

fib Model Code for Concrete Structures 2010





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Notations

Meaning of roman capital letters

A	area
C	torsional moment of inertia; serviceability constraints
D	fatigue damage factor; diffusion coefficient
E	modulus of elasticity; earthquake action; load (action) effect
F	action in general; local loading
G	permanent action; shear modulus
H	horizontal component of a force
I	second moment of a plane area
J	creep function
K	(permeability) coefficient
M	bending moment; coefficient of water absorption; safety margin
N	axial force
P	force
Q	variable action
R	resistance; strength (resisting load effect); reaction at a support; resultant
S	static moment of a plane area
T	torsional moment; temperature
V	shear force, volume
W	modulus of inertia
X	material or soil properties in general; reaction or force in general, parallel to x axis
Y	reaction or force in general, parallel to y axis
Z	reaction or force in general, parallel to z axis

NOTE: Roman capital letters can be used to denote types of material, e.g. C for concrete, LC for lightweight concrete, S for steel, Z for cement.

Meaning of roman lower case letters

a	deflection; distance; acceleration
b	width
c	concrete cover
d	effective height; diameter (see also h)
e	eccentricity; sets of loads (actions)
f	strength
g	distributed permanent load; acceleration due to gravity; limit state function
h	total height or diameter of a section; thickness
i	radius of gyration
j	number of days
k	all coefficients with dimension
l	span; length of an element
m	bending moment per unit length or width; mass; average value of a sample
n	normal (longitudinal, axial) force per unit length or width
p	prestressing
q	distributed variable load
r	radius; resistance variables; resistance function
s	spacing; standard deviation of a sample
t	time; torsional moment per unit length or width; thickness of thin elements
u	perimeter

v	velocity; shear force per unit length or width
w	width of a crack
x	coordinate; height of compression zone
y	coordinate; height of rectangular diagram coordinate; lever arm

Use of Greek lower case letters

alpha	α	angle; ratio; coefficient
beta	β	angle; ratio; coefficient
gamma	γ	safety factor; density; shear strain (angular strain)
delta	δ	coefficient
epsilon	ϵ	strain
zeta	ζ	coefficient
eta	η	coefficient
theta	θ	rotation
lambda	λ	slenderness ratio; coefficient
mu	μ	relative bending moment; coefficient of friction; mean value of a whole population
nu	ν	relative axial force; Poisson's ratio
xi	ξ	coefficient; ratio
pi	π	mathematical use only
rho	ρ	geometrical ratio of reinforcement; bulk density
sigma	σ	axial stress; standard deviation of a whole population
tau	τ	shear stress
phi	φ	coefficient
chi	χ	coefficient
psi	ψ	coefficient; ratio
omega	ω	mechanical ratio of reinforcement

Mathematical symbols and special symbols

S	sum
Δ	difference; increment (enlargement)
\emptyset	nominal diameter of a reinforcing bar or of a cable
'	(single prime) compression (only in a geometrical or locational sense)
e	base of Napierian logarithms
exp	power of the number e
π	ratio of the circumference of a circle to its diameter
n	number of ...
w/c	water/cement ratio
<	smaller than
>	greater than

General subscripts

a	support settlement; additional; accidental load
b	bond; bar; beam
c	concrete; compression; column
d	design value
e	elastic limit of a material
f	forces and other actions; beam flange; bending; friction
g	permanent load
h	horizontal; hook
i	initial
j	number of days

<i>k</i>	characteristic value
<i>l</i>	longitudinal
<i>m</i>	mean value; material; bending moment
<i>n</i>	axial force
<i>o</i>	zero
<i>p</i>	prestressing steel
<i>q</i>	variable load
<i>r</i>	cracking
<i>s</i>	ordinary steel; snow; slab
<i>t</i>	tension;* torsion;* transverse
<i>u</i>	ultimate (limit state)
<i>v</i>	shear; vertical
<i>w</i>	wind; web; wire; wall
<i>x</i>	linear coordinate
<i>y</i>	linear coordinate; yield
<i>z</i>	linear coordinate
1, 2, 3	particular values of quantities
cc	conventional asymptotic value
*	When confusion is possible between tension and torsion, the subscripts tn (tension) and tr (torsion) should be used.

