Decoding Eurocode 7

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Symbols

A	accidental action
A (A')	area (effective area)
A_b (A'_b)	area of base, (effective area of base)
A_n	contact area
A_s	area of steel
A_s ($A_{s,D}$)	area of pile shaft (through consolidating layer)
A_E	seismic action
a	adhesion between ground and wall
a (a_{nom}, a_d)	dimension (nominal, design)
B (B')	breadth (effective breadth)
b (b_B, b_F, b_g)	breadth (of raft, of foundation, of pile group)
b_c, b_q, b_γ	base inclination factors
C_d	limiting value of an effect of an action
C_u	uniformity coefficient
C_c	coefficient of curvature and compression index
c' (c'_k, c'_d)	effective cohesion (characteristic, design)
c'_R	residual effective cohesion
c_u (c_{uk}, c_{ud})	undrained shear strength (characteristic, design)
c_v	coefficient of consolidation
D	diameter; depth of footing below ground level
D_G (D_{Gk}, D_{Gd})	downdrag (characteristic value, design value)
d (d_o, d_w)	depth, (of embedment, to water table)
d_n	particle size, where n%of the soil smaller than this size
d_c, d_q, d_γ	depth factors
E (E_k, E_d)	effect of actions (characteristic, design)
$E_{d,dst}/E_{d,stb}$	destabilizing/stabilizing design effect of actions
E (E_{oed}, E_{plt})	Young's Modulus (oedometer, plate-loading)
e (e_{max}, e_{min})	voids ratio (maximum, minimum)
e_B (e_L)	eccentricity in the direction of B (of L)
F (F_s, F_b, F_o)	factor of safety (for sliding or shaft capacity, for base capacity, for overturning)
F (F_k, F_{rep}, F_d)	force or action (characteristic, representative, design)
f	settlement coefficient
f_y	yield strength of steel
f_c	compressive strength of concrete

G	shear modulus
G (G_k, G_{rep}, G_d)	permanent action (characteristic, representative, design)
G' (G'_k, G'_d)	submerged weight of soil column (characteristic, design)
g	acceleration due to gravity
g_c, g_q, g_γ	ground inclination factors
H (H_{nom}, H_d)	retained height (nominal, design)
H (H_k, H_{rep}, H_d)	horizontal force or action (characteristic, representative, design)
H_R (H_{Rk}, H_{Rd})	sliding resistance (characteristic, design)
h (h_w)	height (of water)
I_c, I_L, I_P	consistency index, liquidity index, plasticity index
I_D	density index
I_q	influence factor
i (i_k, i_d)	hydraulic gradient (characteristic, design)
i_{crit}	critical hydraulic gradient
i_c, i_q, i_γ	load inclination factors
K (K_a, K_o, K_p)	earth pressure coefficient (active, at-rest, passive)
$K_{a\gamma}$, K_{aq}, K_{ac}	components of active earth pressure coefficient
$K_{p\gamma}$, K_{pq}, K_{pc}	components of passive earth pressure coefficient
K_n	auxiliary coefficient
k	permeability; coefficient of sub-grade reaction; factor used in deriving shape factors
k_n	statistical coefficient dependent on sample size 'n'
L (L')	length (effective length)
M	bending moment
M (M_R, M_O)	moment about a point (restoring, overturning)
m_x	mean value of X, variance unknown
m_v (m_{vk})	coefficient of compression/volume compressibility (characteristic)
N	size of the population
N (N_{60}, $(N_1)_{60}$)	SPT blow count (corrected for 60% energy, corrected for energy and effective stress)
N (N_k, N_d)	stability number (characteristic, design)
N_c, N_q, N_γ	bearing capacity factors
N^*_c, N^*_q, N^*_γ	modified bearing capacity factors
n	number of samples
P	pre-stress actions; applied load
P_a (P'_a)	active earth thrust (effective)
P_p (P'_p)	passive earth thrust (effective)
P_p	proof load of anchor
P_d	design anchor force
P_0	lock-off load in anchor
$P_{t,k}$	tendon characteristic tensile load capacity

