APPROACH ROAD INSPECTION AND RATING

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Introduction

- Approach road is the road leading up to the bridge or culvert
- Basic rule is alignment OVER is rated in Approach Road section and Alignment UNDER is rated in Grade Separation or Channel section
- For purpose of this presentation – not road under bridge or through culvert – covered in GS
- For culverts it includes the road fill over the culvert
- Considerations for rating
  - Geometric alignment at the bridge site
  - Condition of approach fill
  - Inventory and condition of guardrails on approaches
  - Drainage on approaches to bridge

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Road Use

Roads are used by:

- People with reduced abilities
- People who just got licensed or new to driving
- Inattentive drivers
- Dangerous / erratic drivers
- Drivers unfamiliar with the area
- Vehicles/Tires in poor condition
- All of these factors have to be accommodated by the approach road alignment.

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Approach Road Section - Bridges

Approach Road				
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				
Roadway Width (m)				
Approach Bump				
Guardrail (Y/N)				
Guardrail				
Length (m)				
Current Standard (Y/N)				
Termination Type				
Drainage				
Approach Road General Rating				

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Approach Road Section - Culverts

Approach Road / Embankment				
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				
Roadway Width (m)				
Embankment				
Sideslope (_:1)				
(Height of Cover)m) :)				
Guardrail (Y/N)				
Approach Road / Embankment General Rating				

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Alignment

Approach Road / Embankment				
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				

- Separate ratings are provided for horizontal and vertical alignments
- Defects in alignment must be categorized in either the horizontal or vertical components
- Inspector should consider road alignments are used during adverse weather or road conditions – e.g. fog, heavy rain, snow, un-gravelled surfaces, icy roads

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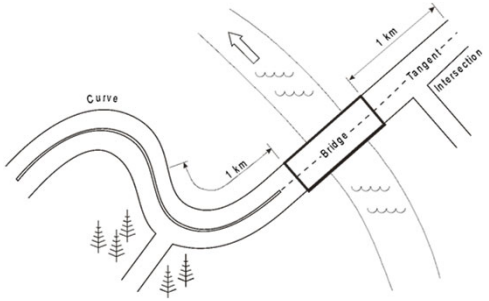
Length of Approach



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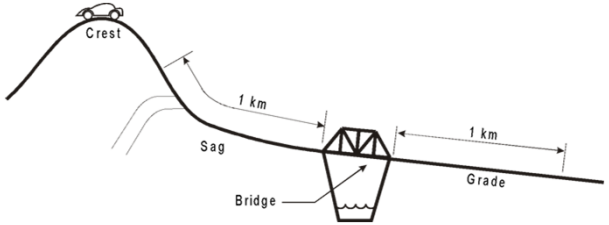
Length of Approach



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Alignment

- Design speed is the posted legal speed for road plus 10 kph
- Evaluate by driving legal speed limit - if safe to do so and conditions permit.
- Observe sight distances
- Note if bridge is super-elevated
- Note presence of speed limit or other signs
  - Sharp curve
  - Steep hill
  - Intersection ahead
    - Could indicate sight distance problem

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Horizontal Alignment

- Horizontal defects result in a reduction in speed to drive the road safely. They include:
  - Reduced visibility – trees, buildings, embankments
  - Sharp corners
  - Intersecting or access roads
  - Bridge is at beginning of or in curve
  - Bridge is offset from straight alignment
  - Limited sight distance for passing safely

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Horizontal Alignment Ratings

- Note presence and record location of intersections or access roads including residential or commercial (field accesses do not affect rating).
  - Rate 7 or less depending on visibility, traffic volume and traffic type.
  - Rating may be 8 or 9 if on tangent and no intersections within 1km
- If horizontal defect is cause of reduced speed, then rate:
  - 6 or more if driven safely at legal speed limit
  - 5 can be driven safely and posted not more than 20 km/hr below legal speed limit
  - 4 or less if posted more than 20 km/hr below the legal speed limit
  - 4 or less if sharp or blind curves
  - 5 if Land Access bridge and appropriate warning signs are in place
- Rate 2 if combined effect of horizontal and vertical alignment is hazardous (e.g. very steep hill combined with sharp hair-pin curve)

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Vertical Alignment

- Vertical alignment defects result in a reduction in speed to drive the road safely. They include:
  - Reduced visibility – crests
  - Steep grades (take into consideration road surface e.g. loose gravel)
  - Adequate sight distance for stopping or passing
  - Intersecting roads