Subscripts for actions and action effects

<i>a(A)</i>	support settlement; accidental action
<i>cc</i>	creep of concrete
<i>cs</i>	shrinkage of concrete
<i>ep</i>	earth pressure
<i>ex</i>	explosion; blast
<i>g(G)</i>	permanent load
<i>im</i>	impact
<i>lp</i>	liquid pressure
<i>m(M)</i>	bending moment
<i>n(N)</i>	axial force
<i>p(P)</i>	prestress
<i>q(Q)</i>	variable load
<i>s(S)</i>	snow load
<i>t(T)</i>	torsion; temperature
<i>v(V)</i>	shear
<i>w(W)</i>	wind load

Subscripts obtained by abbreviation

<i>abs</i>	absolute
<i>act</i>	acting
<i>adm</i>	admissible, permissible
<i>cal</i>	calculated, design
<i>crit</i> (or <i>cr</i>)	critical
<i>ef</i>	effective
<i>el</i> (or <i>e</i>)	elastic
<i>est</i>	estimated
<i>exc</i>	exceptional
<i>ext</i>	external
<i>fat</i>	fatigue
<i>inf</i>	inferior
<i>int</i>	internal
<i>lat</i>	lateral
<i>lim</i>	limit
<i>max</i>	maximum
<i>min</i>	minimum
<i>nec</i>	necessary
<i>net</i>	net

<i>nom</i>	nominal
<i>obs</i>	observed
<i>pl</i>	plastic
<i>prov</i> (or <i>pr</i>)	provisional (stage of construction); provided
<i>red</i>	reduced
<i>rel</i>	relative; relaxation
<i>rep</i>	representative
<i>req</i>	required
<i>res</i>	resisting, resistant
<i>ser</i>	serviceability
<i>tot</i>	total
<i>var</i>	variable

Notation list

Roman lower case letters

<i>1/r</i>	curvature of a section of an element
<i>1/r_(g)</i>	curvature due to <i>g</i>
<i>1/r_(g+q)</i>	curvature due to <i>g</i> and <i>q</i>
<i>1/r_{0(g+q)}</i>	instantaneous (elastic) curvature due to <i>g</i> and <i>q</i>
<i>1/r₁</i>	curvature of an uncracked concrete section (state I)
<i>1/r_{1r}</i>	curvature in state I under cracking moment
<i>1/r₂</i>	curvature of a cracked concrete section (state II)
<i>1/r_{2r}</i>	curvature in state II under cracking moment
<i>1/r_{ts}</i>	tension stiffening correction for curvature
<i>a</i>	geometrical quantity in general; deformation; deflection
<i>a_d</i>	design values of geometrical quantity
<i>a₀</i>	elastic deflection (calculated with rigidity <i>E_c</i> <i>I_e</i>)
<i>b</i>	breadth of compression zone or flange, width of concrete section
<i>b_f</i>	width of FRP section; width of flange
<i>b_{red}</i>	reduced width of web
<i>b_x</i>	smaller side dimension of a rectangular section
<i>b_y</i>	greater side dimension of a rectangular section
<i>b_w</i>	width of web
<i>c</i>	concentration of a substance in a volume element; concrete cover; coefficient for shear resistance due to adhesive bond
<i>c_r</i>	coefficient for shear resistance due to aggregate interlock
<i>c₁</i>	column dimension parallel to the eccentricity of the load
<i>c₂</i>	column dimension perpendicular to the eccentricity of the load
<i>c_{min}</i>	minimum concrete cover
<i>c_{nom}</i>	nominal value of concrete cover (= <i>c_{min}</i> + tolerance)
<i>d</i>	effective depth to main tension reinforcement
<i>d'</i>	effective depth to compression reinforcement
<i>d_{max}</i>	maximum aggregate size
<i>e</i>	load eccentricity
<i>e₀</i>	first order eccentricity (= <i>M_{Ed}</i> / <i>N_{Ed}</i>)
<i>e₀₁</i>	smaller value of the first order eccentricity at one end of the considered element
<i>e₀₂</i>	greater value of the first order eccentricity at one end of the considered element
<i>e_{tot}</i>	total eccentricity
<i>f</i>	strength
<i>f_{bd}</i>	design bond strength
<i>f_{bd,0}</i>	basic design bond strength
<i>f_{bpd}</i>	design bond strength for prestressing tendon

