issues that the department is aware of (in addition to issues that the consultant is aware of). This step is expected to result in a less onerous and more timely process overall

Note: DE requests may occur at the planning stage. Current information on planning practices in the Department is not readily available for some of the subject areas. Please contact the Executive Director responsible for Planning or the appropriate Regional Director where clarification is needed.

Figure 2a - Example of Design Exception Request Form (1 of 2)

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DESIGN EXCEPTION REQUEST FORM

Date:
Project:
Region:
Project Sponsor:
Consultant:

NOTE: complete, modify and/or provide additional information as required.

Project Stage

( )Functional Planning ( )Preliminary Design ( )Detailed Design ( )Construction
( )Traffic Impact Assessment (development) ( )Access Management ( )Other_____Please specify

Project Type

( )Functional Planning ( )New Construction ( )Reconstruction ( )Paving/Surfacing ( )Bridge
( )Operations ( )Geotechnical ( )Environmental ( )Other_____Please specify

Project Data (typically required for all projects):

Project Description				
Highway No.			Control Section	
Km Posts	From:		To:	
Length of Project				
Chainage (if applicable)	From:		To:	
Chain Direction	South to North		West to East	
Design Designation				
Service Classification				
Basic or Existing Right-of-Way				
Existing Traffic Vol.	AA		ASDT	
Projected Traffic Vol. (years)	AA DT		ASDT	
Design Vehicles			Vehicle Distribution	
Design Speed			Posted Speed	

Example of information required for geometric design:

Cross-Section:	Existing Width		Width after Overlay	
	3R/4R (Suggested Min. Width)		Current Standards	
	Backslope		Sideslope	
	Ditch Width			
Level of Service:	Existing		Projected	
Horz. Alignment	Min. Radii		Proposed Radii	
Vert. Alignment	Min. K Crest Curve		Proposed K Crest Curve	
	Min. K Sag Curve		Proposed K Sag Curve	
	Max Grade		Proposed Grade	
Existing Passing/Climbing Lanes				

Figure 2b - Example of Design Exception Request Form (2 of 2)

Alberta

DESIGN EXCEPTION REQUEST FORM

Collision History (if applicable): (Period Year to Year)

( )Segment ( )Interchange ( )Intersection ( )Bridge ( )Other_____Please specify

Collision Data	Non Animal	Animal	Total
Collison Rate			
Collision Frequency			
Collision Severity Breakdown	# Fatal	# Injury	# PDO
Other (Type): Please specify			

Other Criteria - Please Specify

Details and Supporting Documentation of Design Exception

Provide drawings, analysis, evaluations, cost estimates, rationale, justification, mitigation, etc. and supporting documentation as required.

Accepted:

Executive Director of Technical Services Branch/Date

Table 2 - Design Exception Documentation

Category	Details
Basic Information	• A description and details of the project including the type of project (functional planning, new construction, 3R/4R projects, bridge, pavement surfacing, etc.), the location of the project, lengths and limits of the project including the km posts, highway service class, design speed, posted speed, cross-sections, and other improvements to be considered. • Site plans, profiles, sketches, detailed drawings, and/or photographs of the DE and the alternatives considered. • Current and future projected traffic volumes, growth rate, traffic composition, and Turning Movement Diagrams (if applicable).
Design Element(s) and Criteria	• Describe the proposed or planned work(s) requiring a DE, stating the design element(s) to which the DE applies. • The minimum value or range and source of that value. • The proposed value and the degree to which the standard is being modified.
Explanation	• Reasons for the DE • Site constraints (if applicable). • A cost estimate to build to standard versus to the DE, and include cost estimates of alternatives. Use tables, charts and drawings as needed to illustrate impacts. Depending on the economic impact of the proposal on the amount or timing of capital, maintenance, road user or other costs, an economic analysis may be warranted. This is not a mandatory requirement but rather is dependent on the project and the nature of the DE. In many cases a simplified benefit cost analysis may be appropriate. In all cases the principles used should be consistent with the department's Benefit Cost Guide even though use of the Guide's spreadsheet is not mandatory. • A summary of the current standards/practices that are not being followed and what alternatives were considered and evaluated. If the DE has been initiated by the Department, the Department shall provide the supporting rationale. If the Consultant is aware of a better than standard option while doing the assessment or conceptual design, presenting that option (at a high level – minimal detail) is part of the basic expectations of delivery from a skilled, professional partner.
Impacts	• The potential impacts, if any, the exception may have on other standards or practices (e.g. safety and traffic operations). • Implications to future planned improvements to the roadway or corridor that may need to be considered. • A detailed review of the collision history within the project limits. Address and summarize the safety and operational implication and/or collision experience related to the proposed work(s) for the DE. Quantify the substantive safety of the location and how it compares to similar facilities. • Assessment of the exposure and risk with respect to traffic volume, location, severity (predicated and worst case scenario), duration, etc. The evaluation may involve an assessment beyond the project limits. The evaluation may also include a Road Safety Audit (RSA). Normally if an RSA has been completed on a project, this would be submitted together with the DE request. In the event that an RSA has not been done and the Executive Director of Technical Services Branch (TSB) feels it is needed to support the request, an RSA may be required. The performance of an RSA at the DE stage is not the usual practice and can be expected to delay the process beyond the usual response time of three weeks.
Mitigation	• Mitigation measures that were considered (e.g. safety enhancements such as signing, markings, barriers, etc.). • Recommended mitigation measures and any additional operational or maintenance costs associated with them. Include drawings as appropriate. • The effect that mitigation measures are expected to have to address the risks. • Practices implemented in other jurisdictions may be recommended as a potential solution if warranted by the conditions in a particular design.
Supporting Documentation	• Identify any research or other technical resources that were consulted as part of the evaluation process.

Monitor and Evaluate In-Service Performance

Performance of DE locations should be monitored to gauge the effectiveness of mitigation measures and to add to the knowledge about the safety and operational effects of DEs and mitigation measures. Pending a favourable outcome, design standards and practices may be fine-tuned as a result of extensive in-service experience with DEs. Monitoring may be done as part of a special safety assessment program or undertaken as a component of regular highway operations management.

RECOMMENDATION AND ACCEPTANCE

DEs on AT projects are reviewed at a project level and regional office prior to being submitted to Technical Services Branch for a final review and decision (either to accept or reject). The purpose of this process is to ensure independence as well as to provide communication back to Technical Services Branch about pressures to deviate from normal standards and practices.

If a DE request has been prepared and advanced by a consultant to the Region (or other Project Sponsor), the supporting documentation shall be stamped by the appropriate professional in advance of submission to the Department. Depending on the nature of the DE, an appropriate professional may include areas of other practicing disciplines (besides engineering) from other professional associations, societies and/or organizations recognized in the Province of Alberta.

If a DE has been accepted at the planning stage, or through Geometric Assessment, Safety Assessment or Road Safety Audit, the need to revisit that decision at the design stage is to be determined by the Department and would be stated in the Terms of Reference. Planning decisions often warrant a re-visit for various reasons such as: the time elapsed since the planning work was undertaken, evolution of standards and practices, changes in adjacent development and urbanization etc.

In some cases, the Department may request a consultant to prepare a DE. The Department shall provide time constraints and financial constraints if they exist. Examples of those cases will be DEs triggered by funding limitations, unresolved utility issues between the Department and third parties, inadequate right-of-way resulting from unsuccessful expropriation or regulatory requirements. The Consultant has the right to refuse the work if they are uncomfortable with the Department's request.

All requests for DEs must be submitted by the Project Sponsor and the appropriate Regional Director or Executive Director to the Director of Road Geometric Design for acceptance by the Executive Director of TSB. The Executive Director of TSB may forward the DE request to SMEs including Planning (if applicable) to provide an independent review for recommending acceptance or rejection. All recommendations for acceptance by the Project Sponsor, appropriate Executive Director and/or SME(s) shall be submitted and documented by email or cover letter to the Director of Road Geometric Design prior to final acceptance by the Executive Director of TSB.

If the DE is accepted, the acceptance shall be signed off on the DE form by a Professional Engineer representing AT. When the DE is accepted, the Department considers it to be the standard for that element of that particular project.