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Vertical Alignment Rating

- Vertical alignment with a straight grade of 1% or less - rate 9
- If road can be driven safely at legal speed limit rate 6 or more
- If road can be safely driven and posted not more than 20 km/hr below legal rate 5
- Rate 4 or less if:
  - posted more than 20 km/hr below posted speed
  - sight distance is less than required
  - Steep grades, blind crest curves
- Rate 2 if combined effect of horizontal and vertical alignment is hazardous (e.g. very steep hill combined with sharp hair-pin curve)
- Rate 5 if Land Access bridge

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Alignment – Vertical And Horizontal

- For land access structures:
  - Road services land only, not residential access, minimal traffic
  - Appropriate warning signs in place
  - Previous rating guidelines do not apply – rate 5
- Alignment of railway, pedestrian and animal overpasses, and utility structures crossing over top are rated X
- If both Horizontal and Vertical alignments rated X, General Rating is rated 5.
  - Pedestrian bridges over streams/watercourse or roadways
  - Grade Separation - Wildlife crossing over top of roadway
  - Grade Separation - Railway crossing over roadway

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Culvert Grade Separation – Wildlife Over

Horizontal & Vertical Approach Road Alignment Rated X so Gen. Rating = 5

Approach Road / Embankment				
		Last	Now	Explanation of Condition
Horizontal Alignment			X	Wildlife overpass over Hwy. 1
Vertical Alignment			X	
Roadway Width (m)	6.3			
Embankment			7	
Sideslope (___:1)	10.0			
(Height of Cover(m) :)	1.9			
Guardrail (Y/N)	Y			Safety/guide fencing both sides over Hwy. 1.
Approach Road / Embankment General Rating			5	

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Culvert Grade Separation - Wildlife Overpass

Vertical & Horizontal Road Alignment OVER Rated X, Gen. Rating = 5

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Pedestrian Bridge – Stream Under

Horizontal & Vertical Approach Road Alignment Rated X – Gen. Rating =5

Approach Road				
		Last	Now	Explanation of Condition
Horizontal Alignment			X	Pedestrian bridge over Bluerock Creek in Canmore Nordic Centre
Vertical Alignment			X	
Roadway Width (m)	3.3			Gravel trail.
Approach Bump			5	
Guardrail (Y/N)	N			
Guardrail			X	
Length (m)				
Current Standard (Y/N)				
Termination Type				
Drainage			7	
Approach Road General Rating			5	

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Roadway Width

Approach Road / Embankment				
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				
Roadway Width (m)				

- This is the width of the traveled lanes and shoulders
- Do not include median width if present on approach road
- If curbs on the approach road, measure between faces
- Measure at a representative cross-section
- Record minimum width to the nearest 0.1m if different between ends
- Provide explanation if different on each side of structure

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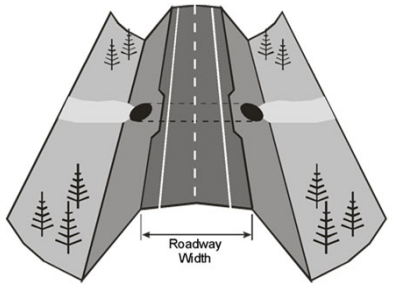
Roadway Width



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Approach Bump

	Approach Road		
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Approach Bump			

- Bridges only
- Refers to the smoothness of the transition onto the structure
- Severe bump
  - Can be hazard to traffic (2 or less)
  - Can lead to increased impact loading on structure (4 or maybe 3 or less)

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Approach Bump

- May be a symptom of
  - Settlement of the approach fill
  - Instability of the fill (slumping)
  - Undermining of fill by water
  - Settlement of or damage to approach slab
- Drive over at legal speed if safe – or at safest speed that conditions allow
- Observe traffic crossing structure
- If no defects and smooth transition rate 9
- If bump is noticeable but tolerable - rate 5
- If speed must be reduced - rate 4 or less
- If causing significant impact loading on bridge deck – rate 3 or less
- If hazardous to traffic - rate 2 or less

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Guardrail

	Approach Road		
	Last	Now	Explanation of Condition
Horizontal Alignment			
Vertical Alignment			
Roadway Width (m)			
Approach Bump			
Guardrail (Y/N)			
Guardrail			
Length (m)			
Current Standard (Y/N)			
Termination Type			

