Guidelines for Numerical Seismic Analysis of Reinforced Concrete Axial-Flexural Elements

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TABLE 2.3: MODELING PARAMETERS FOR WALL WSH6

		PERFORM 3D[a]				**MVLEM[a,b]**		**SFI-MVLEM[b,c]**		**BTM**	
		m=4, n=20				**m=4, n=11**		**m=4, n=6**		**m=8, n=11**	
		Inelastic Steel Material, Non-Buckling				***SteelMPF***		***SteelMPF***		***Steel02***	
		Tension		**Compression**							
		D	F (MPa)	D	F (MPa)						
Steel Parameters	Y	0.00288	576	0.00288	576	$f_{y_{be}}$[d] (MPa)	576	$f_{y_{be}}$[d] (MPa)	576	$f_{y_{be}}$ (MPa)	576
	U	0.07776	876	0.03162	691	E_s (MPa)	200000	E_s (MPa)	200000	E_s (MPa)	200000
	L	0.08064	876	0.03450	691	b[d]	0.02	b[d]	0.02	b	0.02
	R	0.08352	0.88	0.08352	0.7	R_0	20	R_0	20	R_0	20
	X	0.12528	0.88	0.12528	0.7	cR_1	0.925	cR_1	0.925	cR_1	0.925
	FR/FU	-	0.001	-	0.001	cR_2	0.15	cR_2	0.15	cR_2	0.15
	E_s(MPa)	200000		200000							
	Inelastic 1D Concrete Material					***ConcreteCM***		***ConcreteCM***		***ConcretewBeta***	
		Unconfined		**Confined**		**Unconfined**		**Unconfined**		**Diagonal[e]**	**Horizontal[e]**
		D	F (MPa)	D	F (MPa)	f_c' (MPa)	45.6	f_c' (MPa)	45.6	f_c' (MPa)	45.6
	Y	0.00108	34.2	0.00137	43.6	ε_c	0.00226	ε_c	0.00226	ε_c	0.00200
	U	0.00200	45.6	0.00400	58.1	E_c (MPa)	34350	E_c (MPa)	34350	$f_{c_{int}}$ (MPa)	22.8
	L	0.00202	45.6	0.00404	58.1	r_c	6.87	r_c	6.87	$\varepsilon_{c_{int}}$	0.00439
	R	0.01826	0.05	0.03162	0.06	x_{cr}^-	1.065	x_{cr}^-	1.143	f_u (MPa)	0.001
Concrete Parameters	X	0.02739	0.05	0.04743	0.06	f_t (MPa)	2.09	f_t (MPa)	2.09	ε_u	0.00677
	FR/FU	-	0.001	-	0.001	ε_t	0.00008	ε_t	0.00008	f_t (MPa)	0.001
	E_c (MPa)	31738		31738		r_t	1.20	r_t	1.20	$f_{t_{int}}$ (MPa)	0.001
						x_{cr}^+	10000	x_{cr}^+	10000	$\varepsilon_{t_{int}}$	0.00040
						GapClose[f]	1	GapClose[f]	1	$f_{t_{res}}$ (MPa)	0.001
						Confined[g]		**Confined[g]**		$\varepsilon_{t_{res}}$	0.00080
						f_{cc}' (MPa)	58.1	f_{cc}' (MPa)	58.1	α[f]	161.4
						ε_{cc}	0.00536	ε_{cc}	0.00536	β_{int}[f]	0.4
						r_c	9.28	r_c	9.28	$\varepsilon_{n_{int}}$[f]	0.01767
						x_{cr}^-	1.106	x_{cr}^-	1.216	β_{res}[f]	0.1
										$\varepsilon_{n_{res}}$[f]	0.07068
										M[f]	-
										E_c[f] (MPa)	33764
										f_{cc}'[f] (MPa)	-
										ε_{cc}[f]	-

Concrete Parameters	**Horizontal[e]**	**Vertical**	**Confined**
f_c' (MPa)	45.6	45.6	45.6
ε_c	0.00200	0.00200	0.00200
$f_{c_{int}}$ (MPa)	22.8	22.8	29.1
$\varepsilon_{c_{int}}$	0.00555	0.00383	0.00949
f_u (MPa)	0.001	0.001	0.001
ε_u	0.00911	0.00566	0.01423
f_t (MPa)	0.001	2.23	2.23
$f_{t_{int}}$ (MPa)	0.001	0.001[h]	0.001[h]
$\varepsilon_{t_{int}}$	0.00040	0.00040[h]	0.00040[h]
$f_{t_{res}}$ (MPa)	0.001	0.001[h]	0.001[h]
$\varepsilon_{t_{res}}$	0.00080	0.00080[h]	0.00080[h]
α[f]	161.4	0.5	0.5
β_{int}[f]	-	-	-
$\varepsilon_{n_{int}}$[f]	-	-	-
β_{res}[f]	-	-	-
$\varepsilon_{n_{res}}$[f]	-	-	-
M[f]	-	0.0467	0.10875
E_c[f] (MPa)	33764	33764	33764
f_{cc}'[f] (MPa)	-	-	58.1
ε_{cc}[f]	-	-	0.00475

[a] Also requires a material for shear behavior, which was assumed linear-elastic with effective stiffness $G_c = \left(\frac{1}{10}\right) 0.4E_c$ in this study

[b] Requires additional element parameter c, taken as 0.4 in this study

[c] Requires additional *FSAM* material parameters η and α, taken as 1.0 and 0.002, respectively, in this study

[d] Values for tension and compression

[e] Tension behavior neglected in this study

[f] Optional parameters defined in this study

[g] Same values as for unconfined concrete except for parameters listed below

[h] Dummy values when parameter M is defined