

## Errata

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### First Printing of ASCE 7-02 Minimum Design Loads for Buildings and Other Structures

#### Section 9.2.2 Symbols (Changes are shown in BOLD for emphasis only)

**9.2.2 Symbols** The unit dimensions used with the items covered by the symbols shall be consistent throughout except where specifically noted. The symbols and definitions presented in this section apply to these provisions as indicated.

- $A, B, C, D, E, F$  = Seismic Performance Categories as defined in Tables 9.4.2.1a and 9.4.2.1b
- $A, B, C, D, E, F$  = Site Classes as defined in Section **9.4.1.2.1** **9.4.1.2**
- $A_{ch}$  = cross-sectional area (in.<sup>2</sup> or mm<sup>2</sup>) of a component measured to the outside of the special lateral reinforcement
- $A_0$  = area of the load-carrying foundation (ft<sup>2</sup> or m<sup>2</sup>)
- $A_{sh}$  = total cross-sectional area of hoop reinforcement (in.<sup>2</sup> or mm<sup>2</sup>), including supplementary cross-ties, having a spacing of  $s_h$  and crossing a section with a core dimension of  $h_c$
- $A_{vd}$  = required area of leg (in.<sup>2</sup> or mm<sup>2</sup>) of diagonal reinforcement
- $A_x$  = torsional amplification factor, Section **9.5.5.2** **9.5.3.5.2**
- $a_d$  = incremental factor related to  $P$ -delta effects in Section **9.5.5.7.2** **9.5.3.7.2**
- $a_p$  = the amplification factor related to the response of a system or component as affected by the type of seismic attachment, determined in Section 9.6.1.3
- $B_D$  = numerical coefficient as set forth in Table 9.13.3.3.1 for effective damping equal to  $\beta_D$
- $B_M$  = numerical coefficient as set forth in Table 9.13.3.3.1 for effective damping equal to  $\beta_M$
- $b$  = shortest plan dimension of the structure, in ft (mm) measured perpendicular to  $d$
- $C_d$  = deflection amplification factor as given in Table 9.5.2.2
- $C_s$  = seismic response coefficient determined in Section **9.5.5.2.1** and **9.5.9.3.1** **9.5.3.2** (dimensionless)
- ~~$C_s$  = seismic response coefficient determined in Sections **9.5.9.2.1** and **9.5.9.3.1** **9.5.5.2.1** and **9.5.5.3.1** (dimensionless)~~
- $C_{sm}$  = modal seismic response coefficient determined in Section **9.5.6.5** **9.5.4.5** (dimensionless)
- $C_T$  = building period coefficient in Section **9.5.5.3** **9.5.3.3**
- $C_{vx}$  = vertical distribution factor as determined in Section **9.5.5.4** **9.5.3.4**
- $c$  = distance from the neutral axis of a flexural member to the fiber of maximum compressive strain (in. or mm)
- $D$  = the effect of dead load

