Ministry of Forests, Lands, Natural Resource Operations and Rural Development

BRITISH COLUMBIA

Rural Opportunities, Tenures and Engineering Division

Engineering Branch

Guidance for Selecting Bridge Guardrail Containment Level and Determining Need for Bridge Approach Barriers on FSRs

This document provides guidance for Professional Engineers for determining:

- the bridge guardrail containment level (CL-1, CL-2, and CL-3) for new and replacement Forest Service road (FSR) bridges, and
- the need to install bridge approach barriers and establishing the priorities for their installation.

1.0 Guidance on Selecting Bridge Guardrail Containment Level for New Bridges

The bridge guardrail containment level (CL-1, CL-2, and CL-3) on new and replacement Forest Service road (FSR) bridges can be selected on the basis of the site specific bridge characteristics listed in column 2 of attached Table 1. These bridge characteristics were summarized and adapted from two ministry reports: *Phase III – Guideline for Barrier Selection and Design* dated August 2011[1] and *Bridge Approach Barriers on Forest Service Roads – January 2016*.[2]

The bridge characteristics include: (1) traffic mix and level of pedestrian use; (2) bridge deck height (or height of approach); (3) design vehicle speed; (4) bridge deck width (with consideration of approach roadway width relative to bridge deck width); and (5) approach road curvature.

The responsible Professional Engineer can adjust the recommended bridge guardrail containment levels for new bridges shown in Table 1 if it is determined that a lower or higher bridge guardrail containment level is appropriate for the bridge site. The Professional Engineer should document the rationale for any deviation from the guidance provided in Table 1.

2.0 Guidance on Determining Need for Bridge Approach Barriers for New and Existing Bridges

Where needed, bridge approach barriers (BABs) should provide a smooth transition from the approach road onto the bridge. The intent of BABs is to keep errant light vehicle traffic from sudden impacts and to assist those vehicles in maintaining direction of travel onto the bridge deck.

BABs are part of the total bridge barrier system. As shown in column 3 of Table 1, determining the need to install BABs should consider the selected or existing bridge guardrail containment level, and the results of an assessment of bridge characteristics, site specific hazards (e.g., approach road geometry and roadway height above the watercourse), extent of hazard zones, and level of risk to public safety.

The standard to which BABs are installed is left to the judgement of the responsible Professional Engineer. For additional information on types of bridge approach barriers, refer to the ministry document, "Considerations for Use of Ministry Standard Designs - STD-EC-010-05 and STD-EC-010-17 to 22- Bridge Approach Barriers for FSR Bridges." https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/resource-roads/bridge-design-construction/bridge_approach_barrier_considerations.pdf

[1] FLNRORD "Guideline for Barrier Selection and Design" (2011) by Associated Engineering Ltd.

[2] FLNRORD "Bridge Approach Barriers on FSRs" (2016) by Gary McClelland, PEng

Table 1

Guidance for Selecting Bridge Guardrail Containment Level and Determining Need for Bridge Approach Barriers on FSRs

