

GRADE SEPARATION INSPECTION & RATING



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Grade Separation Form

- For purpose of this presentation does not apply to road alignment above – road alignment and other elements rated in Approach Road section
- Basic rule is alignment OVER is rated in Approach Road section and Alignment UNDER is rated in Grade Separation or Channel section
- Applies to bridges with traffic going under and culverts going through
- Applies to Animal, Pedestrian or Railway Underpass structures
- Replaces channel section
- Has items specific to under/overpass rather than channels
- Generated automatically
- Can be requested for blank forms (select GS instead of Channel)

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Grade Separation Form

- Refer to Chapter 10 in BIM Manual for Bridge Grade Separations
- Refer to Chapter 13 – Section 13.8 for Culvert Grade Separations

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Grade Separation Form

- Generated from BIS for following usage types:
 - **GS** - vehicle grade separation
 - **PS** - pedestrian grade separation
 - **SP** - wildlife or cattlepass
 - **RO** - railway overpass
 - **RU** - railway underpass
 - All types above can be either bridge or culvert Grade Separation

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Grade Separation - Road Alignment Under

- The Grade Separation section is different for bridges and culverts
- Refers to H & V road alignment passing under Bridge Grade Separations or through Culvert Grade Separations
- Includes road surface condition for bridge GS
- Road surface given separate rating for culvert GS
- Does not refer to road above (rated in Approach Road section)

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Road Alignment - Rating

Inspection and rating considerations include:

- Evaluating Horizontal Vertical alignment for 1 km each direction, then summarized in a single Road Alignment rating
- vertical and horizontal alignment that may contribute to damage to the bridge
- look for indications of reduced vertical clearance
- Bridge GS includes condition of road that may lead to damage of the bridge
- Railway, pedestrian / stock / animal passes and utilities alignments are rated "X"
If alignment can be safely driven at legal or posted speed limit rate 5 or more.

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Grade Separation - Bridge

- The grade separation section of the BIM inspection form replaces the channel section for structures that are not over streams.
- Grade Separation Section for a bridge:

	Structure Usage		Explanation of Condition
	Last	Now	
Grade Separation			
Road Alignment	7	7	
Traffic Safety Features	8	8	HTCB at median.
Type	Cable barrier		
Slope Protection (Type : CONCRETE; CONCRETE)	4	4	Minor scaling and delam at SE from deck drainage. Gap at NE allowing drainage to undermine.
Bank Stability	8	7	
Drainage	7	7	
Grade Separation General Rating	7	7	

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Bridge Grade Separation – Road Under Grade Separation Road Alignment (rating road under)



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Bridge Grade Separation – Road Under

Grade Separation Road Alignment (rating road under)



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Grade Separation - Culvert

Grade Separation Section for a culvert carrying vehicles:

		Structure Usage		
		Last	Now	Explanation of Condition
Grade Separation				
Road Alignment		5	5	Curves at both ends
Roadway Surface		7	7	6m road through structure one-way N/B.
(Type : ACP)				
Icing (Y/N)	No			
Traffic Safety Features				
Type	Parapets	7	7	
Lighting		4	4	1 light burnt out in mid barrel.
Barrel Leakage (Y/N)	No			
Drainage		7	7	
Structure In Use (Y/N)	Yes			
Grade Separation General Rating		4	4	

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Culvert Grade Separation

Grade Separation Road Alignment (rating road under)



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Culvert Grade Separation

Grade Separation Road alignment (rating road under)



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Bridge or Culvert Grade Separation Pedestrian, Animal, Railroad Underpass

- Refers to Pedestrian, Animal, or Railway underpasses under the Bridge or Culvert Grade Separation
- In these instances, Road Alignment is rated "X".

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Culvert Grade Separation Form

Wildlife, Cattle, Pedestrian - Road Alignment UNDER Rated X

Culvert Section—Chapter 13 Section 13.8

	Structure Usage		Explanation of Condition
	Last	Now	
Grade Separation			
Road Alignment	X	X	
Roadway Surface (Type - SOIL)	6	6	
Icing (Y/N)	No		
Traffic Safety Features Type	None		
Lighting	X	X	
Barrel Leakage (Y/N)	No		
Drainage	4	4	Average 150mm water and ice in pipe.
Structure In Use (Y/N)	No		Fencing is down.
Grade Separation General Rating	4	4	

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Culvert Grade Separation – Pedestrian

Grade Separation Road Alignment UNDER Rated X



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Grade Separation BP – Animal Underpass

Grade Separation Road Alignment UNDER Rated X



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Grade Separation TT – Animal Underpass

Grade Separation Road Alignment UNDER Rated X



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Grade Separation TT – Animal Underpass

Grade Separation Road Alignment UNDER Rated X



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Bridge Grade Separation Form

Wildlife, Cattle, Pedestrian - Road Alignment UNDER Rated X

Bridge Section-Chapter 10

	Structure Usage		Explanation of Condition
	Last	Now	
Grade Separation			
Road Alignment	X	X	Animal underpass
Traffic Safety Features	X	X	
Type	None		
Slope Protection (Type : NATURAL; NATURAL)	7	7	Some Cl.1 and 2.
Bank Stability	7	7	
Drainage	7	7	
Grade Separation General Rating	7	7	

