CODE

A.8.4 It shall be permitted to represent member stiffness near the onset of inelastic response using an effective stiffness based on analysis substantiated by physical test data. Alternatively, it shall be permitted to represent member stiffness near the onset of inelastic response using the effective stiffness values in Table A.8.4.

COMMENTARY

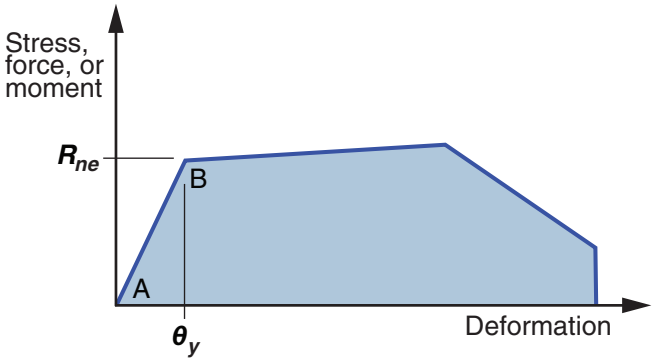

***Fig. RA.8.3**—Generalized force-deformation relations.*

RA.8.4 The effective stiffness values are intended to represent the slope from A to B in Fig. RA.8.3, where B corresponds to expected yield strength. Effective stiffness values for beams and columns are based on Elwood et al. (2007), and incorporate the effects of reinforcement slip along the development length. Tabulated values for structural walls are appropriate to use where the wall is represented by a line element. In some building models, structural walls will be represented by distributed fiber models, in which case the fiber model should directly represent effects of concrete cracking and reinforcement yielding, such that the stiffness values in Table A.8.4 do not apply. Basement walls are unlikely to respond at yield-level forces; therefore, larger stiffness values may be more applicable than those in Table A.8.4 for walls. Diaphragm stiffnesses provided in Table A.8.4 represent typical values. Prestressed and nonprestressed diaphragms mainly resisting single-floor in-plane earthquake forces are commonly modeled as rigid, as allowed by ASCE/SEI 7. Diaphragms transferring relatively large in-plane earthquake forces from multiple floor levels can have effective stiffnesses somewhat lower than those represented in Table A.8.4. In cases where analysis results are sensitive to diaphragm stiffness assumptions, it may be prudent to "bound" the solution by analyzing the structure using a range of diaphragm stiffnesses and selecting the design values as the larger forces from the two analyses. Coupling beam effective stiffnesses are intended to represent values for beams cast monolithically with floor slabs. Values are based on equations presented by Vu et al. (2014), but are adjusted to account for the presence of a slab, differences in modeling approach, and typical shear levels (TBI 2017). Engineering judgment should be used to evaluate effective shear stiffness values, noting that due to typical software implementation limitations, gross area is used in lieu of effective area.