The Department understands that there may be a change in the risk level when Consultants are working outside of the normal standards and practices. Consequently, the Department is willing to evaluate each DE on a case by case basis. If the DE is accepted, the Province will expressly agree to the deviation from normal standards/practices for that particular instance on that particular project.

The acceptance of all DEs shall be documented for future reference.

Figures 3a-c is an example of a completed AT DE request form for a particular project. This illustrates many of the elements described in Table 2.

Figure 3a - Example of Completed Design Exception Request Form (1 of 3)

Note: Values shown in the example were using standards of the time it was completed. New DE of similar nature will need to use values of present day standards

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DESIGN STANDARDS/PRACTICE EXCEPTION REQUEST SUMMARY

Title: Alignment Study – Maximum Allowable Gradient

Memorandum Date: January 4, 2010
Design Exception Request Date: December 17, 2009
Region: North Central
Approval Status: Approved

Project Location					
Highway	Control Section	At km	From km	To km	Existing AADT
40	26		1.560	5.000	200

Project Type (Mark all that apply with an X)					
Functional Planning:	X	New Construction:	X	Reconstruction:	Paving/Surfacing:
Bridge:		Operations:		Geotechnical:	Environmental:
Other:	Design Designation RAU-211-110 (Interim Stage)				

Project Description

A consultant was retained to conduct a Highway Alignment Study for Highway 40:26, Cadomin Access to the Junction of Hwy 47/ Hwy 40. The purpose of the study was to define the right-of-way requirements and determine the anticipated cost of implementing the improvements.

Summary

A design exception request to increase the maximum allowable gradient to 6.85% for an 860m length of the proposed alignment.

Table A.7 of the AT Highway Design Guide states that the desirable maximum grade for the RAU-211.8-110 and RAU-210-110 highway standards is 5%. Note 7 in Table A.7 states that: "The maximum gradient is site specific and should not be exceeded wherever practical. In situations where costs increase substantially depending on the maximum gradient, an economic analysis should be undertaken to determine the suitable maximum gradient for that section of roadway." The highway is located in mountainous terrain and the Transportation Association of Canada Geometric Design Guide for Canadian Roads Table 2.1.3.1 indicates that a maximum grade of 6% is suitable for RAU-110 roadways in mountainous terrain.

Rationale for Approval/Rejection

- Estimated Construction cost savings of $5.15 million for the proposed 6.85% maximum gradient. An approximate 14% construction cost difference between 6.0% and 6.85% gradients.
- Existing traffic volumes are currently at approximately 200 AADT. The vehicle classification are as follows:
  - Passenger vehicles: 84.0%
  - Recreational vehicles: 3.9%
  - Buses: 1.1%
  - Single unit trucks: 5.3%
  - Tractor trailer combinations: 5.7%.

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Figure 3b - Example of Completed Design Exception Request Form (2 of 3)

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DESIGN STANDARDS/PRACTICE EXCEPTION REQUEST SUMMARY

- Long term road user cost between 6.0% and 6.85% is not significant, less than $3,000 per annum.
  - 6.0% grade: $282,000/annum
  - 6.85% grade: $285,400/annum
- Terrain is mountainous, proposed gradient is consistent with terrain and adjacent highway grades.
- Traffic volume is low, traffic conflicts would be low, predicted collisions are low.
- There is no economic justification (considering road users costs and safety costs over the life of the highway) for spending the additional capital cost ($5 million) to achieve the 6% grade.

Additional Mitigation Required
No mitigation is required other than posting "steep grade warning signs".

Key Words
Design grade, maximum gradient, vertical alignment, climbing lane

Photograph/Diagram (If Available)