- Refers to guardrail or other traffic barrier along edges of the approach road
- Purpose:
  - Prevent traffic from leaving the roadway at the structure
  - Prevent traffic from impacting structure

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Guardrail - Culverts

- Rating is not required
- Record the presence of guardrail by **Yes** or **No**
- Provide comment if guardrail is on one shoulder only
- Guardrail that is too short or is otherwise ineffective – provide comment and maintenance recommendation
- Provide comment and maintenance recommendation if missing and is required for safety
- Note defects (e.g. - broken posts, damaged rails) and provide comment and maintenance recommendation
- ***No*** indicates no guardrail

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Guardrails - Bridges

- Record the presence of guardrail by **Yes** or **No**
- Record the minimum length to the nearest meter
  - Comment/Explain if different lengths exist
- Maximum is 99 m
- Record the type of termination
  - Common type is Turned Down End, Wing End, Attenuator, Fleat
- Built based on current Standard Drawings
- Since 2001 most common S1643, 1649, 1651, 1652, 1653, and S1705 (newest)
- Record if the guardrail meets current standards (Yes/No)
  - Explain if "No"
  - Common acceptable explanation is "Not thriebeam" or "Not attenuator"
- HTCB is currently preferred standard and may transition with W-beam
- https://www.alberta.ca/assets/documents/trans-bridge-barrier-drawings.pdf

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Guardrails - Bridges

- Inspect up to 20 m from bridge
- Inspect all components of guardrail
  - Posts
  - Rail or Cable if HTCB
  - Connections
  - Splices
  - Termination (if within 20 m). Comment is more than one type
- Rate according to condition only - not standard
  - e.g. do not down-rate if not built to current standard. Rate condition and functionality
  - E.g. W-beam 550mm road top to center – down-rate if too low or high to function

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Guardrails - Bridges

- Inspect up to 20 m from bridge
- Inspect all components of guardrail
  - Posts
  - Rail
  - Connections
  - Splices
  - Termination (if within 20 m)
- Rate according to condition only - not standard
- Minor damage but still functional – rate 5
- Missing bolts or improper laps - 4 or less
- Damaged - requires replacement – rate 3 or less
- Damaged – potential hazard – rate 2 or less
- Rate "X" if no guardrail exists
  - If required, comment and recommendation

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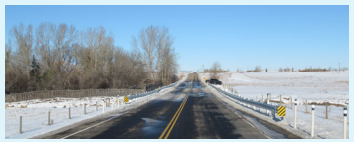
Guardrails – RDG-B1.5

- New W-Beam guardrail installed with Fleat 350 Energy Absorbing Terminals
- By design, the 3rd post from the Fleat 350 Terminal is left unbolted from the rail. Does not affect the guardrail rating.



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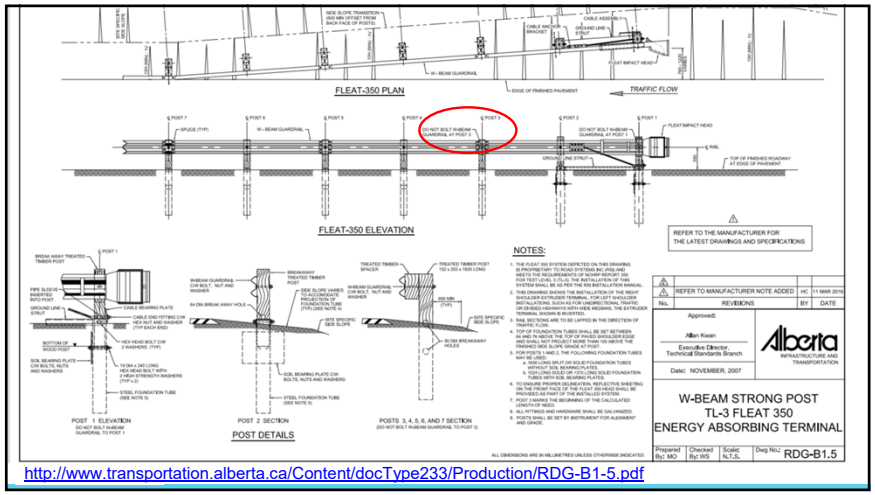

http://www.transportation.alberta.ca/Content/docType233/Production/RDG-B1-5.pdf

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Drainage

- Applies to bridges only
- Refers to the ability of the approaches to handle drainage
  - Must not allow water to drain onto structure
  - Must not allow damage to fills or headslopes
  - Must not pond on approaches
- Includes drain troughs on approaches
- Water may originate from
  - Precipitation onto approaches
  - Runoff from roadway
  - Runoff from structure