- $D_D$  = design displacement, in in. (mm), at the center of rigidity of the isolation system in the direction under consideration as prescribed by Eq. 9.13.3.3.1  
 $D_D'$  = design displacement, in in. (mm), at the center of rigidity of the isolation system in the direction under consideration, as prescribed by Eq. 9.13.4.2-1  
 $D_M$  = maximum displacement, in in. (mm), at the center of rigidity of the isolation system in the direction under consideration, as prescribed by Eq. 9.13.3.3.3  
 $D_M'$  = maximum displacement, in in. (mm), at the center of rigidity of the isolation system in the direction under consideration, as prescribed by Eq. 9.13.4.2-2  
 $D_p$  = relative seismic displacement that the component must be designed to accommodate as defined in Section 9.6.1.4  
 $D_s$  = the total depth of the stratum in Eq. **9.5.9.2.1.2-4** **9.5.5.2.1.2-4** (ft or m)  
 $D_{TD}$  = total design displacement, in in. (mm), of an element of the isolation system including both translational displacement at the center of rigidity and the component of torsional displacement in the direction under consideration as prescribed by Eq. 9.13.3.3.5-1  
 $D_{TM}$  = total maximum displacement, in in. (mm), of an element of the isolation system including both translational displacement at the center of rigidity and the component of torsional displacement in the direction under consideration as prescribed by Eq. 9.13.3.3.5-2  
 $d$  = overall depth of member (in. or mm) in Section 9.5  
 $d$  = longest plan dimension of the structure, in ft (mm), in Section 9.13  
 $d_p$  = the longest plan dimension of the structure, in ft (mm)  
 $E$  = effect of horizontal and vertical earthquake-induced forces (Sections 9.5.2.7 and 9.13)  
 $E_{loop}$  = energy dissipated in kip-in. (kN-mm), in an isolator unit during a full cycle of reversible load over a test displacement range from  $\Delta^+$  to  $\Delta^-$ , as measured by the area enclosed by the loop of the force-deflection curve  
 $e$  = actual eccentricity, in ft (mm), measured in plan between the center of mass of the structure above the isolation interface and the center of rigidity of the isolation system, plus accidental eccentricity, in ft (mm), taken as 5% of the maximum building dimension perpendicular to the direction of force under consideration  
 $F_a$  = acceleration-based site coefficient (at 0.3 sec-period)  
 $F^-$  = maximum negative force in an isolator unit during a single cycle of prototype testing at a displacement amplitude of  $\Delta^-$   
 $F^+$  = positive force in kips (kN) in an isolator unit during a single cycle of prototype testing at a displacement amplitude of  $\Delta^+$   
 $F_i, F_n, F_x$  = portion of the seismic base shear,  $V$ , induced at Level  $i, n$ , or  $x$ , respectively, as determined in Section **9.5.5.4** **9.5.3.4**  
 $F_p$  = the seismic force acting on a component of a structure as determined in Section **9.6.1.3** **9.5.2.6.1.1, 9.5.2.5.1.3, 9.5.2.6.1.4, or 9.6.1.3**  
 $F_v$  = velocity-based site coefficient (at 1.0 sec-period)  
 $F_x$  = total force distributed over the height of the structure above the isolation interface as prescribed by Eq. 9.13.3.5  
 $F_{xm}$  = portion of the seismic base shear,  $V_m$ , induced at Level  $x$  as determined in Section **9.5.5.6** **9.5.4.6**  
 $f_c'$  = specified compressive strength of concrete used in design

- $f_s'$  = ultimate tensile strength (psi or MPa) of the bolt, stud, or insert leg wires. For A307 bolts or A108 studs, it is permitted to be assumed to be 60,000 psi (415 MPa).
- $f_y$  = specified yield strength of reinforcement (psi or MPa)
- $f_{yh}$  = specified yield stress of the special lateral reinforcement (psi or kPa)
- $G$  =  $\lambda v_s^2/g$  = the average shear modulus for the soils beneath the foundation at large strain levels (psf or Pa)
- $G_0$  =  $\lambda v_{s0}^2/g$  = the average shear modulus for the soils beneath the foundation at small strain levels (psf or Pa)
- $g$  = acceleration due to gravity
- $H$  = thickness of soil
- $h$  = height of a shear wall measured as the maximum clear height from top of foundation to bottom of diaphragm framing above, or the maximum clear height from top of diaphragm to bottom of diaphragm framing above
- ~~$h$  = roof elevation of a structure in Section 9.6 This definition for  $h$  is not used in Section 9, Appendix A.9, or their commentaries.~~
- $h$   $\bar{h}$  = effective height of the building as determined in Section 9.5.9.2 or 9.5.9.3 9.5.5.2 or 9.5.5.3 (ft or m)
- $h_c$  = core dimension of a component measured to the outside of the special lateral reinforcement (in. or mm)
- $h_i, h_n, h_x$  = the height above the base Level  $i, n,$  or  $x,$  respectively
- $h_{sx}$  = the story height below Level  $x = (h_x - h_{x-1})$
- $I$  = the occupancy importance factor in Section 9.1.4
- $I_0$  = the static moment of inertia of the load-carrying foundation; see Section 9.5.9.2.1 9.5.5.2.1 (in.<sup>4</sup> or mm<sup>4</sup>)
- $I_p$  = the component importance factor as prescribed in Section 9.6.1.5
- $i$  = the building level referred to by the subscript  $i$ ;  $i = 1$  designates the first level above the base
- $K_p$  = the stiffness of the component or attachment, Section 9.6.3.3
- $K_y$  = the lateral stiffness of the foundation as defined in Section 9.5.9.2.1.1 9.5.5.2.1.1 (lb/in. or N/m)
- $K_\theta$  = the rocking stiffness of the foundation as defined in Section 9.5.9.2.1.1 9.5.5.2.1.1 (ft-lb/degree or N-m/rad)
- $KL/r$  = the lateral slenderness of a compression member measured in terms of its effective buckling length,  $KL,$  and the least radius of gyration of the member cross section,  $r$
- $K_{Dmax}$  = maximum effective stiffness, in kips/in. (kN/mm), of the isolation system at the design displacement in the horizontal direction under consideration as prescribed by Eq. 9.13.9.5.1-1
- $K_{Dmin}$  = minimum effective stiffness, in kips/in. (kN/mm), of the isolation system at the design displacement in the horizontal direction under consideration as prescribed by Eq. 9.13.9.5.1-2
- $K_{max}$  = maximum effective stiffness, in kips/in. (kN/mm), of the isolation system at the maximum displacement in the horizontal direction under consideration as prescribed by Eq. 9.13.9.5.1-3
- $K_{min}$  = minimum effective stiffness, in kips/in. (kN/mm), of the isolation system at the maximum displacement in the horizontal direction under consideration, as prescribed by Eq. 9.13.9.5.1-4

