

7.2 Serviceability limit states

When rating a bridge for serviceability limit states, the load factors given in AS 5100.2 shall be used, except that the use of modified values shall be permitted if specific measurements or other assessments are carried out to determine the actual loads more accurately. Any modification of load factors shall require the approval of the relevant authority. Where superimposed dead load effects are directly measured, the load factors given in Table 7.2 or intermediate values shall be used.

TABLE 7.2
LOAD FACTORS FOR
SERVICEABILITY LIMIT STATES

| Load effect | Design case | Direct measurement |
|---|-------------|--------------------|
| Superimposed dead load (general loads) | 1.3 | 1.1 (see Note) |
| Superimposed dead load (controlled cases) | 1.0 | 1.0 |

NOTE: Where a load factor of 1.1 is used for superimposed dead load, the actual superimposed dead load shall be subsequently controlled and monitored by the relevant authority.

7.3 Ultimate limit states

7.3.1 Dead and superimposed dead loads

When rating a bridge for ultimate limit states, the load factors given in AS 5100.2 shall be used, except that the use of modified values shall be allowed if specific measurements or other investigations are carried out to determine the appropriate loads more accurately. Where load actions are directly measured, the use of the modified load factors given in Table 7.3 shall be permitted. Where other measurements or assessments are undertaken, the load factor to be used shall be determined on the basis of a comparison with the values specified herein, and the accuracy of the measurements or investigations that have been undertaken. Any modification of load factors shall require the approval of the relevant authority.

7.3.2 Live load factors for tested bridges

Where appropriate, specific measurements may be undertaken to determine the actual loads or to measure effects, such as the dynamic load amplification to which the bridge is being subjected, for comparison with the design value of dynamic load allowance. Where the effects of given loads on a bridge are assessed by direct measurement of the structural actions induced in the bridge or by other investigations, the use of a modified load factor, as given in Table 7.3 shall be permitted. For any given effect and load, the design load factor may be modified by the modification ratio (r_m), which is the ratio of the measured action to the action determined analytically for each given load. The value of r_m may be less than unity.

Due allowance shall be made for the possibility that certain load situations may produce larger actions than those that have been measured.

Before selecting and using any modified load factor, it shall be ensured that the load is not being carried by some unreliable load path such as the composite action of concrete slabs not detailed for composite action, frozen bearings and the like. The ductility and redundancy of the structure shall also be considered.

The use of any live load factor that is less than the design value shall be approved by the relevant authority.

7.3.3 Modification of live load factors based on probability of overloading

Where the relevant authority has determined by direct measurement, or other means, that the probability of overloading for a specific vehicle or class of vehicle is different from that used as the basis for the relevant design live load factor, it is permitted for that authority to use a modified live load factor based on the change in probability of overloading, as given in Table 7.3.

TABLE 7.3
MODIFIED LOAD FACTORS FOR THE ULTIMATE LIMIT STATE

| Type of load | Load factor | Where load reduces safety | | Where load increases safety | | Note |
|--|----------------|---------------------------|--------------------|-----------------------------|--------------------|----------|
| | | Design case | Direct measurement | Design case | Direct measurement | |
| Dead load (steel) | γ_B | 1.1 | 1.05 | 0.9 | 0.95 | (1) |
| Dead load (concrete) | γ_B | 1.2 | 1.1 | 0.85 | 0.9 | (1) |
| Dead load (timber) | γ_B | 1.4 | 1.2 | 0.8 | 0.9 | (1) |
| Superimposed dead load (general loads) | γ_{GS} | 2.0 | 1.4 | 0.7 | 0.85 | (2) |
| Superimposed dead load (controlled case) | γ_{GS} | 1.4 | 1.2 | 0.8 | 0.9 | (2) |
| Live load (SM1600 road traffic and pedestrian loads including specific loads for general access) | γ_L | 1.8 | $1.8r_m$ | N/A | N/A | (3), (6) |
| Live load (other road traffic and pedestrian loads) | γ_L | 2.0 | $2.0r_m$ | N/A | N/A | (3), (6) |
| Live load (road traffic) (specific loads) | γ_L | 1.5 | $1.5r_m$ | N/A | N/A | (4), (6) |
| Live load (road traffic) (specific loads for restricted access) | γ_{LRA} | 1.5 | $1.5r_m$ | N/A | N/A | (4), (6) |
| Centrifugal forces (SM1600 road traffic, including specific loads for general access) | γ_L | 1.8 | $1.8r_m$ | N/A | N/A | — |
| Centrifugal forces (other road traffic) | γ_L | 2.0 | $2.0r_m$ | N/A | N/A | (5), (6) |
| Braking forces (SM1600 road traffic, including specific loads for general access) | γ_L | 1.8 | $1.8r_m$ | N/A | N/A | (5), (6) |
| Braking forces (other road traffic) | γ_L | 1.5 | $1.5r_m$ | N/A | N/A | (5), (6) |
| Live load (rail traffic) | γ_L | 1.6 | $1.6r_m$ | N/A | N/A | (3) |
| Live load (rail traffic) (specific loads) | γ_L | 1.4 | $1.4r_m$ | N/A | N/A | (4), (6) |
| Centrifugal and nosing forces (rail traffic) | γ_L | 1.6 | $1.6r_m$ | N/A | N/A | (5) |
| Braking and traction forces (rail traffic) | γ_L | 1.6 | $1.6r_m$ | N/A | N/A | (5) |

NOTES:

- 1 For balanced cantilever and anchor cantilever structures, a minimum value of 1.0 shall be used in accordance with AS 5100.2.
- 2 Where superimposed loads are removable, the condition with those loads removed shall be considered.
- 3 These factors shall only apply when rating a bridge for general loads.
- 4 These factors shall only apply when rating a bridge for specific loads where the authority can exercise a high degree of control over and monitor the passage of such loads.
- 5 For these loadings, it shall be acceptable to reduce the loads provided that a vehicle speed limit is specified.
- 6 For direct measurement, the modification ratio (r_m) shall be determined as described in this Clause, and may vary for different structural actions.