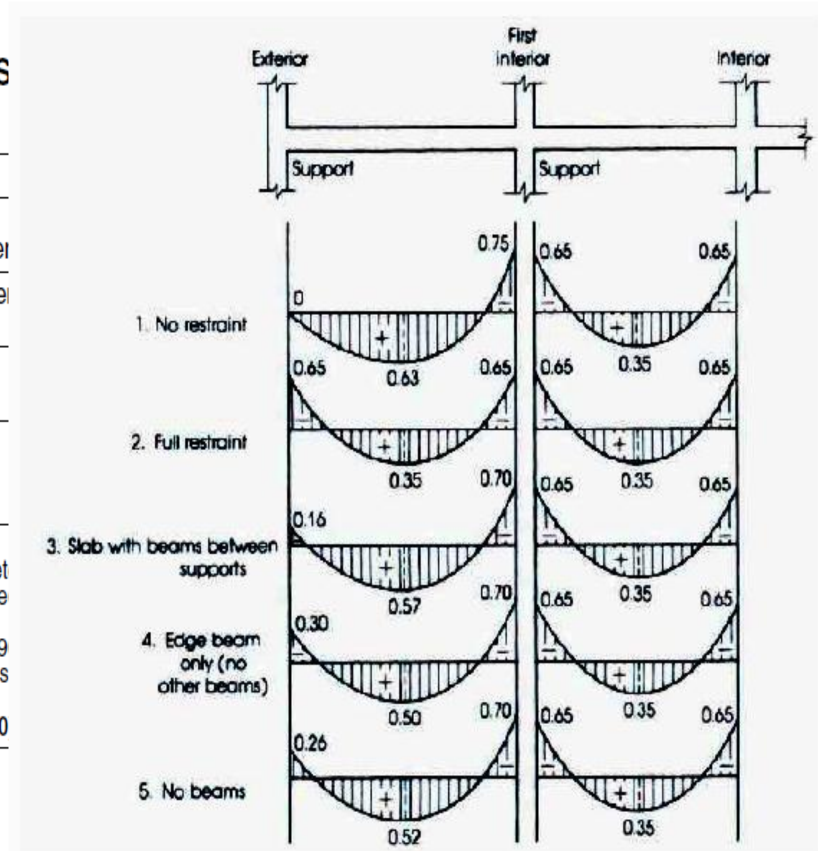
**REINFORCED CONCRETE II**
**1st EXAM TABLES SHEET**

## TABLE 9.5(a) — MINIMUM THICKNESS OF NONPRESTRESSED BEAMS OR ONE-WAY SLABS UNLESS DEFLECTIONS ARE CALCULATED

| | Minimum thickness, *h* | | | |
|---|---|---|---|---|
| | Simply supported | One end continuous | Both ends continuous | Cantilever |
| Member | Members not supporting or attached to partitions or othe construction likely to be damaged by large deflections | | | |
| Solid one-way slabs | ℓ/20 | ℓ/24 | ℓ/28 | ℓ/10 |
| Beams or ribbed one-way slabs | ℓ/16 | ℓ/18.5 | ℓ/21 | ℓ/8 |

Notes:
Values given shall be used directly for members with normalweight concret and Grade 60 reinforcement. For other conditions, the values shall be modifie as follows:
a) For lightweight concrete having equilibrium density, $w_c$, in the range of 9 to 115 lb/ft$^3$, the values shall be multiplied by $(1.65 - 0.005w_c)$ but not les than 1.09.
b) For $f_y$ other than 60,000 psi, the values shall be multiplied by $(0.4 + f_y/100{,}000$




# CODE

## TABLE 9.5(c)—MINIMUM THICKNESS OF SLABS WITHOUT INTERIOR BEAMS*

| $f_y$, MPa† | Without drop panels‡ | | | With drop panels‡ | | |
|---|---|---|---|---|---|---|
| | Exterior panels | | Interior panels | Exterior panels | | Interior panels |
| | Without edge beams | With edge beams§ | | Without edge beams | With edge beams§ | |
| 280 | $\ell_n/33$ | $\ell_n/36$ | $\ell_n/36$ | $\ell_n/36$ | $\ell_n/40$ | $\ell_n/40$ |
| 420 | $\ell_n/30$ | $\ell_n/33$ | $\ell_n/33$ | $\ell_n/33$ | $\ell_n/36$ | $\ell_n/36$ |
| 520 | $\ell_n/28$ | $\ell_n/31$ | $\ell_n/31$ | $\ell_n/31$ | $\ell_n/34$ | $\ell_n/34$ |

*For two-way construction, $\ell_n$ is the length of clear span in the long direction, measured face-to-face of supports in slabs without beams and face-to-face of beams or other supports in other cases.
†For $f_y$ between the values given in the table, minimum thickness shall be determined by linear interpolation.
‡Drop panels as defined in 13.2.5.
§Slabs with beams between columns along exterior edges. The value of $\alpha_f$ for the edge beam shall not be less than 0.8.