f_c	cylinder compressive strength of concrete	f_{Ftu}	ultimate residual strength (post-cracking strength for ultimate crack opening) for fibre-reinforced concrete
f_{lc}	cylinder compressive strength of lightweight aggregate concrete	f_{Ftud}	design value of post-cracking strength for ultimate crack opening for fibre-reinforced concrete
f_c^*	cylinder compressive strength of concrete under triaxial loading (confined strength), reduced concrete strength due to transverse tension	f_k	characteristic value of material or product property; characteristic value of strength
f_{cc}	cylinder compressive strength of concrete under uniaxial stress	f_L	Limit of Proportionality
f_{cd}^*	design compressive strength of concrete under triaxial loading (confined strength), reduced design concrete strength due to transverse tension	f_{Lk}	characteristic value of Limit of Proportionality
f_{cd}	design value of f_c	f_{lck}	characteristic value of compressive strength of lightweight aggregate concrete
$f_{cd,fat}$	design fatigue reference strength of concrete under compression	f_{lcm}	mean value of compressive strength of lightweight aggregate concrete
$f_{c, imp, k}$	characteristic compressive strength under high rates of loading	$f_{lctk, max}$	upper bound value of the characteristic tensile strength of lightweight aggregate concrete
f_{ck}	characteristic value of compressive strength of concrete	$f_{lctk, min}$	lower bound value of the characteristic tensile strength of lightweight aggregate concrete
$f_{ck,c}$	value of f_{ck} of confined concrete	f_{lctm}	mean value of axial tensile strength of lightweight aggregate concrete
$f_{ck,cube}$	characteristic value of cube compressive strength of concrete	$f_{p0.1}$	0.1% proof strength of prestressing steel
$f_{ck,fat}$	characteristic value of fatigue reference compressive strength	$f_{p0.2}$	0.2% proof strength of prestressing steel
$f_{ck,ft}$	characteristic value of concrete compressive strength after freeze-thaw attack	$f_{p0.1k}$	characteristic 0.1% proof strength of prestressing steel
f_{cm}	mean value of compressive strength of concrete	$f_{p0.2k}$	characteristic 0.2% proof strength of prestressing steel
$f_{cm,sus}(t,t_0)$	mean value of compressive strength of concrete at time t when subjected to a high sustained compressive stress at an age at loading t_0	f_{pt}	tensile strength of prestressing steel; UTS (Ultimate Tensile Strength) of prestressing steel
f_{ct}	axial tensile strength of concrete	f_{ptd}	design tensile strength of prestressing steel
f_{ctd}	design value of f_{ct}	f_{ptk}	characteristic value of tensile strength of prestressing steel; characteristic value of UTS (Ultimate Tensile Strength) of prestressing steel
$f_{ct, imp, k}$	characteristic tensile strength under impact loading	f_{py}	tensile yield stress of prestressing steel
f_{ctk}	characteristic value of f_{ct}	f_{pyd}	design value of tensile yield stress of prestressing steel
$f_{ctk, is}$	characteristic measured in-situ tensile strength	f_{pyk}	characteristic value of tensile yield stress of prestressing steel
$f_{ctk, max}$	upper bound value of the characteristic tensile strength of concrete	f_r	relative (or projected) rib area
$f_{ctk, min}$	lower bound value of the characteristic tensile strength of concrete	$f_{R,j}$	residual flexural tensile strength of fibre reinforced concrete corresponding to Crack Mouth Opening Displacement ($CMOD$) = $CMOD_j$
$f_{ctk, sus}$	characteristic tensile strength of concrete under sustained loading	f_{R1k}	characteristic residual strength of fibre reinforced concrete significant for serviceability conditions
f_{ctm}	mean value of axial tensile strength of concrete	f_{R3k}	characteristic residual strength of fibre reinforced concrete significant for ultimate conditions
$f_{ct,fl}$	flexural tensile strength (at $T = 20^\circ\text{C}$)	$f_{sp,\theta}$	proportional limit of reinforcing steel at temperature θ
$f_{ctm,fl}$	mean flexural tensile strength (at $T = 20^\circ\text{C}$)	$f_{sy,\theta}$	maximum stress of reinforcing steel at temperature θ
$f_{ct,sp}$	splitting tensile strength of concrete	$f_{0.2}$	0.2% proof strength of reinforcing steel
$f_{ctm,sp}$	mean splitting tensile strength of concrete	$f_{0.2k}$	characteristic value of 0.2% proof strength of reinforcing steel
f_d	design value of material or product property; design value of strength	f_t	tensile strength of reinforcing steel
f_f	tensile strength of non-metallic reinforcement	f_{tk}	characteristic value of tensile strength of reinforcing steel
f_{fad}	design anchorage bond strength for non-metallic reinforcement	f_{tm}	mean value of tensile strength of reinforcing steel
f_{fbd}	design value of tensile stress in non-metallic reinforcement limited by bond to concrete	f_y	yield strength of reinforcing steel in tension
f_{fbm}	mean value of tensile stress in the non-metallic reinforcement limited by bond to concrete	$f_{y,act}$	actual yield strength of reinforcing steel in compression
f_{fd}	design tensile strength of non-metallic reinforcement	f_{yc}	yield strength of reinforcing steel in compression
f_{fk}	characteristic value of tensile strength of non-metallic reinforcement	f_{ycd}	design yield strength of reinforcing steel in compression
f_{Fts}	serviceability residual strength (post-cracking strength for serviceability crack opening) for fibre-reinforced concrete	f_{yd}	design yield strength of reinforcing steel in tension
f_{Ftsd}	design value of post-cracking strength for serviceability crack opening for fibre-reinforced concrete	f_{yk}	characteristic value of yield strength of reinforcing steel in tension
		f_{ym}	mean value of yield strength of reinforcing steel in tension
		g_d	design value of distributed permanent load
		h	overall depth of member, total height; notional size of a member ($2 A_c/u$; u : perimeter in contact with the atmosphere)
		h_b	depth of beam

