

Notes for Designers

MRTS90

Modular Bridge Expansion Joints



Queensland
Government

Issued for the convenience of designers when completing the Annexure MRTS90.1 Modular Bridge Expansion Joints.

1.1 Expansion Joint Openings

Compute the following MBEJ openings (refer to Figure 1)

- a) The minimum MBEJ opening at serviceability: $J_{s,min} = J_i - e_s (T_{max} - T_i) = \underline{\hspace{2cm}}$ mm
- b) The maximum MBEJ opening at serviceability: $J_{s,max} = J_i + c_s + e_s (T_i - T_{min}) = \underline{\hspace{2cm}}$ mm
- c) The MBEJ opening for ultimate limit state: $J_u = J_i + 1.2c_s + 1.25e_s (T_i - T_{min}) = \underline{\hspace{2cm}}$ mm
- d) MBEJ opening for fatigue limit state[#]: $J_f = \underline{\hspace{2cm}}$ mm

[#] The MBEJ opening for fatigue design recommended by NCHRP is the mean value -

$$J_f = (J_{s,min} + J_{s,max}) / 2$$

A slightly more conservative value is the "root mean cube", based on the fact that fatigue damage varies as the 3rd power of the stress and stress due to a concentrated load varies linearly as the span -

$$J_f = \left[\frac{J_{s,min}^3 + J_{s,max}^3}{2} \right]^{1/3}$$

If detailed temperature records are available, a logical choice is to assess the mean daily temperature experienced by the bridge for most days of the year (T_f) and compute the MBEJ opening for fatigue as -

$$J_f = J_i + c_s + e_s (T_i - T_f)$$

where

- J_i = Gap at initial condition †
- e_s = Change in width of gap for 1°C change in average bridge temperature
- c_s = Total creep and shrinkage movement until the end of the design life
- T_{max} = Maximum average bridge temperature (refer to AS 5100.2, Clause 17.2)
- T_{min} = Minimum average bridge temperature
- T_i = Expected temperature at initial condition †

† for a new bridge, J_i is the gap specified on the drawing for the assumed temperature T_i ;

for replacing a joint on an existing bridge, J_i and T_i shall be measured at the site

1.2 Horizontal Forces

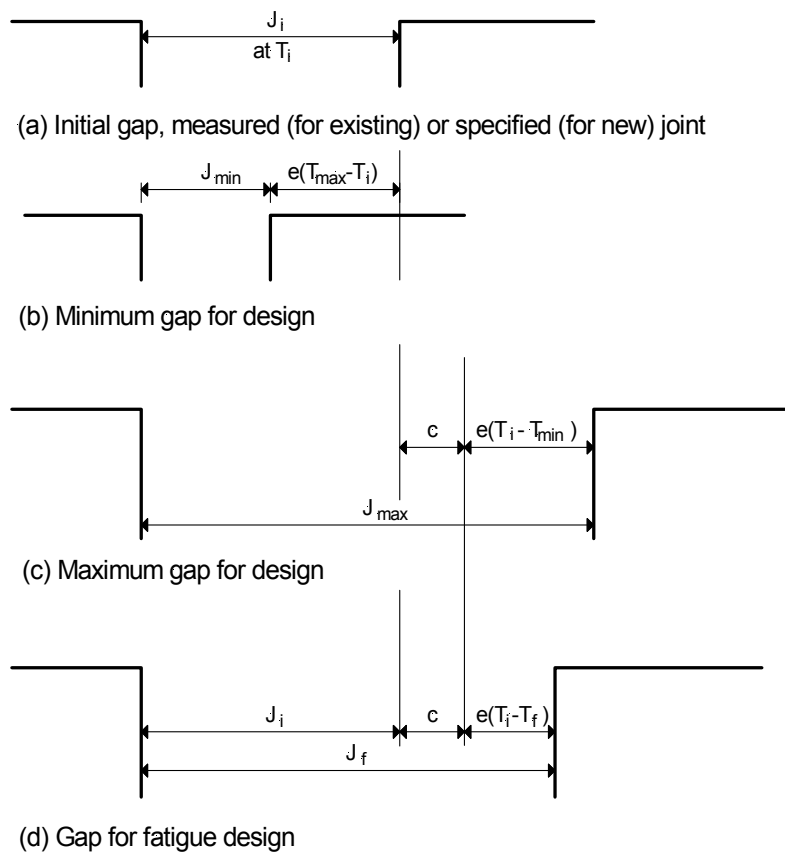
The value of η

- a) $\eta = 0.35$ in accordance with Clause 17.3.2 of AS 5100.4; and
- b) NCHRP 402 recommends a value of 0.2 for normal conditions, which shall be increased for locations where there are steep gradients or where hard braking is expected close to traffic signals, to a maximum value of 0.5.

1.3 Additional Requirements for Skewed Expansion Joints

Such requirements shall include, at least, the transverse movement due to thermal distortion of the skewed deck.

Figure 1 - Expansion MBEJ Movements



NOTE: The gaps are different for serviceability, ultimate and fatigue design.