- $k$  = distribution exponent given in Section 9.5.5.4 9.5.3.4  
 $k^-$  = stiffness of the building as determined in Section 9.5.9.2.1.1 ~~9.5.5.2.1.1~~ (lb/ft or N/m)  
 $k_{eff}$  = effective stiffness of an isolator unit, as prescribed by Eq. 9.13.9.3-1  
 $L$  = overall length of the building (ft or m) at the base in the direction being analyzed  
 $L$  = length of bracing member (in. or mm) in Section A.9.8  
 $L$  = effect of live load in Section 9.13  
 $L_0$  = overall length of the side of the foundation in the direction being analyzed, Section 9.5.9.2.1.2 9.5.5.2.1.2 (ft or m)  
 $l$  = dimension of a diaphragm perpendicular to the direction of application of force. For open-front structures,  $l$  is the length from the edge of the diaphragm at the open-front to the vertical resisting elements parallel to the direction of the applied force. For a cantilevered diaphragm,  $l$  is the length of the cantilever.  
 $M_f$  = foundation overturning design moment as defined in Section 9.5.5.6 9.5.3.6 (ft-kip or kN-m)  
 $M_0, M_{0l}$  = the overturning moment at the foundation-soil interface as determined in Sections 9.5.9.2.3 and 9.5.9.3.2 ~~9.5.5.2.3~~ and 9.5.5.3.2 (ft-lb or N-m)  
 ~~$M_f$  = foundation overturning design moment as defined in Section 9.5.3.6~~  
 $M_t$  = torsional moment resulting from the location of the building masses, Section 9.5.5.5.2 9.5.3.5.2  
 $M_{ta}$  = accidental torsional moment as determined in Section 9.5.5.5.2 9.5.3.5.2  
 $M_x$  = building overturning design moment at Level  $x$  as defined in Section 9.5.5.6 9.5.3.6 or 9.5.4.7  
 $m$  = a subscript denoting the mode of vibration under consideration; i.e.,  $m = 1$  for the fundamental mode  
 $N$  = number of stories, Section 9.5.5.3.2 9.5.3.3  
 $N$  = standard penetration resistance, ASTM D1536-84  
 $\bar{N}$  = Average field standard penetration resistance for the top 100 ft (30 m); see Section 9.4.1.2.1 9.4.1.2  
 $N_{ch}$  = average standard penetration resistance for cohesionless soil layers for the top 100 ft (30 m); see Section 9.4.1.2.1 9.4.1.2  
 $n$  = designates the level that is uppermost in the main portion of the building  
 $P_D$  = required axial strength on a column resulting from application of dead load,  $D$ , in Section 9.5 (kip or kN)  
 $P_E$  = required axial strength on a column resulting from application of the amplified earthquake load,  $E'$ , in Section 9.5 (kip or kN)  
 $P_L$  = required axial strength on a column resulting from application of live load,  $L$ , in Section 9.5 (kip or kN)  
 $P_n$  = nominal axial load strength (lb or N) in A.9.8  
 $P_n$  = algebraic sum of the shear wall and the minimum gravity loads on the joint surface acting simultaneously with the shear (lb or N)  
 $P_u^*$  = required axial strength on a brace (kip or kN) in Section A.9.8  
 $P_x$  = total unfactored vertical design load at and above Level  $x$ , for use in Section 9.5.5.7.2 9.5.3.7.2  
 $PI$  = plasticity index, ASTM D4318-93  
 $Q_E$  = effect of horizontal seismic (earthquake-induced) forces, Section 9.5.2.7