h_f	depth of flange	r	radius
h_{key}	height of shear key in joint interface	s	slip (relative displacement between steel and concrete cross-sections), shear slip (at interfaces); spacing of bars; coefficient which depends on the strength class of cement
h_{sp}	distance between the notch tip and the top of the specimen	s_m	slip at maximum bond stress
Δh_w	height of water column	$s_{n,t}$	slip due to permanent or repeated loading
i	radius of gyration	s_{max}	maximum bar spacing
k	plasticity number; unintentional angular displacement	s_r	distance between cracks; radial spacing of layers of shear reinforcement
k_a	effectiveness coefficient of anchorage system	$s_{r,m}$	mean spacing between cracks
k_b	shape factor	s_t	longitudinal spacing of confining reinforcement
k_{bl}	bond length calibration factor	s_u	ultimate slip
k_c	coefficient	t	time, age, duration; thickness of thin elements
k_d	effectiveness factor dependent on the reinforcement detail	t_0	age at first loading
k_l	stress–strength ratio	t_1	age of the concrete when its temperature returns to ambient temperature
k_m	coefficient of confinement from transverse reinforcement	t_f	thickness of non-metallic reinforcement
k_n	displacement factor for repeated constant amplitude loading	t_{eq}	equivalent time interval for calculation of relaxation losses
k_t	displacement factor for permanent load	t_{p1}	mean duration of a heating cycle
l	design span, effective span, length of an element, thickness of a penetrated section	t_R	reference period
Δl	change in distance between two measuring points	t_s	concrete age at the beginning of shrinkage or swelling
l_0	design lap length, effective length (of columns); distance between measuring points	t_T	temperature adjusted concrete age
l_b	design anchorage length; design lap length	u	length of a perimeter; component of displacement of a point
l_{bp}	basic anchorage length of bonded pretensioned reinforcement	u_0	length of the periphery of the column or distribution area of load
l_{bpd}	design anchorage length of bonded pretensioned reinforcement	u_1	length of the control perimeter for punching
l_{bpt}	transmission length of bonded pretensioned reinforcement	u_{ef}	length of the perimeter of A_{ef}
$l_{b,min}$	minimum anchorage length; minimum lap length	u_n	length of the control perimeter for punching outside a slab zone with shear reinforcement
l_{cs}	characteristic length (fracture parameter)	v	shear force per unit width (out-of-plane loading), component of displacement of a point
l_p	development length for bonded prestressing reinforcement	w	crack width; component of displacement of a point
Δl_{pl}	residual elongation after unloading	w_c	crack width for $\sigma_{ct} = 0$
$l_{p,max}$	length over which the slip between prestressing steel and concrete occurs	w_k	calculated characteristic crack width
$l_{s,max}$	length over which the slip between steel and concrete occurs	w_{lim}	nominal limit value of crack width
l_t	transmission length	w_u	maximum crack opening accepted in structural design: its value depends on the ductility required
m	moment per unit width (out-of-plane loading); mass of substance flowing; degree of hydration; moisture content	x	depth of compression zone; distance; parameter
n	number of bars, number of load cycles; force per unit width (in-plane loading)	$x_c(t)$	carbonation depth at the time t
n_b	number of anchored bars or pairs of lapped bars in the potential splitting surface; number of bars in the bundle	x_d	design value of parameter x
n_{Ri}	number of cycles leading to failure at stress levels $S_{i,min}$ and $S_{i,max}$, respectively	z	internal lever arm
n_{Si}	number of cycles applied at constant minimum and maximum stress levels $S_{i,min}$ and $S_{i,max}$, respectively		
n_t	number of legs of confining reinforcement crossing a potential splitting failure surface at a section		
p	local gas pressure; overall steel ductility parameter		
p_m	mean pressure		
p_{tr}	transverse pressure perpendicular to the bar axis; mean compressive stress perpendicular to the potential splitting failure surface at the ultimate limit state		
q_d	design value of distributed variable load		

