

AS 5100.2:2017 Bridge design Part 2: Design loads

Amendment No. 2

Revised text amendment

Publishing and Approval Dates

Council of Standards Australia Approval: 13 June 2024

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Summary

This Amendment applies to the following elements:

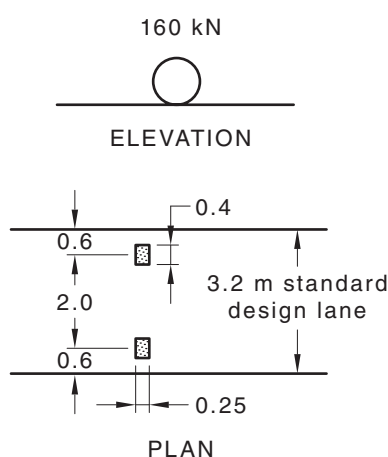
- Preface
- Clauses 2, 3, 4, 5, 6.4, 6.5, 7.2.3, 7.2.4, 7.2.5, 7.9, 9.1, 9.2, 9.3, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.8.1, 9.8.2, 9.8.2.1, 9.8.2.2, 9.8.2.3, 9.8.2.4, 9.8.2.5, 9.8.3, 9.8.4, 11.2, 11.3, 11.4.1, 11.4.2.1, 11.4.2.3, 11.4.4.3, 11.6, 12.2.2, 15.1, 15.5, 15.9.1, 15.9.3, 16.1, 16.2, 16.3.1, 16.3.2, 16.7.1, 16.8, 17.1, 17.3.3, 22.1, 23.3, 24.2, 24.2, B1
- Tables 6.4, 7.9, 9.5.2, 9.8.2.2, 9.8.2.4, 9.8.2.5, 11.2, 12.2.2, 15.9.2, 22.1, 22.2.1, 22.2.2, D1, D2, D3
- Figures 7.2.3, 9.2(A), 9.2(B), 17.3.3
- Appendix B

Amendment details

AS 5100.2:2017 is amended as follows. The amendments should be inserted in the locations as instructed.

Element	Instruction/New text
Preface	Delete second last paragraph.
CI 2	Delete "AASHTO LRFD Bridge Design Specifications" and <i>replace</i> with "AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals".
CI 3	1 Entry 3.7, <i>delete</i> heading and <i>replace</i> with the following: 3.7 Track classification 2 <i>Delete</i> entry 3.7.4, and <i>replace</i> with the following: 3.7.4 Light rail (LR) Passenger only rail transport, including trams, carrying axle loads up to 15 t.
CI 4	In the notation table, <i>delete</i> the definition for n_T and <i>replace</i> with the following: number of equivalent stress cycles of fatigue design stress range (f^*) at the design location for the passage of the fatigue design traffic load over the bridge
CI 5	1 After Item 8, <i>add</i> the following: 9 Approval to use the rational method for fatigue assessment (Clauses 9.8.1 and 9.8.3). 10 Track classification and base number of load cycles (Clauses 9.8.2.4 and 9.8.2.5).

Element	Instruction/New text
	2 <i>Renumber</i> existing Items 9 to 21 to Items 11 to 23.
CI 6.4	At the end of the first paragraph, <i>add</i> the following: Variation in water levels shall be taken into account by using design levels based on a return period of 1 000 years for the ULS or 100 years for the SLS.
Tbl 6.4	<i>Delete</i> the note.
CI 6.5	Second paragraph, after “maximum amount”, <i>add</i> the following: , unless otherwise approved by the relevant authority
CI 7.2.3	<i>Delete</i> second paragraph and <i>replace</i> with the following: The A160 axle load shall be positioned within a 3.2 m standard design lane, as shown in Figure 7.2.3.
Fig 7.2.3	<i>Delete</i> figure and <i>replace</i> with the following:



DIMENSIONS IN METRES

FIGURE 7.2.3 A160 AXLE LOAD

CI 7.2.4	<i>Delete</i> second paragraph and <i>replace</i> with the following: The M1600 moving traffic load shall be positioned within a 3.2 m standard design lane as shown in Figure 7.2.4.
CI 7.2.5	Second paragraph, <i>delete</i> last sentence and <i>replace</i> with the following: The S1600 stationary traffic load shall be positioned within a 3.2 m standard design lane as shown in Figure 7.2.5.
CI 7.9	- After first paragraph, <i>add</i> the following: Notwithstanding that the fatigue load effects calculated from this loading have a constant amplitude, the fatigue load effects shall be considered to be variable amplitude loading when selecting the relevant S-N curve for the calculation of fatigue strength. - After Item (D), <i>delete</i> the first two paragraphs and <i>replace</i> with the following: Irrespective of the actual number of design lanes on the bridge, the fatigue loading from only two design lanes shall be considered to contribute to the fatigue damage of the component under consideration. The two design lanes shall be referred to as Lane 1 and Lane 2 and be selected on the following bases: (1) Fatigue loading in Lane 1 causes the largest peak-to-peak stress range in the component under consideration. (2) Fatigue loading in Lane 2 causes the second largest peak-to-peak stress range in the component under consideration.

Lanes 1 and 2 may be in the same direction, or may be in opposing directions (whichever provides the two largest peak-to-peak stress ranges in the component under consideration), and will vary for different components under consideration.