- $Q_v$  = load equivalent to the effect of the horizontal and vertical shear strength of the vertical segment, Section A.9.8  
 $R$  = response modification coefficient as given in Table 9.5.2.2  
 $R_p$  = component response modification factor as defined in Section 9.6.1.3  
 $r$  = a characteristic length of the foundation as defined in Section ~~9.5.9.2.1~~ ~~9.5.5.2.1~~  
 $r_a$  = characteristic foundation length as defined by Eq. 9.5.9.2.1.1-5 ~~Eq. 9.5.5.2.1.2-2~~ (ft or m)  
 $r_m$  = characteristic foundation length as defined by Eq. 9.5.9.2.1.1-6 ~~Eq. 9.5.5.2.1.2-3~~ (ft or m)  
 $r_x$  = ratio of the design story shear resisted by the most heavily loaded single element in the story, in direction x, to the total story shear  
 $S_S$  = mapped maximum considered earthquake, 5% damped, spectral response acceleration at short periods as defined in Section 9.4.1.2  
 $S_I$  = mapped maximum considered earthquake, 5% damped, spectral response acceleration at a period of 1 sec as defined in Section 9.4.1.2  
 $S_{DS}$  = design, 5% damped, spectral response acceleration at short periods as defined in Section 9.4.1.2  
 $S_{DI}$  = design, 5% damped, spectral response acceleration at a period of 1 sec as defined in Section 9.4.1.2  
 $S_{MS}$  = the maximum considered earthquake, 5% damped, spectral response acceleration at short periods adjusted for site class effects as defined in Section 9.4.1.2  
 $S_{MI}$  = the maximum considered earthquake, 5% damped, spectral response acceleration at a period of 1 sec adjusted for site class effects as defined in Section 9.4.1.2  
 $\bar{s}_u$  = average undrained shear strength in top 100 ft (30 m); see Section 9.4.1.2, ASTM D2166-91 or ASTM D2850-87  
 $s_h$  = spacing of special lateral reinforcement (in. or mm)  
 $T$  = the fundamental period of the building as determined in Section ~~9.5.5.2.1~~ ~~9.5.3.2.1~~  
 ~~$\tilde{T}, \tilde{T}_1, T, T_1$~~  = the effective fundamental period (sec) of the building as determined in Sections 9.5.9.2.1.1 and 9.5.9.3.1 ~~9.5.5.2.1.1 and 9.5.5.3.1~~  
 $T_a$  = approximate fundamental period of the building as determined in Section 9.5.5.3 ~~9.5.3.3~~  
 $T_D$  = effective period, in sec, of the seismically isolated structure at the design displacement in the direction under consideration as prescribed by Eq. 9.13.3.3.2  
 $T_m$  = modal period of vibration of the  $m^{\text{th}}$  mode of the building as determined in Section 9.5.6.5 ~~9.5.4.5~~  
 $T_M$  = effective period, in sec, of the seismically isolated structure at the maximum displacement in direction under consideration as prescribed by Eq. 9.13.3.3.4  
 $T_p$  = fundamental period of the component and its attachment, Section 9.6.3.3  
 $T_0$  =  $0.2S_{D1}/S_{DS}$   
 $T_S$  =  $S_{D1}/S_{DS}$   
 $T_M$  = effective period, in sec, of the seismically isolated structure at the maximum displacement in direction under consideration as prescribed by Eq. 9.13.3.3.4  
 ~~$T_m$  = modal period of vibration (sec) of the  $m^{\text{th}}$  mode of the building as determined in Section 9.5.4.5~~  
 $T_4$  = net tension in steel cable due to dead load, pre-stress, live load, and seismic load (Section A.9.8.8)