$P_{t0.1,k}$	characteristic tensile load at 0.1% strain
$P(X, \lambda, \zeta)$	probability density function
p_{ult}	ultimate load from plate test
Q (Q_a, Q_{ult})	load (allowable, ultimate)
Q_{ult} ($Q_{s,ult}$, $Q_{b,ult}$)	ultimate pile capacity (shaft, base)
Q_i (Q_{ki}, Q_{di})	surcharge on slice (characteristic, design)
Q (Q_k, Q_{rep}, Q_d)	variable action (characteristic, representative, design)
Q_{ult}	ultimate bearing resistance
q	surcharge
q (q')	overburden pressure (effective)
q_0	overburden pressure
q (q_a, q_{ult})	bearing capacity (allowable, ultimate)
q_c	cone resistance
q_{Ek}	characteristic bearing pressure
q_{Ed}	design bearing pressure
q_{Rk}	characteristic bearing resistance
q_{Rd}	design bearing resistance
q_u	unconfined compressive strength
q_{bk}	characteristic unit pile base resistance
q_{sk}	characteristic unit pile shaft resistance
R (R_k, R_d)	resistance (characteristic, design)
R_b (R_{bk}, R_{bd})	base resistance (characteristic, design)
R_s (R_{sk}, R_{sd})	shaft resistance (characteristic, design)
R_c (R_{ck}, R_{cd})	compressive resistance (characteristic, design)
R_t (R_{tk}, R_{td})	tensile resistance (characteristic, design)
R_m	measured resistance
R_{cal}	calculated resistance
R_a ($R_{a,k}$, $R_{a,d}$)	anchorage pull-out resistance (characteristic, design)
r	radius of circle
r_u	pore pressure parameter
S	shear resistance to sliding
$S_{d,dst}$	design seepage force
s (s_0, s_1, s_2)	settlement (immediate, consolidation, creep)
s_{Ed}	calculated settlement under the design actions
s_{Cd}	maximum tolerable settlement
s_x	sample's standard deviation
s_c, s_q, s_γ	shape factors
T	measured torque in vane test
T (T_k, T_d)	tensile vertical action (characteristic, design)
t_∞	Student's t-value
t	depth embedment of gravity retaining wall
t_s	thickness of wall stem
t_b	thickness of wall base

U_a	water pressure force on active side of wall
U_{ah}	horizontal component of water pressure force on active side of wall
U_{av}	vertical component of water pressure force on active side of wall
U_{ad}	design water pressure force on active side of wall
U_v	uplift vertical water pressure force
U_h	horizontal water pressure force
U_k	characteristic uplift water pressure force
U_{Gk}	characteristic uplift water pressure force
U_{Gd}	design uplift water pressure force
u	pore pressure
u_k	characteristic pore pressure
u_d	design pore pressure
$u_{k,dst}$	characteristic destabilizing pore pressure
$u_{d,dst}$	design destabilizing pore pressure
V	vertical force
V_x	sample's coefficient of variation
V_{rep}	representative total vertical action
V_{Gk}	characteristic permanent vertical action
V'_{Gk}	characteristic permanent effective vertical action
V_{qk}	characteristic variable vertical action
V_d	design vertical action
V_{Gd}	design permanent vertical action
V'_{Gd}	design permanent effective vertical action
$V_{d,dst}$	total design destabilizing action
$V_{d,stb}$	total design stabilizing action
v	velocity
v_a	horizontal movement active
v_p	horizontal movement passive
W	self weight of foundation
W'	submerged weight
W_d	design self-weight
W_i	self-weight of slice
W_{ki}	characteristic self-weight of slice
W_{di}	design self-weight of slice
W_{Gk}	characteristic permanent self-weight
w	water content
w_L	liquid limit
w_P	plastic limit
X	value of material property
$X_{k,j}$	characteristic material property
$X_{k,inf}$	lower (inferior) characteristic value of material property