Greek lower case letters

α	coefficient; reduction factor; inclination of reinforcement crossing an interface; sum of the angular displacements
α_e	modular ratio ($= E_s/E_c$)
$\alpha_{e,p}$	modular ratio ($= E_p/E_c$)
$\alpha_{e,sec}$	secant modular ratio ($= E_{s,sec}/E_{c,sec}$)
α_{fl}	conversion factor ($= f_{ctm}/f_{ctm,fl}$)
α_i	unintended inclination of compressive members
α_{im}	unintended inclination of group of vertical prestressing members
α_p	coefficient of thermal expansion of prestressing reinforcement
α_{spl}	conversion factor ($= f_{ctm}/f_{ctm,spl}$)
α_{sT}	coefficient of thermal expansion for steel
α_T	coefficient of thermal expansion in general

α_1	coefficient representing the influence of reinforcement provided	$\varepsilon_{cs}(t)$	shrinkage or swelling strain at concrete age t
α_2	coefficient representing the influence of passive confinement from cover	$\varepsilon_{c\zeta}(t)$	stress dependent strain at concrete age t
α_3	coefficient representing the influence of passive confinement from transverse reinforcement	ε_{ct}	concrete tensile strain
β	coefficient characterizing the bond quality of reinforcing bars, coefficient for the compressive strength of a strut across an interface	$\varepsilon_{cT}(t)$	thermal strain at a concrete age t
β_c	coefficient for the compressive strength of a strut across an interface	ε_{clim}	ultimate strain of concrete in compression
$\beta_{bc}(t, t_0)$	coefficient to describe the development of basic creep with time after loading	ε_{pd0}	strain of prestressed reinforcement corresponding to P_{d0}
$\beta_{dc}(t, t_0)$	coefficient to describe the development of drying creep with time after loading	ε_f	strain of non-metallic reinforcement
$\beta_{cc}(t)$	coefficient to describe the development of strength of concrete with time	ε_{fu}	strain of non-metallic reinforcement at maximum force in tension
$\beta_{c,sus}(t, t_0)$	coefficient to describe the decrease of strength with time under sustained load	ε_{fuk}	characteristic value of strain of non-metallic reinforcement at maximum force in tension
$\beta_E(t)$	coefficient to describe the development of modulus of elasticity of concrete with time	ε_{lc1}	lightweight aggregate concrete strain at maximum compressive stress
$\beta_{lcc}(t)$	coefficient to describe the development of strength of lightweight aggregate concrete with time	ε_{lclim}	ultimate strain of lightweight aggregate concrete in compression
γ	safety factor	ε_{pu}	strain of prestressing steel at maximum force
γ_c	partial safety factor for concrete material properties	ε_{puk}	characteristic value of strain of prestressing steel at maximum force
γ_{cb}	partial safety factor for bond	ε_r	strain at the onset of cracking
$\gamma_{c,fat}$	partial safety factor for concrete material properties under fatigue loading	ε_s	steel strain
γ_d	partial safety factor for partial factors for model uncertainties	ε_{s1}	steel strain in uncracked concrete