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Bridge Grade Separation – Wildlife Underpass

Grade Separation Road Alignment UNDER Rated X



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Bridge Grade Separation – Pedestrian Underpass

Grade Separation Road Alignment UNDER Rated X



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Bridge Grade Separation - RXR UNDER

Rail Alignment UNDER Rated X

Grade Separation	Structure Usage		Explanation of Condition
	Last	Now	
Road Alignment	X	X	Railroad.
Traffic Safety Features	X	X	
Type	None		
Slope Protection	7	7	
(Type - CONCRETE; CONCRETE)			
Bank Stability	7	7	
Drainage	7	7	
Grade Separation General Rating	7	7	

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Grade Separation – Railroad Overpass

Rail Alignment Rated X



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Culvert Grade Separation – RxR Underpass

Rail Alignment UNDER Rated X

Grade Separation	Structure Usage		Explanation of Condition
	Last	Now	
Road Alignment	X	X	Railway.
Roadway Surface	7	7	
(Type - GRAVEL)			
Icing (Y/N)	No		
Traffic Safety Features	X	X	
Type			
Lighting	X	X	
Barrel Leakage (Y/N)	Yes		Leakage at both sidewalls and roof of rings 15-20.
Drainage	7	7	
Structure In Use (Y/N)	No		Appears to be pedestrian use only.
Grade Separation General Rating	7	7	

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Grade Separation – Culvert RXR Underpass

Rail Alignment Rated X



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Bridge or Culvert Grade Separation Pedestrian, Animal, Railroad Overpass

- Refers to Pedestrian, Animal, Utility or RxR overpasses over top of roadway
- Road alignment under is rated in Grade Separation section
- Road alignment over is rated in Approach Road section
- In these instances, both Horizontal and Vertical Road Alignment is rated "X"
- Results in General Rating of 5
- Refer to Sections 1.10.1 and 1.10.6

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Bridge or Culvert Grade Separation Form

Wildlife Overpass – Horizontal & Vertical Alignment Rated X

Bridge Section Chapter 10.3 Culvert Section Chapter 13 Section 13.8

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) are Rated X so Gen. Rating = 5



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Bridge Grade Separation Form – RxR Overpass Rail Alignment OVER Rated X

Bridge Section Chapter 10.3 Culvert Section Chapter 13 Section 13.8

Approach Road			
	Last	Now	Explanation of Condition
Horizontal Alignment		X	Railway crossing over top of Hwy. 3.
Vertical Alignment		X	
Roadway Width (m)	3.6		
Approach Bump		X	
Guardrail (Y/N)	Y		Steel tube posts and rail along both sides.
Guardrail		7	
Length (m)	33.0		
Current Standard (Y/N)	N		Sheet metal ballast sheilds 1m high along both sides to contain ballast.
Termination Type	NONE		
Drainage			5
Approach Road General Rating			5

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Bridge Grade Separation – RXR Overpass (Cl. A)

Horizontal and Vertical Alignment of Railway (OVER) Rated X so Gen. Rating = 5



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Roadway Surface

- Refers to Culvert Grade Separations and Animal/Pedestrian Underpasses
- Purpose is to provide a surface for traffic usage
 - Smooth surface
 - No holes, depressions or projections
 - Not slippery
- Record type of surface
 - Asphalt
 - Concrete
 - Gravel
 - Soil
- Look for defects that might affect high-load vehicles
- Defects that create hazards to traffic or pedestrians
- Record the presence of icing on the roadway or barrel Y/N – comment if Yes. May affect Drainage rating.
- If defects a problem for stock/traffic, rate 4 or less
- If hazardous, rate 2 or less (holes, projections, icing on traffic or pedestrian surfaces)

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Traffic Safety Features

- Refers to curbs, medians, guardrails, attenuators, high tension cable barriers, advance warning signs, vertical clearance signs, crash protection/attenuators
- Inspect 20 m each direction of guardrails, barriers, HTCB
- Not applicable for stock underpasses
- Indicate type and rate condition and functionality
- If not present record type as “None” and rate “X”

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Traffic Safety Features

Inspection and rating considerations for safety features are as follows:

- do not rate standard of safety feature, rate functionality and condition as per original design
- rating includes all components of the safety feature, including connections
- if elements are missing but there is evidence that they were previously there, then rate “4” or less
- use “explanation of condition” to further describe features or to indicate concerns, maintenance required, etc.