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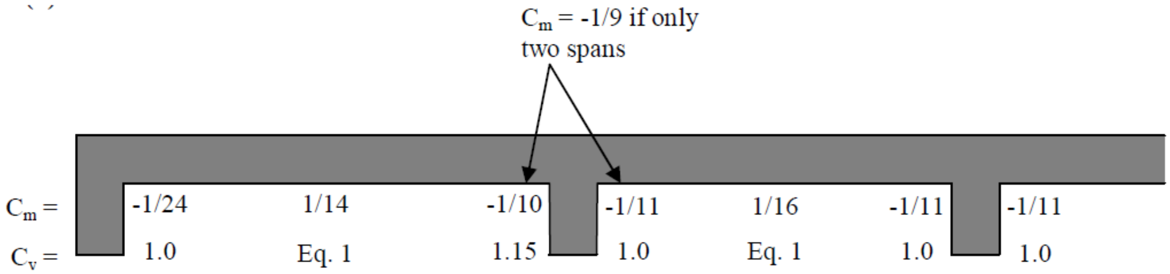



**Percentage of longitudinal moment in column strip , Interior panels**

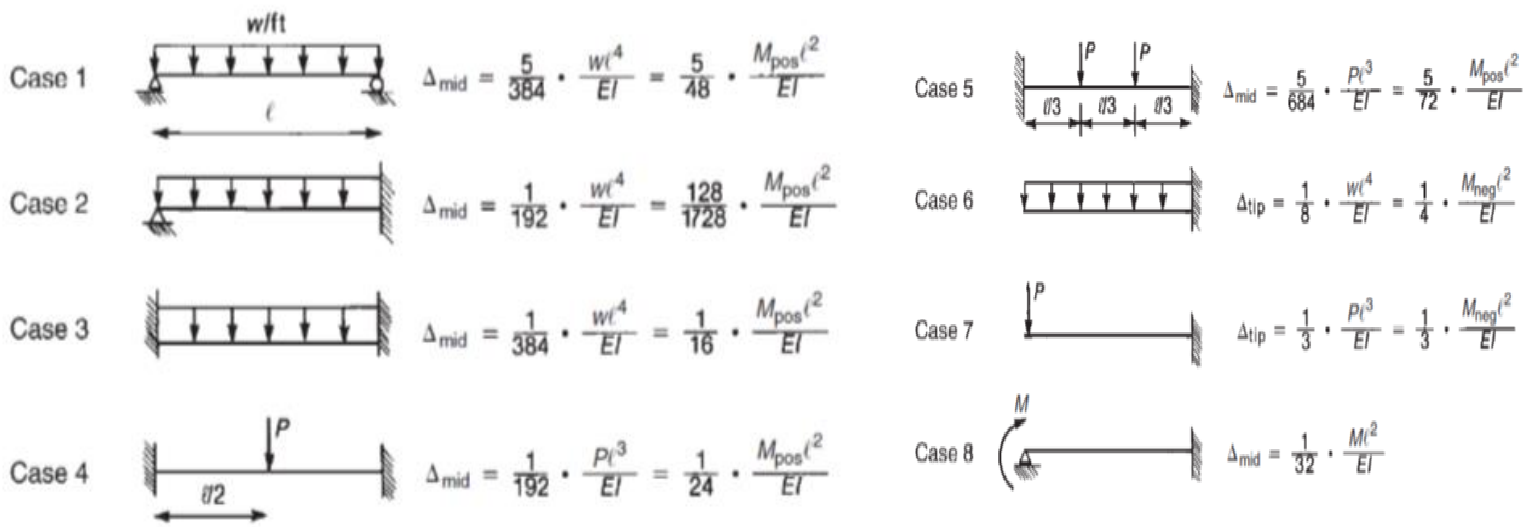
| | | Aspect Ratio $L_2/L_1$ | | |
|---|---|---|---|---|
| | $\alpha_{f1} l_2 / l_1$ | 0.5 | 1.0 | 2.0 |
| Negative moment at interior support | 0 | 75 | 75 | 75 |
| | ≥1.0 | 90 | 75 | 45 |
| positive moment near mid span | 0 | 60 | 60 | 60 |
| | ≥1.0 | 90 | 75 | 45 |