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Drainage

- Look for:
  - Ponding of water on approaches or ends of structure
  - Erosion of fills, road embankment, headslope or ditches
  - Voids under approach slabs or abutments
  - Undermining of drain troughs
  - Damage or deterioration of drain troughs

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Drainage

- Good drainage away from bridge – rate 5 or more
- Drainage onto bridge gutters - rate 4 or less
- Drainage onto bridge driving lanes-rate 3 or less
- Drainage eroding headslope or sideslope – rate 4 or less
- Erosion from approach road ditch drainage – rate 4 or less
- Drainage causing a hazard - rate 2 or less (e.g. ponding or icing into travel lanes)

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Embankment

		Approach Road / Embankment		
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				
Roadway Width (m)				
Embankment				
Sideslope (_:1)				

- Applies to culverts only
- Rates the stability of the road embankment at the culvert and the effects on:
  - traffic
  - structural and functional integrity of the culvert
- Evaluates:
  - roadway surface
  - Side slopes
  - transitions at ends of culvert

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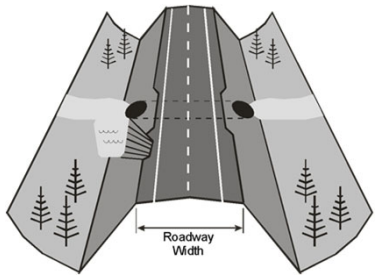
Embankment – Culvert Approach Road



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Embankment

Refers to Culvert Approach Roads

- Look for:
  - cracks or other evidence of instability
  - signs of erosion such as gullying on sideslopes
  - scour at toes of sideslopes or end transitions
- Embankments with no instability or scour/erosion - rate 7 or better
- Embankments with erosion problems - rate 4 or less
- Unstable embankments causing damage to the culvert - rate 3 or less
- Unstable embankments affecting roadway - rate 3 or less

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Sideslopes

- Not rated
- Estimate or measure the slope of the sideslope (h:v)
- Record steeper of upstream or downstream sideslope
- If berms or different slopes on the same side, record steepest slope
  - Do not record average slope
- Explain if sideslopes are irregular
  - varying slopes
  - benches or berms
  - different slopes on each sideslope

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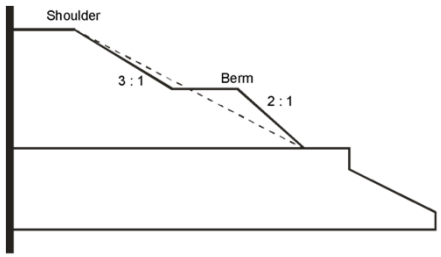
Sideslopes



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Height of Cover

Approach Road / Embankment				
		Last	Now	Explanation of Condition
Horizontal Alignment				
Vertical Alignment				
Roadway Width (m)				
Embankment				
Sideslope (_:1)				
(Height of Cover)m) :)				
Guardrail (Y/N)				
Approach Road / Embankment General Rating				

- Inventory item (grey box on form). Record if blank, revise if incorrect.
- The vertical distance between top of roadway at centerline and top of the culvert at the upstream end
- Need to be accurate, especially for low covers
  - Live load effects are greater
- Record to the nearest 0.1m

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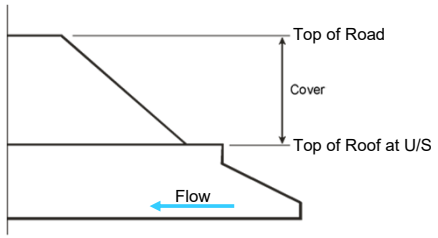
Height of Cover



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General Rating

Refer to 1.10. 1 and 6.8 (Bridges)

Refer to 1.10.6 and 13.4.6 (Culverts)

- Governing Elements
  - Horizontal alignment
  - Vertical alignment
  - Safety Concerns (severe approach bump)
  - Potential hazards (Drainage causing ponding/icing
  - Embankment rating of 3 or less (Culverts)
  - Guardrail that is damaged resulting in a hazard (i.e. missing sections)
- No approach rails but hazardous governs the General Rating (rate 2)
- Horizontal and Vertical alignment rated X – General rating is 5

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