γ_f	partial safety factor for the tensile strength of non-metallic reinforcement	ε_{s2}	steel strain in crack
γ_F	partial safety factor for actions; partial safety factor for fibre reinforced concrete	ε_{sm}	mean steel strain
γ_G	partial safety factor for permanent actions	$\Delta\varepsilon_{sr}$	increase of steel strain due to crack formation in the section
γ_m	partial safety factor for material properties	ε_{sr1}	steel strain at the point of zero slip under cracking forces
γ_M	partial safety factor for material properties, model uncertainties and geometrical uncertainties	ε_{sr2}	steel strain in the crack under cracking forces (σ_{ct} reaching f_{ctm})
γ_Q	partial safety factor for variable actions	ε_{sT}	thermal strain of steel
γ_{Rd}	partial safety factor associated with the uncertainty of the model and geometrical uncertainties	ε_{su}	strain of reinforcing steel at maximum load
γ_s	partial safety factor for the material properties of reinforcing and prestressing steel	$\Delta\varepsilon_{ts}$	increase of strain by the effect of tension stiffening
$\gamma_{s,fat}$	partial safety factor for the material properties of reinforcing and prestressing steel under fatigue loading	ε_u	limit strain value; strain of reinforcing steel at maximum force
γ_{sd}	partial safety factor accounting for model uncertainty	ε_{uk}	characteristic value of reinforcing steel strain at maximum force
δ	shear displacement	ε_{yd}	design yield strain of reinforcing steel ($= f_{yd}/E_s$)
δ_{jj}	node displacement	ε_v	transverse contraction
ε	strain	ζ	ratio of bond strength of prestressing steel and high-bond reinforcing steel
ε_c	concrete compressive strain	η	viscosity of gas
ε_c^*	concrete compressive strain under triaxial stress	η_1	coefficient representing the type of reinforcing bar being anchored or lapped
ε_{cbs}	concrete basic shrinkage strain	η_2	coefficient representing the position of the bar during casting
ε_{cds}	concrete drying shrinkage strain	η_3	coefficient representing the bar diameter
ε_{cm}	average concrete strain within $l_{s,max}$	η_4	coefficient representing the characteristic strength of steel reinforcement being anchored or lapped
ε_{c1}	concrete strain at maximum compressive stress	η_{p1}	coefficient representing the type of prestressing tendon
$\varepsilon_{c1,imp}$	impact concrete strain at maximum load	η_{p2}	coefficient representing the casting position of the tendon
$\varepsilon_{cc}(t)$	concrete creep strain at concrete age $t > t_0$	θ	angle between web compression and the axis of a member; rotation
$\varepsilon_{ci}(t_0)$	stress dependent initial strain of concrete at the time of first loading	θ_f	angle between inclined compression in a flange and the axis of the member
ε_{cf}	strain at maximum stress due to repeated loads	κ	coefficient
$\varepsilon_{cn}(t)$	stress independent strain at a concrete age t	κ_1	coefficient for axial force in interface connectors
		κ_2	coefficient for dowel action resistance of interface connectors
		λ	slenderness ratio ($= l_0/i$)

