flexural strength also must be calculated to determine the minimum load (beam shear) that produces yielding (i.e., flexural or shear yielding).

ACI 318-08 provides guidance on effective flexural stiffness, recommending the use of $E_cI_{eff} = 0.35E_cI_g$. ASCE/SEI 41-06 recommends $E_cI_{eff} = 0.5E_cI_g$, and changes incorporated into ASCE/SEI 41-06 *Supplement No. 1*, recommend the use of $E_cI_{eff} = 0.3E_cI_g$. These effective flexural stiffness values are intended to provide an estimate of the secant stiffness to the yield point.

New Zealand Standard NZS 3101, *Concrete Structures Standard* (NZS, 1995), includes specific recommendations for effective flexural stiffness of diagonally-reinforced and conventionally-reinforced coupling beams. NZS 3101 defines the effective moment of inertia as:

$$I_e = \frac{A}{B + C\left(\frac{h}{l_n}\right)^2} I_g \tag{4-9}$$

where h is the total depth of the coupling beam, l_n is the clear span, and I_g is the gross concrete cross-section moment of inertia. Coefficients A, B, and C are provided in Table 4-1, based on the type of longitudinal reinforcement (diagonal or conventional) and on the anticipated ductility demand.

Table 4-1 New Zealand Standard 3101 Coupling Beam Coefficients

	Diagonally Reinforced			*Conventionally Reinforced*		
Ductility	*A*	*B*	*C*	*A*	*B*	*C*
1.25	1.00	1.7	1.3	1.00	1.0	5.0
3.0	0.70	1.7	2.7	0.70	1.0	8.0
4.5	0.55	1.7	2.7	0.55	1.0	8.0
6.0	0.40	1.7	2.7	0.40	1.0	8.0

NZS 3101 values for effective moment of inertia are intended for use with linear analysis, and are secant approximations at the given level of ductility. Values of the ratio I_e/I_g for a range of ductility demands (μ) and clear span-to-depth ratios are shown in Figure 4-29. For low ductility demands implying modest yielding (μ=1.25), NZS 3101 values are close to the ASCE/SEI 41-06 value of $0.5I_g$. For ductility demands of μ=3.0 and μ=4.5, NZS 3101 values are similar to the ACI 318-08 value ($0.35I_g$) and the ASCE/SEI 41-06 *Supplement No. 1* value ($0.3I_g$) at clear span-to-depth ratios larger than 2.0.

Where a linear analysis is used for service level assessments, use of $E_cI_{eff} = 0.3E_cI_g$ appears appropriate. If a linear analysis is used for a design level