CODE

COMMENTARY

Table A.8.4—Effective stiffness values[1]

Component		Axial	Flexural	Shear
Beams	nonprestressed	$1.0E_cA_g$	$0.3E_cI_g$	$0.4E_cA_g$
	prestressed	$1.0E_cA_g$	$1.0E_cI_g$	$0.4E_cA_g$
Columns with compression caused by design gravity loads[2]	$\geq 0.5A_gf_c'$	$1.0E_cA_g$	$0.7E_cI_g$	$0.4E_cA_g$
	$\leq 0.1A_gf_c'$ or with tension	$1.0E_cA_g$ (compression) $1.0E_sA_{st}$ (tension)	$0.3E_cI_g$	$0.4E_cA_g$
Structural walls[3]	in-plane	$1.0E_cA_g$	$0.35E_cI_g$	$0.2E_cA_g$
	out-of-plane	$1.0E_cA_g$	$0.25E_cI_g$	$0.4E_cA_g$
Diaphragms (in-plane only)[4]	nonprestressed	$0.25E_cA_g$	$0.25E_cI_g$	$0.25E_cA_g$
	prestressed	$0.5E_cA_g$	$0.5E_cI_g$	$0.4E_cA_g$
Coupling beams	with or without diagonal reinforcement	$1.0E_cA_g$	$0.07\left(\frac{\ell_n}{h}\right)E_cI_g$ $\leq 0.3E_cI_g$	$0.4E_cA_g$
Mat foundations	in-plane	$0.5E_cA_g$	$0.5E_cI_g$	$0.4E_cA_g$
	out-of-plane[5]		$0.5E_cI_g$	

[1]Tabulated values for axial, flexural, and shear shall be applied jointly in defining effective stiffness of an element, unless alternative combinations are justified.

[2]For columns with axial compression falling between the limits provided, flexural stiffness shall be determined by linear interpolation.

[3]Tabulated values are appropriate where members are modeled using line elements to represent their properties.

[4]Diaphragms shall be permitted to be modeled as rigid in-plane if this does not result in differences in analysis outcomes.

[5]Specified stiffness values for mat foundations pertain for the general condition of the mat. Where the wall or other vertical members imposed sufficiently large forces, including local force reversals across stacked wall openings, the stiffness values may need to be reduced.

A.8.5 In beam-column joints if joint flexibility is not modeled explicitly, it shall be permitted to model joint flexibility implicitly by defining the effective stiffness of beams and columns framing into the joint to include joint flexibility and by introducing beam and column rigid end offsets that extend to the center of the joint.

RA.8.5 In reinforced concrete frames detailed to resist earthquake forces, joints are not expected to experience significant degradation. In lieu of a more rigorous representation of joint shear stiffness, rigid offsets of beam and column members extending the length of the joint dimensions are permitted (Birely et al. 2012). A sensitivity study on stiffness assumptions indicates that overall building stiffness may be more sensitive to the choice of effective stiffness for frame and wall members than for joints (Kwon and Ghannoum 2016). The rigid joint offset approach is compatible with the effective stiffness values presented in Table A.8.4, which account for the softening effects of longitudinal bar slip within the joints.

A.8.6 If beams other than coupling beams are cast monolithically with slabs, the effective slab width defined in 6.3.2 shall be included in the evaluation of beam flexural and axial stiffnesses.

A.9—Expected material strength

A.9.1 Expected material strength shall be defined based on applicable project-specific data or data from projects using similar materials and construction. If applicable data are not available, the expected material strengths in Table A.9.1 shall be permitted.

RA.9—Expected material strength

RA.9.1 The multiplier on f_c' may be smaller for high-strength concrete when higher quality control measures are in place or when fly ash and other additives are. Refer to ACI 232.2R for discussion of impacts of fly ash. Default values for other steel grades have not been provided in Table A.9.1 due to insufficient data.

A Nonlinear