**Percentage of longitudinal moment in column strip , Exterior panels**

| | | | Aspect Ratio $L_2/L_1$ | | |
|---|---|---|---|---|---|
| | $\alpha_{f1} l_2 / l_1$ | $\beta_t$ | 0.50 | 1.0 | 2.0 |
| Negative moment at exterior support | 0 | 0 | 100 | 100 | 100 |
| | | ≥2.5 | 75 | 75 | 75 |
| | ≥ 1.0 | 0 | 100 | 100 | 100 |
| | | ≥2.5 | 90 | 75 | 45 |
| Positive moment near mid span | 0 | | 60 | 60 | 60 |
| | ≥ 1.0 | | 90 | 75 | 45 |
| Negative moment at interior | 0 | | 75 | 75 | 75 |
| | ≥1.0 | | 90 | 75 | 45 |

**TABLE 6.1** Maximum Permissible Computed Deflections

| Type of Member | Deflection to Be Considered | Deflection Limitatio |
|---|---|---|
| Flat roofs not supporting or attached to nonstructural elements likely to be damaged by large deflections | Immediate deflection due to live load $L$ | $\frac{\ell^{*}}{180}$ |
| Floors not supporting or attached to nonstructural elements likely to be damaged by large deflections | Immediate deflection due to live load $L$ | $\frac{\ell}{360}$ |
| Roof or floor construction supporting or attached to nonstructural elements likely to be damaged by large deflections | That part of the total deflection occurring after attachment of nonstructural elements (sum of the long-term deflection due to all sustained loads and the immediate deflection due to any additional live load)[†] | $\frac{\ell^{\ddagger}}{480}$ |
| Roof or floor construction supporting or attached to nonstructural elements not likely to be damaged by large deflections | | $\frac{\ell^{\S}}{240}$ |




Case 1 $\Delta_{mid} = \frac{5}{384} \cdot \frac{w\ell^4}{EI} = \frac{5}{48} \cdot \frac{M_{pos}\ell^2}{EI}$

Case 2 $\Delta_{mid} = \frac{1}{192} \cdot \frac{w\ell^4}{EI} = \frac{128}{1728} \cdot \frac{M_{pos}\ell^2}{EI}$

Case 3 $\Delta_{mid} = \frac{1}{384} \cdot \frac{w\ell^4}{EI} = \frac{1}{16} \cdot \frac{M_{pos}\ell^2}{EI}$

Case 4 $\Delta_{mid} = \frac{1}{192} \cdot \frac{P\ell^3}{EI} = \frac{1}{24} \cdot \frac{M_{pos}\ell^2}{EI}$

Case 5 $\Delta_{mid} = \frac{5}{684} \cdot \frac{P\ell^3}{EI} = \frac{5}{72} \cdot \frac{M_{pos}\ell^2}{EI}$

Case 6 $\Delta_{tip} = \frac{1}{8} \cdot \frac{w\ell^4}{EI} = \frac{1}{4} \cdot \frac{M_{neg}\ell^2}{EI}$

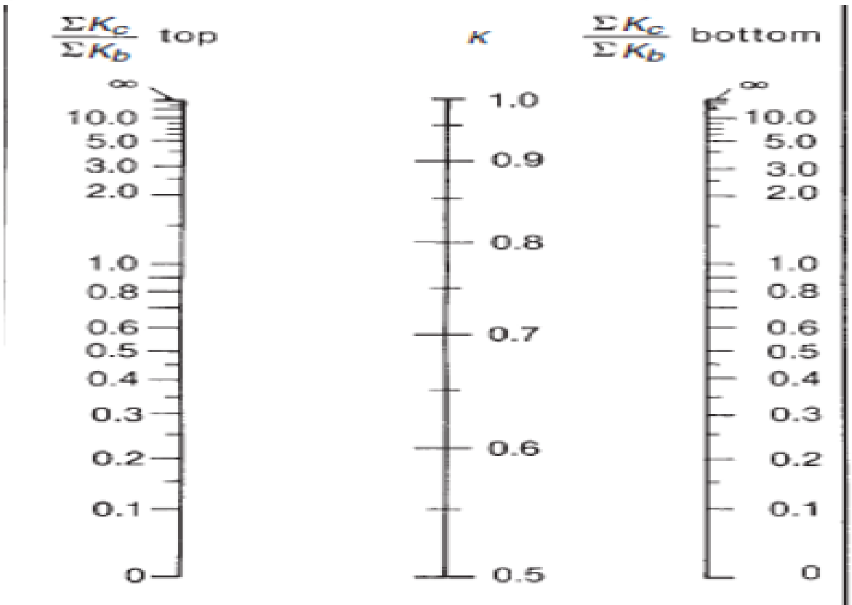
Case 7 $\Delta_{tip} = \frac{1}{3} \cdot \frac{P\ell^3}{EI} = \frac{1}{3} \cdot \frac{M_{neg}\ell^2}{EI}$