$X_{k,sup}$	upper (superior) characteristic value of material property
$X_{d,i}$	design material property
X_i	inter-slice horizontal force
x_i	lever arm of slice
Z_a	depth on investigation points
z	depth
α	angular strain; shaft adhesion factor for piles
α_i	angle of base of slice
β	K tan δ; slope of back fill or other surface; relative rotation; angular distortion
β_k	characteristic slope of back fill or other surface
β_d	design slope of back fill or other surface
γ (γ_s, γ_w, γ′)	weight density (of soil, of water, submerged)
γ_k (γ_{ck})	characteristic weight density of soil (of concrete)
γ_i	load factor in AASHTO LRFD method
$\gamma_F/\gamma_{F,fav}$	partial factor on unfavourable/favourable action
$\gamma_{F,dst}/\gamma_{F,stb}$	partial factor on destabilizing/stabilizing action
$\gamma_G/\gamma_{G,fav}$	partial factor on unfavourable/favourable permanent action
γ_Q	partial factor on unfavourable variable actions
γ_A	partial factor on unfavourable accidental actions
γ_M	partial factor on material properties
γ_φ	partial factor on coefficient of shearing resistance
$\gamma_{c'}$	partial factor on effective cohesion
γ_{cu}	partial factor on undrained shear strength
γ_{qu}	partial factor on unconfined compressive strength
γ_{Rd}	partial factor on resistance; model factor
γ_R (γ_{Rv}, γ_{Rh})	partial factor on resistance (bearing, sliding)
γ_{Rsls}	partial factor on resistance for satisfying SLS conditions
γ_{Re}	partial factor on earth resistance
γ_a	partial factor on prestressed anchorage resistance
γ_b	partial factor on pile base resistance
γ_s	partial factor on pile shaft resistance
γ_{st}	partial factor on pile tensile shaft resistance
γ_t	partial factor on total pile resistance
Δ	relative deflection
Δa	margin or tolerance on nominal dimension
ΔH	increase in retained height
Δs	differential settlement
Δu	excess pore pressure
$\Delta\sigma_v$	change in total vertical stress
δ (δ_k, δ_d)	angle of interface friction (characteristic, design)

δ	lateral deflection
δs	differential settlement
δ_x	coefficient of variance of the population, variance known
ε	error at depth z
ζ	standard deviation of ln(X)
η_i	load modifier in AASHTO LRFD method
θ	rotation; angle of back face of wall or virtual back
κ_N	statistical coefficient dependent on the size of the population variance known
Λ (Λ_{EQU}, Λ_{GEO}, Λ_{STR}, Λ_{HYD}, Λ_{UPL}, Λ_{SLS})	degree of utilization (for limit state EQU, GEO, STR, HYD, UPL, SLS)
λ	mean value of ln (X)
μ_x	mean value of X, variance known
ξ	reduction factor applied to unfavourable permanent actions; correlation factors applied to pile test results
ξ_a	correlation factor applied to anchorage suitability tests
ρ	bulk density
ρ_c	density of concrete; consolidation settlement
σ_x	standard deviation of the population, variance known
σ_x^2	variance of the population
σ_v	vertical total stress
σ_{vk}	characteristic vertical total stress
σ_{vd}	design vertical total stress
$\sigma_{v,b}$	vertical total stress at pile base
σ_h	horizontal total stress
σ_n	normal total stress
σ_{nk}	characteristic normal total stress
σ_{nd}	design normal total stress
σ'_h	horizontal effective stress
σ'_{hk}	characteristic horizontal effective stress
σ'_{hd}	design horizontal effective stress
σ'_v	vertical effective stress
σ'_{vk}	characteristic vertical effective stress
σ'_{vd}	design vertical effective stress
σ'_n	normal effective stress
σ'_{nk}	characteristic normal effective stress
σ'_{nd}	design normal effective stress
σ_a (σ'_a)	total active stress (effective)
σ_{ah}	horizontal component of active total stress
σ_p	passive total stress
σ'_p	passive effective stress

σ'_{ah}	horizontal component of active effective stress
$\sigma_{d,stb}$	design stabilizing total stress
σ'_{d}	design effective stress
φ	resistance factor in AASHTO LRFD method
φ (φ_k, φ_d)	effective angle of shearing resistance (characteristic, design)
φ_{cv} ($\varphi_{cv,d}$)	constant volume effective angle of shearing resistance (design)
φ_{pk}	characteristic peak effective angle of shearing resistance
φ_R	residual effective angle of shearing resistance
τ_E (τ_{Ek}, τ_{Ed})	shear stress/effect (characteristic, design)
τ_R (τ_{Rk}, τ_{Rd})	shear resistance (characteristic, design)
ψ, ψ_0, ψ_1, ψ_2	combination factors
ω	tilt

Common subscripts

A	accidental
a	active
a	allowable
b	base
c	compressive
cv	at constant volume
d	design
dst	destabilizing
Ed	design effect
fav	favourable
G	permanent
h	horizontal
k	characteristic
net	net value
nom	nominal
p	passive
Q	variable
Rd	design resistance
rep	representative
SLS	serviceability limit state
s	shaft
stb	stabilizing
t	tensile
t	total
v	vertical
ULS	ultimate limit state
u	undrained

ult	ultimate