beams running into heavy columns this should be increased, but not to exceed $\frac{wl^2}{12}$.

Flat Slab.—The recommendations in the following paragraphs relate to flat slabs extending over several rows of panels in each direction. Necessarily the treatment is more or less empirical. The coefficients and moments given relate to uniformly distributed loads.

Column Capital.—For computation purposes, the diameter of the column capital will be considered to be measured where its vertical thickness is at least 1½ ins., provided the slope of the capital below this point nowhere makes an angle with the vertical of more than 45°. In case a cap is placed above the column capital, the part of this cap within a cone made by extending the lines of the column capital upward at the slope of 45° to the bottom of the slab or dropped panel may be considered as part of the column capital in determining the diameter for design purposes. Without attempting to limit the size of the column capital for special cases, it is recommended that the diameter of the column capital (or its dimension parallel to the edge of the panel) generally be made not less than one-fifth of the dimension of the panel from centre to centre of adjacent columns. A diameter equal to 0.225 of the panel length has been used quite widely and acceptably.

Dropped Panel.—Generally, it is recommended that the width of the dropped panel be at least 4/10 of the corresponding side of the panel as measured from centre to centre of columns, and that the offset in thickness be not more than 5/10 of the thickness of the slab outside the dropped panel.

Slab Thickness.—The following formulas for minimum thicknesses are recommended as general rules of design when the diameter of the column capital is not less than 1/5 of the dimensions of the panel from centre to centre of adjacent columns, the larger dimension being used in the case of oblong panels. For notations, let

t = total thickness of slab, in inches;
L = panel length, in feet;
w = sum of live load and dead load, in pounds per square foot.

Then, for a slab without dropped panels,

$$\text{minimum } t = 0.024\, L\sqrt{w + 1\tfrac{1}{2}};$$

for a slab with dropped panels,

$$\text{minimum } t = 0.02\, L\sqrt{w + 1};$$

for a dropped panel whose width is 4/10 of the panel length,

$$\text{minimum } t = 0.03\, L\sqrt{w + 1\tfrac{1}{2}}.$$

In no case should the slab thickness be made less than 6 ins., nor should the thickness of a floor-slab be made less than 1/32 of the panel length, nor the thickness of a roof-slab less than 1/40 of the panel length.

Bending and Resisting Moments in Slabs.—Analysis shows that, for a uniformly distributed load, and round columns, and square panels, the numerical sum of the positive moment and the negative moment at a vertical section of a slab taken across a panel along a line midway between columns, and another section taken along an edge of the panel parallel to the first section, but skirting the part of the periphery of the column capitals at the two corners of the panels, is given quite closely by the equation

$$M_x = \frac{1}{8}\, wl \left(l - \frac{2}{3}\, c \right)^2.$$

In this formula and in those which follow relating to oblong panels,

w = sum of the live and dead loads per unit of area;
l = side of a square panel measured from centre to centre of columns;
l_1 = one side of the oblong panel measured from centre to centre of columns;
l_2 = other side of oblong panel measured in the same way;
c = diameter of the column capital;
M_x = numerical sum of positive moment and negative moment in one direction;
M_y = numerical sum of positive moment and negative moment in the other direction.

For oblong panels, the equation for the numerical sum of the positive moment and the negative moment at the two sections named becomes

$$M_x = \frac{1}{8}\, wl_2 \left(l_1 - \frac{2}{3}\, c \right)^2$$

$$M_y = \frac{1}{8}\, wl_1 \left(l_2 - \frac{2}{3}\, c \right)^2$$

where M_x is the numerical sum of the positive moment and the negative moment for the sections parallel to the dimension, l_2, and M_y is the numerical sum of the positive moment and the negative moment for the sections parallel to the dimension, l_1.

What proportion of the total resistance exists as positive moment and what as negative moment is not readily determined. The amount of the positive moment and that of the negative moment may be expected to vary somewhat with the design of the slab. It seems proper, however, to make the division of total resisting moment in the ratio of ⅜ for the positive moment to ⅝ for the negative moment.

With reference to variations in stress along the sections, it is evident from conditions of flexure that the resisting moment is not distributed uniformly along either the section of positive moment or that of negative moment. As the law of the distribution is not known definitely, it will be necessary to make an empirical apportionment along the sections; and it will be considered sufficiently accurate generally to divide the sections into two parts and to use an average value over each part of the panel section.

Positive Moment.—For a square interior panel, it is recommended that the positive moment for a section in the middle of a panel extending across its width be taken as

$$\frac{1}{25}\, wl \left(l - \frac{2}{3}\, c \right)^2.$$

Of this moment, at least 25 per cent. should be provided for in the inner section; in the two outer sections of the panel at least 55 per cent. of the specified moment should be provided for in slabs not having dropped panels, and at least 60 per cent. in slabs having dropped panels, except that in calculations to determine necessary thickness of slab away from the dropped panel at least 70 per cent. of the positive moment should be considered as acting in the two outer sections.

Negative Moment.—For a square interior panel, it is recommended that the negative moment for a section which follows a panel edge from column capital to column capital and which includes the quarter peripheries of the edges of the two column capitals (the section altogether forming the projected width of the panel) be taken as