(Column 1) Recommended Bridge Guardrail Containment Level for New and Replacement Bridges Based on Column 2*	(Column 2) Displayed Bridge Characteristics on New and Replacement Bridges	(Column 3) Determining Need and Priorities for Bridge Approach Barriers on New and Replacement Bridges, and Existing Bridges
CL-1	**ALL** the following bridge characteristics displayed: 1. **Traffic mix and level of pedestrian use:** a. Exclusively industrial vehicle traffic, or predominantly industrial vehicle traffic, and minimal public traffic on the road. For example, such roads could be short-term FSRs that may access only harvesting operations and that provide access to little that would be of interest to the general public, and the FSRs are typically deactivated upon completion of harvesting operations; b. No pedestrian traffic; 2. **Bridge deck height:** Relatively low height above water/hazard (< 5.0 m above waterway or other hazard); 3. **Design vehicle speed:** Normal operating speeds (< 50 km/h); 4. **Bridge deck width:** < 5.6 m; 5. **Approach road curvature:** Good vertical and horizontal alignment.	**New and Replacement Bridges** For a new or replacement bridge that displays all the characteristics listed in column 2 (for CL-1), installation of approach barriers is **recommended**. If barriers are not installed, the responsible Professional Engineer should document the rationale. **Existing Bridges** For an existing bridge that does not currently have any approach barriers installed and displays all the characteristics listed in column 2 (for CL-1), the Professional Engineer responsible for routine bridge inspections should assess at an appropriate time whether approach barriers are needed and document the rationale.
CL-2	**ONE OR MORE** of the following bridge characteristics displayed: 1. **Traffic mix and level of pedestrian use:** a. Mostly industrial vehicle traffic; b. Such roads are typically long-term FSRs (often Capital funded) with permanent bridges, and often link up with other road networks and used by forest companies and other resource users; c. Limited use by the public. Public use limited to moderately popular recreation sites and limited through traffic. Public users may be unfamiliar with the route and associated hazards; d. Limited use by pedestrians; 2. **Bridge deck height:** Significant height above water and/or near a significant hazard (≥ 5.0 m and < 10.0 m above waterway or other hazard); 3. **Design vehicle speed:** Increased operating speeds (< 80 km/h); 4. **Bridge deck width:** Increased deck width (≥ 5.6 m and < 8.0 m); 5. **Approach road curvature:** Adverse geometry and/or visibility.	**New and Replacement Bridges** For a new or replacement bridge that displays one or more of the characteristics listed in column 2 (for CL-2 or CL-3), installation of bridge approach barriers is **required** unless the responsible Professional Engineer determines otherwise and documents the rationale. **Existing Bridges** For an existing bridge that will be retrofitted with an improved CL-2 or CL-3 guardrail containment level, adding or improving bridge approach barriers is **required** unless the responsible Professional Engineer determines otherwise and documents the rationale. For an existing bridge that does not currently have any approach barriers installed and displays one or more of the characteristics listed in column 2 (for CL-2 or CL-3), the Professional Engineer responsible for routine bridge inspections should assess at an appropriate time whether approach barriers are needed and document the rationale.
CL-3**	**ONE OR MORE** of the following bridge characteristics displayed: 1. **Traffic mix and level of pedestrian use:** a. Primarily public traffic, or high level of public and/or pedestrian use (may provide access to popular tourist/recreation destinations, or rural communities), and may see a significant proportion of drivers who are unfamiliar with the driving conditions; b. Such roads are typically high public use FSRs; 2. **Bridge deck height:** Significant height above water and/or near a significant hazard (≥10.0 m above waterway or other hazard); 3. **Design vehicle speed:** High operating speeds (80 km/h); 4. **Bridge deck width:** Increased deck width or multi-lane bridge (≥ 8.0 m); 5. **Approach road curvature:** Adverse geometry and/or visibility.	

NOTES

* The responsible Professional Engineer can adjust the recommended bridge guardrail containment levels for new and replacement bridges shown in Table 1 if it is determined that a lower or higher bridge guardrail containment level is appropriate for the bridge site. The Professional Engineer should document the rationale for any deviation from the guidance provided in Table 1. Where vertical grade exceeds the area-specific average (e.g., > 4%), apply professional judgement to determine whether a higher standard bridge guardrail containment level is appropriate.

** There are infrequent situations where the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) may be responsible for a Very High Public Use FSR, notwithstanding that Very High Public Use roads should be administered by the Ministry of Transportation and Infrastructure (TRAN). In these infrequent situations, the responsible Professional Engineer should consider the need for a higher standard than CL-3 (e.g., TRAN standard barriers that have been crash tested to appropriate AASHTO MASH Test Levels TL-1 and TL-2). Additionally, this may also require the need for BABs to meet TRAN standards including an engineered and crash tested transition from the BAB to the bridge barrier.