- $V$  = total design lateral force or shear at the base, Section 9.5.5.2 ~~9.5.3.2~~  
 $V_b$  = total lateral seismic design force or shear on elements of the isolation system or elements below isolation system as prescribed by Eq. 9.13.3.4.1  
 $V_s$  = total lateral seismic design force or shear on elements above the isolation system as prescribed by Eq. 9.13.3.4.2  
 $V_t$  = design value of the seismic base shear as determined in Section 9.5.6.8 ~~9.5.4.8~~  
 $V_u$  = required shear strength (lb or N) due to factored loads in Section 9.6  
 $V_x$  = seismic design shear in story  $x$  as determined in Section 9.5.5.5 or 9.5.6.8 ~~9.5.3.5 or 9.5.4.8~~  
 $\bar{V}_1$  = portion of the seismic base shear,  $V$ , contributed by the fundamental mode, Section 9.5.9.3 ~~9.5.5.3~~ (kip or kN)  
 $\Delta V$  = reduction in  $V$  as determined in Section 9.5.9.2 ~~9.5.5.2~~ (kip or kN)  
 $\Delta V_1$  = reduction in  $V_1$  as determined in Section 9.5.9.3 ~~9.5.5.3~~ (kip or kN)  
 $v_s$  = average shear wave velocity for the soils beneath the foundation at large strain levels, Section 9.5.9.2 ~~9.5.5.2~~ (ft/s or m/s)  
 $\bar{v}_s$  = average shear wave velocity in top 100 ft (30 m); see Section 9.4.1.2  
 $v_{so}$  = average shear wave velocity for the soils beneath the foundation at small strain levels, Section 9.5.9.2 ~~9.5.5.2~~ (ft/s or m/s)  
 $W$  = total gravity load of the building as defined in Section 9.5.5.2 ~~9.5.3.2~~. For calculation of seismic-isolated building period,  $W$  is the total seismic dead load weight of the building as defined in Sections 9.5.9.2 and 9.5.9.3 ~~9.5.5.2 and 9.5.5.3~~ (kip or kN)  
 $\bar{W}$  = effective gravity load of the building as defined in Sections 9.5.9.2 and 9.5.9.3 ~~9.5.5.2 and 9.5.5.3~~ (kip or kN)  
 $W_c$  = gravity load of a component of the building  
 $W_D$  = energy dissipated per cycle at the story displacement for the design earthquake; see Section 9.13.3.2  
 $W_m$  = effective modal gravity load determined in accordance with Eq. 9.5.6.5-2 ~~9.5.4.5-2~~  
 $W_p$  = component operating weight (lb or N)  
 $w$  = width of a diaphragm or shear wall in the direction of application of force. For sheathed diaphragms, the width shall be defined as the dimension between the outside faces of the tension and compression chords.  
 $w$  = moisture content (in percent), ASTM D2216-92  
 $w_i, w_n, w_x$  = portion of  $W$  that is located at or assigned to Level  $i, n,$  or  $x,$  respectively  
 $x$  = level under consideration  
 $x$  = 1 designates the first level above the base  
 $y$  = elevations difference between points of attachment in Section 9.6  
 $y$  = distance, in ft (mm), between the center of rigidity of the isolation system rigidity and the element of interest measured perpendicular to the direction of seismic loading under consideration, Section 9.13  
 $z$  = level under consideration;  $x = 1$  designates the first level above the base  
 $\alpha$  = relative weight density of the structure and the soil as determined in Section 9.5.9.2.1.1 ~~9.5.5.2.1~~  
 $\alpha$  = angle between diagonal reinforcement and longitudinal axis of the member (degree or rad)

