Support-Capacity Notes

Liner Parameters – Rebar Properties

Number of Rows – number of rows on one side of a beam, since symmetrical reinforcement is assumed for the section

Spacing – space between reinforcement (out of plane)

Diameter – rebar diameter

Clear cover depth – depth to face of reinforcement (same on both sides of the section)

Clear spacing between rows – space between rows on the same side of the section

Note: section is assumed to have symmetric reinforcement

Code Parameters – ACI 318

Phi compression and Phi tension
§9.3.2 – Strength reduction factor ϕ for compression-controlled sections is defined in §9.3.2.2(b) as 0.65

§10.3.3 – Compression-controlled if $\varepsilon_t < -0.002$; this factor is applied to both N and M values

§9.3.2 – Strength reduction factor ϕ for tension-controlled sections is defined in §9.3.2.1 as 0.9
§10.3.3 – Tension-controlled if $\varepsilon_t > -0.005$; this factor is applied to both N and M values

ϕ values in the transition region are obtained by interpolating linearly between the tension- and compression-controlled regions.

Alpha factor
§10.2.7.1 – A concrete stress of $\alpha f_c' = 0.85 f_c'$ is assumed uniformly distributed over an equivalent compression zone (α is the strength reduction factor for concrete)

Beta factor
§10.2.7.3 – adjustment factor for depth of rectangular stress block.
"For f_c' between 17 and 28 MPa, β_1 shall be taken as 0.85. For f_c' above 28MPa, β_1 shall be reduced linearly at a rate of 0.05 for each 7MPa of strength in excess of 28 MPa, but β_1 shall not be taken less than 0.65."

Maximum axial resistance factor
Used for calculating max N cutoff value only.
§10.3.6.2 – ϕ = 0.8

Code Parameters – CSA A23.3

Phi concrete
Strength-reduction factor for concrete
§8.4.2 – concrete strength = $\phi_c f_c'$ where ϕ_c = 0.65

Phi steel
Strength-reduction factor for steel
§8.4.3 – concrete strength = $\phi_c f_s$ where ϕ_s = 0.85 for reinforcing bars

Alpha factor
Concrete stress of $\alpha_1 \phi_c f_c'$ is uniformly distributed over an equivalent compression zone a distance β_1 from the maximum compression strain
Strength-reduction factor for concrete

§10.1.7(a) and (c)

$$\alpha_1 = 0.85 - 0.0015 f_c' \geq 0.67$$

Beta factor
§10.1.7 (c)

$$\beta_1 = 0.97 - 0.0025 f_c' \geq 0.67$$

Maximum axial resistance factor
§10.10.4(b)

$P_{r_{max}} = 0.8 P_{r_o}$ for tied columns, where

$$P_{r_o} = \alpha_1 \phi_c f_c' \left(A_g - A_{st}\right) + \phi_s f_y A_{st}$$

Code Parameters – EC2

Phi compression and Phi tension
§2.4.1.4 – Table 2.2: Partial Factors for ULS

γ_c = 1.5 for concrete
γ_s = 1.15 for steel

Material strength = nominal strength / γ

Eta factor
§3.1.7(3) – factor defining effective concrete strength

$$\eta = 1 \ \ for\ f_{ck} \leq 50MPa$$

$$\eta = 1 - \frac{f_{ck} - 50}{200} \ \ for\ 50 < f_{ck} \leq 90\ MPa$$

Lambda factor
§3.1.7(3) – factor defining effective height of concrete compression zone

$$\lambda = 0.8 \ \ for\ f_{ck} \leq 50\ MPa$$

$$\lambda = 0.8 - \frac{f_{ck} - 50}{400} \ \ for\ 50 < f_{ck} \leq 90MPa$$

Maximum axial resistance factor
Default value = 1
No mention in code

Alpha cc
Effective concrete strength = ηf_{cd}, where f_{cd} is the design compressive strength

$$f_{cd} = \alpha_{cc} f_{ck}/\gamma_c$$

γ_c = partial safety factor for concrete
α_{cc} = coefficient for taking into account long term effects of loading on compressive strength (recommended value = 1.0; values subject to National Annex recommendations)