Case 8 $\Delta_{mid} = \frac{1}{32} \cdot \frac{M\ell^2}{EI}$

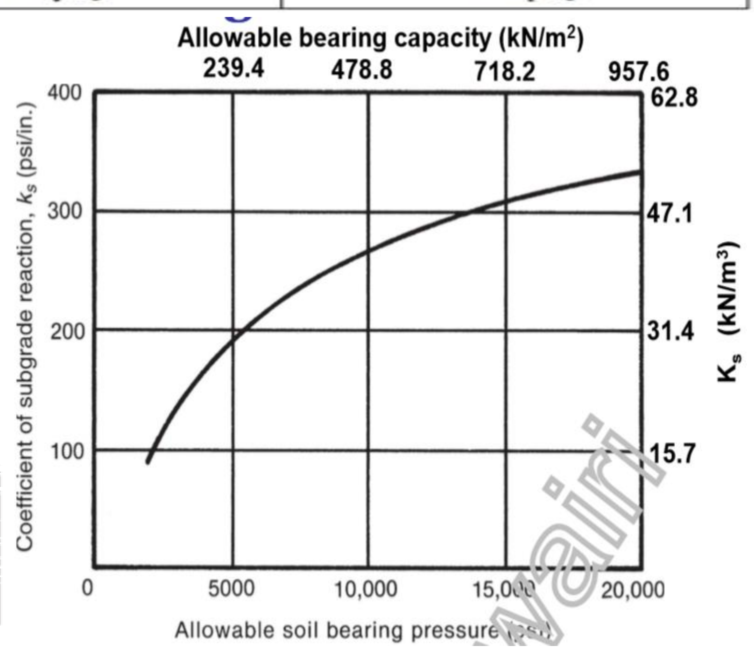
## Table 7.3: Time-dependent factors

| Period (months) | $\xi$ |
|---|---|
| 3 | 1.0 |
| 6 | 1.2 |
| 12 | 1.4 |
| 60 | 2.0 |

| Case | $\leq \phi 20$ | $> \phi 20$ |
|---|---|---|
| **Case 1:** Clear spacing of bars being developed not less than db, clear cover not less than db, and stirrups throughout *ld* not less than code minimum<br><br>**or**<br><br>**Case 2:** Clear spacing of bars being developed not less than 2db and clear cover not less than db | $l_d = \frac{12 f_y \psi_t \psi_e \lambda}{25\sqrt{f_c'}} d_b$ | $l_d = \frac{12 f_y \psi_t \psi_e \lambda}{20\sqrt{f_c'}} d_b$ |
| **Other cases** | $l_d = \frac{18 f_y \psi_t \psi_e \lambda}{25\sqrt{f_c'}} d_b$ | $l_d = \frac{18 f_y \psi_t \psi_e \lambda}{20\sqrt{f_c'}} d_b$ |




(a) Nonsway frames.




| Top | k | | | | |
|---|---|---|---|---|---|
| Hinged | 0.70 | 0.81 | 0.91 | 0.95 | 1.00 |
| Elastic $\psi = 3.1$ | 0.67 | 0.77 | 0.86 | 0.90 | 0.95 |
| Elastic, Flexible $\psi = 1.6$ | 0.65 | 0.74 | 0.83 | 0.86 | 0.91 |
| Stiff $\psi = 0.4$ | 0.58 | 0.67 | 0.74 | 0.77 | 0.81 |
| Fixed | 0.50 | 0.58 | 0.65 | 0.67 | 0.70 |
| | Fixed | Stiff | Elastic, Flexible | Elastic | Hinged |
| | Bottom | | | | |