The fatigue loadings in Lane 1 and 2 shall be applied separately when calculating the peak-to-peak stress ranges (i.e. the fatigue loadings in Lane 1 and Lane 2 shall be assumed to occur at different points in time). The fatigue damage from Lane 1 and Lane 2 shall be combined using a Miner's summation or equivalent in accordance with the applicable part of this Standard.

The number of heavy vehicles per day in one direction shall be allocated into Lanes 1 and 2 in accordance with Table 7.9.

Tbl 7.9 (new)

After Clause 7.9, *add* the following:

TABLE 7.9
ALLOCATION OF HEAVY VEHICLES PER DAY IN ONE DIRECTION INTO
HEAVY VEHICLES PER LANE PER DAY IN THAT DIRECTION

Route description	No. of design lanes in one direction	Proportion in Lane 1	Proportion in Lane 2
All routes	1	100 %	100 % in the opposing direction (unless a single lane bridge)
Principal interstate freeways and highways, and other rural routes	2 or more	100 %	Nil (or 100 % if in the opposing direction)
Urban routes ^a	2 or more	65 %	35 % (or 65 % if in the opposing direction)

^a If approved by the relevant authority, an alternative, conservative design approach may be used which allocates for 'Principal interstate freeways and highways, and other rural routes'.

Tbl 9.5.2

Column 3, row for "Case No. 8", *delete* text and *replace* with the following:

The values to be used correspond to those applying to the cross-girder, as given in Cases 4 and 5.

Cl 9.5.3

Delete clause and *replace* with the following:

9.5.3 Dynamic load allowance (α) for bending moment

The value of the dynamic load allowance (α) for bending moment for ballasted deck spans, open deck spans or spans with direct rail fixation shall be calculated as follows:

$$\alpha = 0.20 \leq \frac{2.16}{\sqrt{L_{\alpha}}} - 0.27 \leq 0.67 \quad \dots 9.5.3$$

where

L_{α} = characteristic length in metres

The dynamic load allowance (α) shall be adjusted for train speed or nominated rail line speed. It shall be taken to be constant for speeds above 80 km/h and shall vary linearly from 0 for a speed of zero to full value at 80 km/h.

The value of α for steam locomotives shall be increased by 20 % unless flywheels are dynamically balanced or otherwise approved by the relevant authority.

The value of α for fatigue design shall be multiplied by a factor of 0.50.

The value of α for transoms in open deck bridges and local effects for direct fixed tracks shall be 1.0.

Where an effective transition approach to a bridge abutment is not provided, α shall be increased by not less than 50 % of the calculated dynamic load allowance unless otherwise approved by the relevant authority.

CI 9.5.4

Delete clause and *replace* with the following:

9.5.4 Dynamic load allowance (α) for other load effects

The dynamic load allowance (α) for axial forces, shear forces, torsion, reactions, and deflections shall be taken as 0.65 of the value specified in Clause 9.5.3, for the relevant limit state.

Where the application of the dynamic load allowance leads to greater safety for strength or stability, e.g. against overturning, α shall be taken as zero (0) for the relevant limit state.

CI 9.5.5

Delete clause and *replace* with the following:

9.5.5 Application

For all parts of the structure extending down to the ground level, the dynamic load allowance (α) shall be as specified in Clauses 9.5.3 and 9.5.4 as appropriate.

For all parts of the structure below ground, including culverts, α shall be linearly transitioned from the ground level value to zero (0) at a cover depth of 2 m. For structures in railway embankments, the ground level shall be taken as the underside of the ballast.

The dynamic load allowance established for the appropriate cover depth shall apply to all parts of the structure below the cover depth. The depth of the cover shall be measured from the underside of the ballast.

CI 9.5.6

Delete clause text, and *replace* with the following:

Since vibrations can continue and slowly decay after the passing of traffic, the reversal of the dynamic response to live load shall be taken into account. In particular, the minimum reaction on bearings shall allow for the reduction, which may occur from the results of the dynamic effects.

CI 9.8.1

Delete clause and *replace* with the following:

9.8.1 General

Rail bridges of all deck types shall be designed for fatigue design traffic loads. These loads shall be determined using either —

- (a) the empirical method; or
- (b) the rational method.

Although the fatigue load effects calculated from this loading have a constant amplitude, they shall be considered to be variable amplitude loading when assessing fatigue strength in accordance with AS 5100.5 and AS/NZS 5100.6.

CI 9.8.2

Delete clause and *replace* with the following:

9.8.2 Empirical method**9.8.2.1 General requirements**

If the empirical method is used —

- (a) the design fatigue traffic load shall be based on simulated axle groups specified in Clause 9.2 or as specified by the relevant authority; and
- (b) the fatigue design stress range shall be taken as the maximum algebraic difference of stresses caused by the fatigue traffic load.

CI 9.8.2.2 (new)

After Clause 9.8.2.1, *add* the following:

9.8.2.2 Fatigue design rail traffic load

Unless otherwise specified by the relevant authority, the fatigue design rail traffic load shall be in accordance with the requirements of Table 9.8.2.2.

The distance between the simulated axle groups (L_v) shall be varied between 12 m and 20 m to produce the maximum fatigue design stress range (f^*) for each structural element (see Clause 9.8.2.3).