Therefore, live load deflection is the greater of:

$\Delta_{LT} = 1.11$ in. ↓ (Controls)

$0.25\ \Delta_{LT} + \Delta_{LL} = 0.25(1.11) + 0.47 = 0.75$ in. ↓

Allowable live load deflection: 1.43 in. > 1.11 in. OK

9.4.16 TRANSVERSE POST-TENSIONING

Article C4.6.2.2.1 in the *LRFD Specifications* states that for bridge type (*g*), the structure acts as a monolithic unit if sufficiently interconnected. To satisfy this requirement, the *LRFD Specifications* recommends that a minimum average transverse prestress of 0.250 ksi be used. However, definition of the contact area for that post-tensioning is unclear as to whether it is the shear key, the diaphragm, or the entire box side surface. Instead of an empirical minimum, El-Remaily (1996) recommends that the entire deck surface be modeled as a rigid assembly of gridwork with adequate post-tensioning to provide for a continuous transverse member at the diaphragm locations. A design chart based on this theory is given in Chapter 8 for the required transverse post-tensioning per unit length of span.

According to the chart, for a 28 ft-wide bridge with 39 in. deep beams, an effective post-tensioning force of 6.75 kips/ft is required. Since diaphragms are provided at quarter-points of the span, the post-tensioning force required is:

6.75(23.75) = 160 kips/diaphragm

It is recommended that transverse post-tensioning consist of one tendon near the top and another near the bottom in order to provide sufficient flexural strength.

Use 160-ksi prestressing bars. Assume the effective prestress to be 55 percent of the ultimate strength of the bar.

$P_{eff} = 0.55(160)A_{PT} = 88.0A_{PT}$ kips

Thus, total required $A_{PT} = \dfrac{160.0}{88.0} = 1.82\ \text{in.}^2/\text{diaphragm}$

Try (2) 1¼ in. diameter, 160 ksi, bars.

The total area provided is $A_{PT} = 2(1.23) = 2.46\ \text{in.}^2$

Total provided post-tensioning force = (2.46)(0.55)(160) = 216 kips/diaphragm > 160 kips/diaphragm OK

If the post-tensioning bars are positioned so that they are concentric with the diaphragm cross section, concrete stress due to the effective prestressing force is:

216/(8)(39) = 0.629 ksi

If available, (2) $1^1/_8$ in. diameter bars could be used.