

Structural & transportation

✓ Concrete:

- Strength design: $\phi M_n \geq M_u$
- Flexural stress: $f_s = \frac{Mc}{I}$

✓ Steel:

- Plastic moment: $M_p = ZF_y$
- Shear strength: $V_n = 0.6F_y A_w$

✓ Transportation:

- Stopping sight distance: $SSD = 1.47Vt + \frac{V^2}{30(f \pm G)}$
- Curve radius: $R = \frac{V^2}{15(e + f)}$
- Traffic flow: $q = kv$, flow = density $\times$ speed

Environmental & engineering economy

✓ Water treatment:

- BOD: $BOD_t = L_0(1 - e^{-kt})$
- Hardness as $CaCO_3$: $mg/L \times \frac{50}{EW}$
- $pH = -\log[H^+]$

✓ Sedimentation:

- Stokes' law: $v = \frac{g(\rho_p - \rho_w)d^2}{18\mu}$
- Overflow rate: $OR = \frac{Q}{A}$

✓ Activated sludge:

- $F/M = \frac{QS_0}{VX}$
- Solids retention time: $\theta_c = \frac{\text{solids in the aeration tank}}{\text{solids wasted per day}}$

✓ Disinfection: $Ct = \text{constant}$

✓ Engineering economy:

- $F = P(1 + i)^n$
- $P = \frac{F}{(1 + i)^n}$
- $P = A \frac{(1 + i)^n - 1}{i(1 + i)^n}$