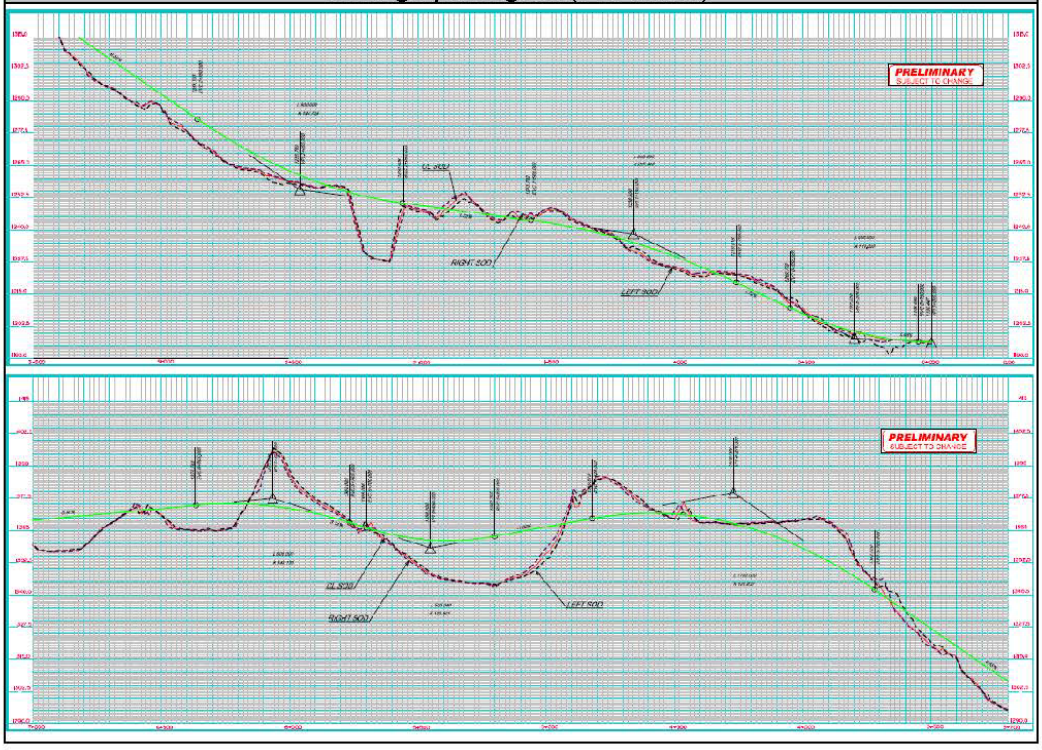

Figure 3c - Example of Completed Design Exception Request Form (3 of 3)

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DESIGN STANDARDS/PRACTICE EXCEPTION REQUEST SUMMARY

Photograph / Diagram (If Available)

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APPEAL PROCESS (BETWEEN CONSULTANT AND DEPARTMENT)

If the Consultant is in disagreement with the DE as requested by the Department, they may appeal to the Department in a process as follows:

- Communicate to the Project Sponsor (typically the Region) the rationale/justification for the disagreement with the DE.
- The Project Sponsor shall set up an appeal meeting with the Consultant and representatives from TSB and/or Planning, whichever is applicable. The purpose of the meeting will be to discuss the concerns of all parties involved, and to establish a joint solution that is generally agreeable to all, subject to fiscal and time constraints. The meeting shall be recorded and the minutes shall be provided as supporting documentation to facilitate the acceptance process of the DE. If an agreement cannot be reached in the appeal meeting, the decision may be elevated to the Executive Director of TSB. Alternately, the Consultant may choose not to proceed with the project, or the Department may choose to remove the work in question from the overall scope of the project; in both cases another party will have to be solicited to perform the unfinished work.
- If an agreement is reached, proceed with the solution established at the appeal meeting, providing all required documentation as per the usual DE request process (including the minutes from the appeal meeting).

TIMEFRAME FOR RESPONSE

If the DE application is fully documented (including a rationale, drawings, risk analysis etc. as applicable), the normal timeframe for response from TSB is three weeks. In the interest of getting a timely response, it is prudent for the Consultant or Project Sponsor to engage in initial discussions with TSB on the concept and clarification of required information prior to the formal submission.

DISPUTE RESOLUTION (INTERNAL TO THE DEPARTMENT)

In the event that an agreement cannot be reached between the Executive Director, TSB, and the sponsoring Executive Director on the DE, then it may be elevated to the Assistant Deputy Minister (ADM) of Transportation Services (TS) for a final decision.

All requests must be fully documented (including the decision of the Executive Director, TSB) and submitted by the sponsoring Executive Director to the ADM of TS. The Executive Director, TSB should be copied on the request.