- $\beta$  = ratio of shear demand to shear capacity for the story between Level  $x$  and  $x - 1$   
 $\tilde{\beta}$  = fraction of critical damping for the coupled structure-foundation system, determined in Section 9.5.9.2.1 9.5.5.2.1  
 $\beta_D$  = effective damping of the isolation system at the design displacement as prescribed by Eq. 9.13.9.5.2-1  
 $\beta_M$  = effective damping of the isolation system at the maximum displacement as prescribed by Eq. 9.13.5.2-2  
 $\beta_0$  = foundation damping factor as specified in Section 9.5.9.2.1 9.5.5.2.1  
 $\beta_{eff}$  = effective damping of the isolation system as prescribed by Eq. 9.13.9.3-2  
 $\gamma$  = average unit weight of soil (lb/ft<sup>3</sup> or kg/m<sup>3</sup>)  
 $\Delta$  = design story drift as determined in Section 9.5.5.7.1 9.5.3.7.1  
 $\Delta_a$  = allowable story drift as specified in Section 9.5.2.8  
 $\Delta_m$  = design modal story drift determined in Section 9.5.6.6 9.5.4.6  
 $\Delta^+$  = maximum positive displacement of an isolator unit during each cycle of prototype testing  
 $\Delta^-$  = maximum negative displacement of an isolator unit during each cycle of prototype testing  
 $\delta_{max}$  = maximum displacement at Level  $x$ , considering torsion, Section 9.5.5.5.2 9.5.3.5.2  
 $\delta_{avg}$  = the average of the displacements at the extreme points of the structure at Level  $x$ , Section 9.5.5.5.2 9.5.3.5.2  
 $\delta_x$  = deflection of Level  $x$  at the center of the mass at and above Level  $x$ , Eq. 9.5.5.7.1 9.5.3.7.1  
 $\delta_{xe}$  = deflection of Level  $x$  at the center of the mass at and above Level  $x$  determined by an elastic analysis, Section 9.5.5.7.1 9.5.3.7.1  
 $\delta_{xem}$  = modal deflection of Level  $x$  at the center of the mass at and above Level  $x$  determined by an elastic analysis, Section 9.5.6.6 9.5.4.6  
 $\delta_{xm}$  = modal deflection of Level  $x$  at the center of the mass at and above Level  $x$  as determined by Eqs. 9.5.4.6-3 and 9.13.3.2-1  
 $\tilde{\delta}_x, \tilde{\delta}_{xl}$   ~~$\delta_x, \delta_{xl}$~~  = deflection of Level  $x$  at the center of the mass at and above Level  $x$ , Eqs. 9.5.9.2.3-1 and 9.5.9.3.2-1 ~~9.5.5.2.3-1 and 9.5.5.3.2-1~~ (in. or mm)  
 $\theta$  = stability coefficient for  $P$ -delta effects as determined in Section 9.5.5.7.2 9.5.3.7.2  
 $\iota$  = overturning moment reduction factor, Eq. 9.5.3.6  
 $\rho$  = a reliability coefficient based on the extent of structural redundancy present in a building as defined in Section 9.5.2.7  
 $\rho_s$  = spiral reinforcement ratio for precast, prestressed piles in Sections A.9.7.4.4.5 and A.9.7.5.4.4  
 $\rho_x$  = a reliability coefficient based on the extent of structural redundancy present in the seismic force-resisting system of a building in the  $x$  direction  
 $\lambda$  = time effect factor  
 $\varphi$  = capacity reduction factor  
 $\varphi$  = strength reduction factor or resistance factor  
 $\varphi_{im}$  = displacement amplitude at the  $i^{\text{th}}$  level of the building for the fixed-base condition when vibrating in its  $m^{\text{th}}$  mode, Section 9.5.6.5 9.5.4.5  
 $\Omega_0$  = overstrength factor as defined in Table 9.5.2.2

- $\Sigma E_D$  = total energy dissipated, in kip-in. (kN-mm), in the isolation system during a full cycle of response at the design displacement,  $D_D$
- $\Sigma E_M$  = total energy dissipated, in kip-in. (kN-mm), in the isolation system during a full cycle of response at the maximum displacement,  $D_M$
- $\Sigma F_D^+|_{max}$  = sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a positive displacement equal to  $D_D$
- $\Sigma |F_D^+|_{min}$  = sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a positive displacement equal to  $D_D$
- $\Sigma |F_D^-|_{max}$  = sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a negative displacement equal to  $D_D$
- $\Sigma |F_D^-|_{min}$  = sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a negative displacement equal to  $D_D$
- $\Sigma |F_M^+|_{max}$  = sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a positive displacement equal to  $D_M$
- $\Sigma |F_M^+|_{min}$  = sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a positive displacement equal to  $D_M$
- $\Sigma |F_M^-|_{max}$  = sum, for all isolator units, of the maximum absolute value of force, in kips (kN), at a negative displacement equal to  $D_M$
- $\Sigma |F_M^-|_{min}$  = sum, for all isolator units, of the minimum absolute value of force, in kips (kN), at a negative displacement equal to  $D_M$