

Appendix D: Lightly Trafficked Rural Bridges

Table of Contents

D1	General	D-2
D2	Specific Requirements	D-2
D2.1	Geometric and Side Protection Requirements (2.2).....	D-2
D2.2	Traffic Loads - Gravity Effects (3.2)	D-3
D2.3	Combination of Load Effects (3.5)	D-3
D2.4	Earthquake Resistant Design : Risk Factor (Tables 5.2 and 5.4).....	D-4

(Blank Page)

D1 General

For State Highways, use of the criteria in this appendix will be subject to approval of Transit New Zealand's Land Transport Manager.

- (a) Note that this appendix provides minimum design standards.

These criteria cover one-lane bridges on lightly trafficked roads. Such bridges may be on public or private roads.

On public roads, the criteria shall only be used where all the following criteria are met:

- (i) the traffic count is less than 100 vpd; and
- (ii) the road cannot become a through route; and
- (iii) the alignment is such that speeds are generally below 70 km/h; and
- (iv) use of the route by logging trucks is unlikely; and
- (v) no significant overloads are expected to occur, or the bridge can be bypassed.

- (b) Following each clause title below, is the number of the clause in the main body of this document which is modified by this appendix. Where no modification is detailed below, the original clauses shall apply in full.

D2 Specific Requirements

D2.1 Geometric and Side Protection Requirements (2.2)

The specific requirements of Appendix A may be waived, but the following width limits apply:

- (a) Bridges without handrails or traffic barriers: 3.0 m minimum, 3.7 m maximum between kerbs or wheel guards.
- (b) Bridges with pedestrian barriers: 3.0 m minimum, 3.7 m maximum between kerbs or wheel guards, 3.7 m minimum between pedestrian barriers.
- (c) Bridges with traffic barriers: 3.7 m minimum, 4.3 m maximum between guardrails.

On private roads, traffic barriers are not required provided either kerbs complying with B2.5 and the loading set out in B6.4 or wheel guards to the same criteria are provided. Footpaths and Pedestrian Barriers are only required if pedestrians are likely to frequent the bridge. Pedestrian barriers shall comply with B2.3 for type and B6.2 for loading.

Since agricultural vehicles up to 3.7 m width may use a public road without permit, the choice of type and height of side protection should be made after consideration of

the actual vehicles using the road, and the clearance to any overhanging portions of the vehicles.

D2.2 Traffic Loads - Gravity Effects (3.2)

- (a) For design of both main members and decks, the HN design load may be replaced by 0.85 HN. The dimensions of the loaded areas remain the same as for full HN load. HO load need not be considered.
- (b) Areas of deck where wheels cannot normally travel, due to dimensional limitations or physical barriers need not be designed for the wheel loads of (a) above, but shall be designed for one 15 kN wheel load, using the same contact area as an HN wheel, placed anywhere on the deck.
- (c) Note that the uniformly distributed part of the reduced HN load covers the effect of a stock load.

D2.3 Combination of Load Effects (3.5)

- (a) In prestressed concrete design, the tension limit for concrete may be taken as $0.50\sqrt{f_c'}$ for monolithic members and $0.20\sqrt{f_c'}$ across construction joints, in all load groups.

Table D1 : Load Combinations for the Serviceability Limit State

Group	Loads
1A	DL + EP + OW + SG + ST + LLxI
1B	DL + EP + OW + SG + ST + TP
2A	DL + EP + OW + SG + ST + LLxI + HE + TP
2B	DL + EP + OW + SG + ST + LLxI + HE + WD
2C	DL + EP + FW + SG + ST + LLxI + HE
3A	DL + EP + OW + SG + ST + EQ + 0.33 TP
3B	DL + EP + FW + SG + ST + WD
4	Not applicable
5A	DL + EP + OW + SG + 0.33 WD + CN
5B	DL + EP + OW + SG + 0.33 TP + CN
5C	DL + EP + OW + SG + 0.33 EQ + CN

**Table D2 : Load Combinations and Load Factors
For The Ultimate Limit State**

Group	Loads and Load Factors
1A	$U = 1.10 (DL + 1.35 EP + OW + SG + ST + 1.67 LLxI)$
1B	$U = 1.10 (DL + 1.35 EP + OW + SG + ST + 1.25 TP)$
2A	$U = 1.20 (DL + EP + OW + SG + ST + LLxI + HE + TP)$
2B	$U = 1.20 (DL + EP + OW + SG + ST + LLxI + HE) + WD$
2C	$U = 1.20 (DL + EP + SG + ST + LLxI + HE) + FW$
3A*	$U = 1.00 (kDL + 1.25 (EP + OW) + SG + ST + EQ + 0.33 TP)$
3B	$U = 1.00 (DL + 1.25 EP + FW + SG + ST + WD)$
4	Not applicable
5A	$U = 1.20 (DL + EP + OW + SG + 1.1 CN) + 0.33WD$
5B	$U = 1.20 (DL + EP + OW + SG + 0.33 TP + 1.1 CN)$
5C	$U = 1.20 (DL + EP + OW + SG + 0.33 EQ + 1.1 CN)$

* $k = 1.3$ or 0.8 , whichever is more severe, to allow for vertical acceleration.

D2.4 Earthquake Resistant Design : Risk Factor (Tables 5.2 and 5.4)

In determining the risk factor for obtaining the seismic design force, the importance category may be 3, except in the case of any bridge crossing a railway, State Highway or motorway, when the importance category shall be 1.