

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