

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:	<input checked="" type="checkbox"/>	New Construction:	<input checked="" type="checkbox"/>
Reconstruction:		Paving/Surfacing:	
Bridge:		Geotechnical:	
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%.

- 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)