μ	coefficient of friction; relative bending moment	χ	aging coefficient in the evaluation of creep structural effects
ν_c	Poisson's ratio of concrete	$\psi(t, t_0)$	relaxation coefficient
ν_s	Poisson's ratio of steel	ω_c	mechanical reinforcement ratio
ξ	creep induced stress redistribution after modification of restraint conditions		
ρ	ratio of (longitudinal) tensile reinforcement (= $A_s/(bd)$); density		
$\rho_{s,ef}$	effective reinforcement ratio (= $A_s/A_{c,ef}$)		
ρ_t	relaxation after t hours		
$\rho_t(T)$	relaxation after t hours at temperature T		
ρ_{100}	relaxation after 100 hours		
ρ_{1000}	relaxation after 1000 hours		
ρ_w	ratio of web reinforcement (= $A_{sw}/(b_w s_w \sin \alpha)$)		
σ	stress		
$\sigma_1, \sigma_2, \sigma_3$	principal stresses		
σ_c	concrete compressive stress		
σ_{cd}	design concrete compressive stress		
σ_{ct}	concrete tensile stress		
$\sigma_{c,c}$	compressive stress of confined concrete		
$\sigma_{c,max}$	maximum compressive stress		
$\sigma_{c,min}$	minimum compressive stress		
$\sigma_{ct,max}$	maximum tensile stress		
σ_f	stress in non-metallic reinforcement		
σ_n	(lowest) compressive stress resulting from normal force acting at the interface		
$\sigma_{p0}(x)$	initial stress in prestressing steel at a distance x from anchorage device		
$\sigma_{p0,max}$	maximum tensile stress in prestressing steel at tensioning		
σ_{pcs}	stress in prestressing steel after all losses (including creep and shrinkage)		
σ_{pd}	tendon stress under design load		
$\Delta\sigma$	stress range relevant to fatigue of reinforcement		
$\Delta\sigma_{Rsk}(n)$	stress range relevant to n cycles obtained from a characteristic fatigue strength function		
σ_s	steel stress		
σ_{sd}	steel stress to be anchored by bond over the distance l_b		
σ_{s2}	steel stress in the crack		
σ_{se}	steel stress at the point of zero slip		
σ_{sr2}	steel stress in the crack under cracking load (σ_{ct} reaching f_{ctm})		
$\Delta\sigma_{Es}$	steel stress range under the acting loads		
τ_0	bond stress according to the bond stress–slip curve		
τ_a	ultimate shear capacity due to adhesion or interlocking		
τ_b	local bond stress		
$\tau_{b,m}$	bond stress modified in case of bar yielding, transverse pressure and cracking parallel to the bar axis and cyclic loading		
$\tau_{b,max}$	maximum value of bond stress		
τ_{Ed}	design interface shear stress		
τ_{Rdi}	design value of interface shear strength		
τ_u	ultimate shear friction capacity		
$\tau_{u,split}$	peak value of bond strength in a splitting failure		
$\varphi(t, t_0)$	creep coefficient		
φ_0	basic creep coefficient		
φ_0, dc	drying creep coefficient		
φ_0, k	nonlinear notional creep coefficient		
φ_l	basic creep coefficient for lightweight aggregate concrete		
$\Delta\varphi_{T,trans}$	transient thermal creep coefficient which occurs at the time of the temperature increase		
		Roman capital letters	
		A	total area of a section or part of a section (enclosed within the outer circumference)
		A_1	section area in state I (taking into account the reinforcement)
		A_b	area of single bar
		A_c	area of concrete cross section or concrete compression chord
		$A_{c,ef}$	effective area of concrete in tension
		A_{core}	effectively confined area of cross-section in compression
		A_d	design value of accidental action
		A_{Ed}	design value of seismic action
		A_{Ek}	representative value of seismic action
		A_k	area enclosed by the centrelines of a shell resisting torsion
		A_p	area of prestressing steel
		A_s	area of reinforcement
		$A_{s'}$	area of compression reinforcement
		A_{sh}	area of hoop reinforcement for torsion
		A_{sl}	area of longitudinal reinforcement
		A_{sp}	cross sectional area of prestressing steel
		A_{st}	area of transverse reinforcement; cross sectional area of one leg of a confining bar
		A_{sw}	area of shear reinforcement
		$A_{s,cal}$	calculated area of reinforcement required by design
		$A_{s,min}$	minimum reinforcement area
		AF	amplification factor
		C	serviceability constraints
		C_0	initial chloride content of concrete
		C_f	aggregate effectivity factor
		$C_{S,\Delta x}$	chloride content at a depth of Δx
		D	fatigue damage; diffusion coefficient; deformation
		D_{app}	apparent diffusion coefficient of a substance in concrete
		D_{eff}	effective diffusion coefficient of a substance in concrete
		D_{lim}	limiting fatigue damage
		D_{RCM}	rapid chloride migration coefficient
		E	modulus of elasticity; load (action) effect; cumulative leaching
		E_c	modulus of elasticity of concrete
		E_{ci}	tangent modulus of elasticity of concrete at an age of 28 days
		$E_{ci}(t_0)$	tangent modulus of elasticity of concrete at the time of loading t_0
		$E_{ci}(t)$	tangent modulus of elasticity of concrete at an age $t \neq 28$ days
		$E_{c,1}$	secant modulus from the origin to the peak compressive stress
		$E_{c,imp}$	modulus of elasticity of concrete for impact loading
		E_d	design action-effect
		E_f	modulus of elasticity for non-metallic reinforcement
		E_{lc}	modulus of elasticity for lightweight aggregate concrete
		E_{lci}	tangent modulus of elasticity of lightweight aggregate concrete at concrete age of 28 days
		E_p	modulus of elasticity of prestressing steel
		E_s	modulus of elasticity of reinforcing steel
		$E_{s,\theta}$	modulus of elasticity of reinforcing steel at temperature θ