4-1 BRIDGE FOUNDATION LOADS

Table 1. End Supports (Abutments) at Service Limit State

Service Limit State		M_X (kip-ft)		V_Y (kips)		P (kips)[1] Net	
		M_{X_total}	M_{X_perm}	V_{Y_total}	V_{Y_perm}	P_{total}	P_{perm}
Eccentricity	$M_{X\ max}$						
	$M_{X\ min}$						
	P_{total_min}						
	Controlling load combination[2]						
Settlement	$M_{X\ max}$						
	$M_{X\ min}$						
	P_{total_max}						
	Controlling load combination[3]						

Table 2. End Supports (Abutments) at Strength/Construction Limit States

Strength/Construction Limit States		M_X (kip-ft)	V_Y (kips)	P_{total} (kips)[1] Gross
Bearing	$M_{X\ max}$			
	$M_{X\ min}$			
	P_{total_max}			
	Controlling load combination[3]			
Sliding	$V_{Y\ max}$			
	$V_{Y\ min}$			
	P_{total_min}			
	Controlling load combination[4]			

Notes:
1) Axial force (P) is assumed positive if compressive.
2) Controlling load combination is the one resulting in the highest eccentricity.
3) Controlling load combination is the one resulting in the highest $q_{n,u}/q_{pn}$ or $q_{g,u}/q_R$ ratio for foundations on soil, or $q_{n,max}/q_{pn}$ or $q_{g,max}/q_R$ ratio for foundations on rock.
4) Controlling load combination is the one resulting in the highest "factored sliding force/factored sliding resistance" ratio.

Table 3. Intermediate Supports (Bents & Piers) at Service Limit State

Service Limit State		M_X (kip-ft)		M_Y (kips)		P (kips)[1] Net	
		M_{X_total}	M_{X_perm}	M_{Y_total}	M_{Y_perm}	P_{total}	P_{perm}
Eccentricity	$M_{X\ max}$						
	$M_{X\ min}$						
	$M_{Y\ max}$						
	$M_{Y\ min}$						
	P_{total_min}						
	Controlling load combination[2]						
Settlement	$M_{X\ max}$						
	$M_{X\ min}$						
	$M_{Y\ max}$						
	$M_{Y\ min}$						
	P_{total_max}						
	Controlling load combination[3]						

Table 4. Intermediate Supports (Bents & Piers) at Strength Limit State

Strength Limit State		M_X (kip-ft)	M_Y (kip-ft)	V_X (kips)	V_Y (kips)	P_{total} (kips)[1] Gross
Bearing	$M_{X\ max}$					
	$M_{X\ min}$					
	$M_{Y\ max}$					
	$M_{Y\ min}$					
	P_{total_max}					
	Controlling load combination[3]					
Sliding	$V_{X\ max}$					
	$V_{X\ min}$					
	$V_{Y\ max}$					
	$V_{Y\ min}$					
	P_{total_min}					
	Controlling load combination[4]					

Notes:

1) Axial force (P) is assumed positive if compressive.
2) Controlling load combination is the one resulting in the highest eccentricity.
3) Controlling load combination is the one resulting in the highest $q_{n,u}/q_{pn}$ or $q_{g,u}/q_R$ ratio for foundationson on soil, or $q_{n,max}/q_{pn}$ or $q_{g,max}/q_R$ ratio for foundations on rock.
4) Controlling load combination is the one resulting in the highest "factored sliding force/ factored sliding resistance" ratio.

Table 5. Intermediate Supports (Bents & Piers) at Extreme Event-I Limit State (Seismic)

Extreme Event–I Limit State	*M* (kip-ft)		*V* (kips)		*P* (kips)
	M_X	M_Y	V_X	V_Y	P_{Total}
M_{d1} -I[1,2]					
M_{d2} -I					
M_{d3} -I					
M_{d4} -I					
M_{d5} -I					
M_{d6} -I					
M_{d7} -I					
M_{d1} -II					
M_{d2} -II					
M_{d3} -II					
M_{d4} -II					
M_{d5} -II					
M_{d6} -II					
M_{d7} -II					

Notes:

1) M_{d1}-M_{d7} stand for cases where seismic overstrength moment (M_o) and associated shear (V_o) are applied at 15 degree increments (0°- 90°) to a symmetrical spread footing.
2) Cases I and II correspond to highest and lowest column axial forces resulted from seismic overturning in multicolumn bents. For single-column bents the two cases (I and II) will be summarized into one case.