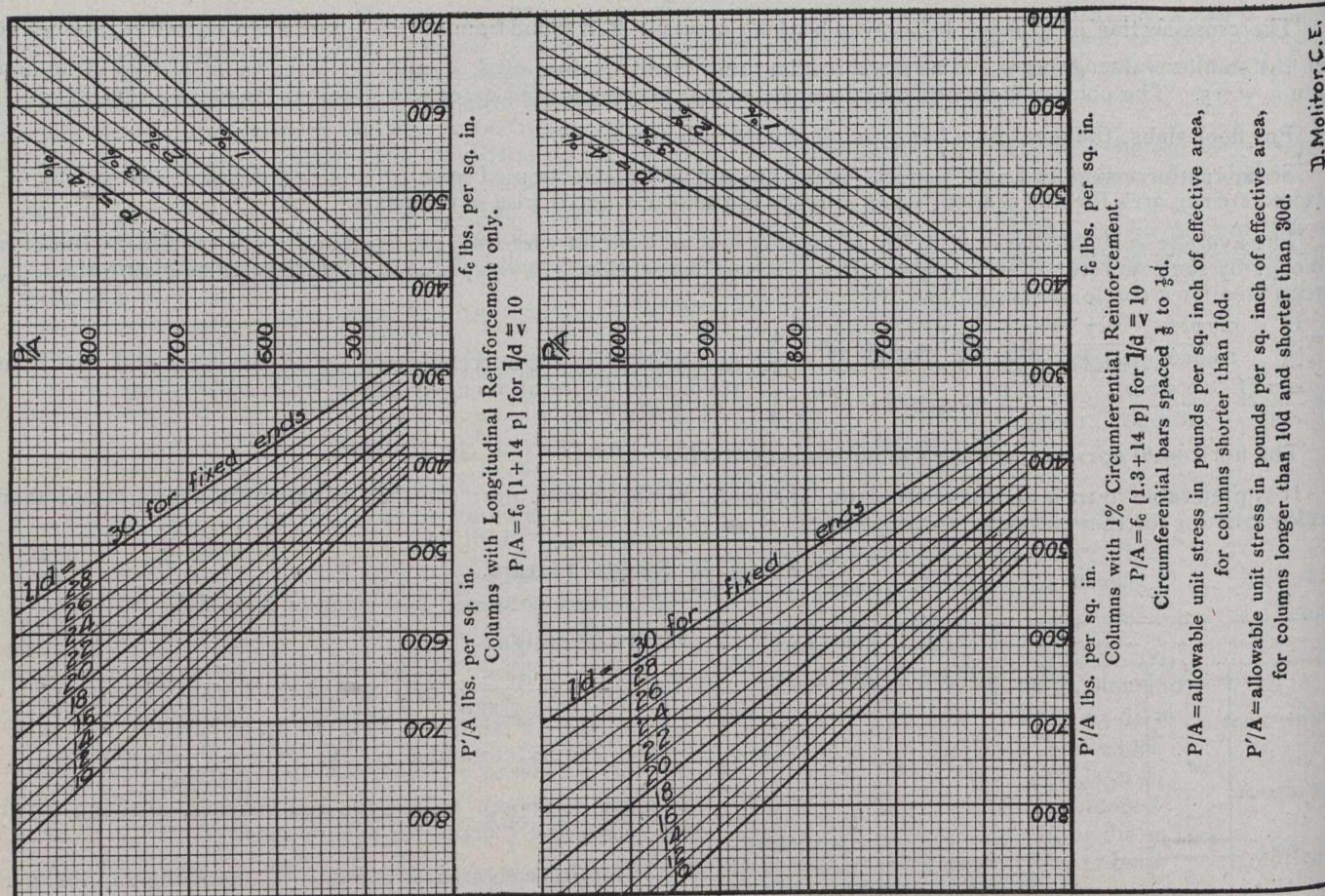


Diagram 1.—REINFORCED CONCRETE COLUMNS.



REINFORCED CONCRETE COLUMNS.

Let P = safe axial load in pounds when $l/d \leq 10$.
 P' = safe axial load in pounds for $l/d = 10$ to 30.
 A = effective area of column in sq. inches.
 A_s = sectional area of longitudinal steel in sq. inches.
 A'_s = sectional area of circumferential steel in sq. inches.

$$p = \frac{A_s}{A} \text{ and } p' = \frac{A'_s}{A} = \text{steel ratios.}$$

$$n = \frac{E_s}{E_c} = 15 \text{ for average working conditions.}$$

f_c = safe unit working stress for concrete in columns.

l = unsupported length of column in inches.

d = least dimension of effective area in inches.

d_i = insulation = 2" all around for fire protection.

a

$s = \frac{p'A}{ac}$ = pitch of circumferential steel, where a = area

of one hoop and c = length of a single hoop = 4 d for square and πd for round columns.

The safe axial load on columns shall be determined by the following formulae:—

1. Piers without reinforcement:

$$P = Af_c \text{ for } l/d \leq 6.$$

2. Columns with longitudinal reinforcement only:

$$P = Af_c [1 + (n - 1)p] \text{ for } l/d \leq 10 \text{ and } p = 0.02 \text{ to } 0.04.$$

Longitudinal bars must be tied at intervals not exceeding 1 ft.

3. Columns with longitudinal and circumferential reinforcement:

$$P = Af_c [1 + 14p + 30p'] \text{ for } l/d \leq 10 \text{ and } p = 0.02 \text{ to } 0.04,$$

$$p' = 0.01.$$

Spacing of circumferential bars, $s = d/8$ to $d/5$.

4. Columns longer than 10 d and shorter than 30 d :

For fixed ends.

$$P' = \frac{P}{1 + \frac{1}{1600d} \left(\frac{l}{d} \right)^2}, \quad P' = \frac{P}{1 + \frac{1}{800d} \left(\frac{l}{d} \right)^2}.$$

For hinged ends.