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Slope Protection

- Refers to protection system on headslopes of bridges to prevent erosion
- Look for:
 - evidence of settlement
 - cracked, broken or bulging concrete protection
 - Deck drainage away from system
 - voids under concrete slabs
- Note graffiti
- Rate 4 or less for:
 - Significant settlement or moving downwards
 - Significant heaving or cracking of concrete slope protection
 - Voids under concrete slope protection
 - Any maintenance required

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Bank Stability

Refers to stability of bridge headslopes

- Look for:
 - damage or displacement
 - settlement at abutment and piers
 - bulging at toe of slope
 - loss of material at toe of slope
 - wet or slumping areas

Rate 4 or less if:

- Settled and exposing underside of abutment seat
- Instability that affects the Substructure or Superstructure
- Instability requiring monitoring

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Drainage

Refers to the ability to dispose of water at:

- Toe of headslopes and transitions on bridges
- Roadway surface from Culvert Grade Separations
- Ends and barrel of Pedestrian or Animal underpasses
 - Typ. water sources are deck and approach road drainage, ditch drainage, and weep holes.
 - Some underpasses are also designed for water flow
 - See “Special Comments for Next Inspection”

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Drainage – Bridge or Culvert GS

On Bridge or Culvert Grade Separations handling vehicle traffic look for:

- Ponding at toe of headslopes and transitions or inside culverts
- Blockage of existing drainage systems
- Damage to embankments
- Record "Yes" if barrel leakage – comment

Ratings:

- If functioning and no damage to slope protection, embankments and no bank instability rate 5 or more
- If damage or slope instability rate 4 or less
- Drainage causing ponding, icing on travel lanes & potential hazard rate 2 or less
- Abutment scour/erosion and pier scour rated X on Bridge Grade Separations

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Bridge Grade Separation – Poor Drainage



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Bridge Grade Separation – Poor Drainage



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Bridge Grade Separation – Poor Drainage



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Bridge Grade Separation – Poor Drainage



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Drainage – Ped/Animal Underpass

On Pedestrian/Animal Underpasses look for:

- Ponding in culvert barrel or at ends
- Any condition contributing to icing
- Damage to sideslopes or embankments

Record "Yes" if barrel leakage and provide comment. Rating is not required but if "Yes" leakage may effect rating of Roadway surface and Drainage

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Ratings:

- Functioning, no damage to sideslope or embankment rate 5 or more
- If poor drainage causes icing or ponding around animal underpasses rate 4 or less
- If drainage causes ponding or icing and potential hazard on pedestrian underpass 2 or less

Animal Underpass – Other Drainage Considerations

- Normally the following are not applicable (rate "X")
 - scour and scour protection at ends
 - fish passage in barrel
 - waterway adequacy in barrel
- If designed to also handle water flow
 - Note in "Special Comments for Next Inspection" (This culvert also handles drainage. 05/06/2016)
 - Inspect and provide ratings for:
 - scour and scour protection at ends
 - fish passage
 - waterway adequacy

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Animal Underpass – Handles Drainage



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Lighting

- Refers to lighting in culvert grade separations and pedestrian underpasses
- Not applicable for stock underpasses - rate X
- If lighting does not exist but in opinion of inspector is required rate X and provide comment and recommendation
- Minor damage that does not affect operation or functionality rate 5
- Defects affecting operation and functionality rate 4 or less

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Structure In Use

- Refers to whether the Stock underpass is used for it's intended purpose
- Indicate "In Use" by Yes or No
- If there is evidence the structure is no longer in service, then circle "N" and make a note in the "explanation of condition" regarding the circumstances (e.g. guide fence is down)
- Provide comment/explanation if "No" (e.g. guide fencing is down)

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General Rating – Grade Separations – Road Under

- Governing Elements – (refer to 1.10.5 and 10.7 (Bridges), 1.10.10 and 13.8.7 (Culverts)).
 - Road Alignment rating
 - Roadway Surface rating (Culvert GS only)
 - Traffic Safety Features rating (except improperly lapped guardrail)
 - Bank Stability rating of 4 or less
 - Drainage rating

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Sample Completed Form Grade Separation – Road Under

	Structure Usage		Explanation of Condition
	Last	Now	
Grade Separation			
Road Alignment	7	7	
Traffic Safety Features	4	4	1 damaged post at W.B median and wrong lap at NW.
Type	GUARDRAIL		
Slope Protection (Type : CONCRETE; CONCRETE)	4	4	Broken around pier columns-200mm at North & 120 mm at South. Settled 100mm at North top sections. Sealed, in some areas, open gaps in others.
Bank Stability	5	5	
Drainage	5	4	Ponding water at west toe of headslope - not affecting driving lanes.
Grade Separation General Rating	4	4	

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General Rating – Animal or Pedestrian Underpasses

- Governing Elements – (refer to 1.10.10 and 13.8.7)
 - Road Surface rating
 - Drainage rating

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Sample Completed Form Animal Under Pass

		Structure Usage		Explanation of Condition
		Last	Now	
Grade Separation				
Road Alignment		X	X	
Roadway Surface (Type - SOIL)		6	6	
long (Y/N)	No			
Traffic Safety Features Type	None	X	X	
Lighting				
Barrel Leakage (Y/N)	No			
Drainage		4	4	Average 150mm water and ice in pipe.
Structure In Use (Y/N)	No			Fencing is down.
Grade Separation General Rating		4	4	

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Alberta Infrastructure and Transportation Extranet

https://extranet.infra.gov.ab.ca/infra_login.html

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Questions?



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