downwind of the stack for about an hour or more will not yield the maximum concentration at the point but data which are more nearly the average value across the cone.

For general usefulness, it is possible to substitute values of n, Cy and Cz which Sutton has proposed as being applicable for "average conditions." In most localities, the average temperature gradient over an extended period will not vary markedly from the neutral condition (zero lapse rate). It is thus possible to predict long term average downwind concentrations by making calculations based on this assumption. In our studies, we have not had occasion to be concerned with momentary fluctuations of concentration, but rather with average concentrations over a period of time. For the latter type of problem, we have found the Sutton equation to be quite useful.

In several localities which we have studied, the measured concentrations have been less than the predicted concentrations by as much as a factor of 5. This discrepancy is consistent with the fact pointed out above, that an air sampler located downwind of the stack more nearly measures the average concentration across the plume than the theoretical maximum at the plume core. Thus, while this equation cannot be used for precise estimates of concentration, it is useful in estimating the order of magnitude of pollution to be expected.

For estimating the ground level concentrations under average meteorological conditions, we have used the value $n = 0.25$ and the values of Cy and Cz as given in table 1.

TABLE 1.—*Values of Cy, Cz Proposed by Sutton*[1] *for Average Meterorologic Conditions*

Height of Source Above Ground, M.	Value of C
0	$Cy = 0.21$; $Cz = 0.12$
10	$Cy = 0.21$; $Cz = 0.12$
25	0.12 } $C = Cy = Cz$
50	0.10 } $C = Cy = Cz$
75	0.09 } $C = Cy = Cz$
100	0.07 } $C = Cy = Cz$

Substituting in equation 1:

$$\chi = \frac{2 \times 10^3 Q}{\pi\, Cy\, Cz\, u\, x^{1.75}}\, \epsilon^{\frac{-h^2}{Cz^2 x^{(1.75)}}} \qquad (2)$$

From which it can be shown that the maximum concentration downwind of the stack will be:

$$\chi_{max} = \frac{2000\, Q\, Cz}{\epsilon\, \pi\, h^2\, u\, Cy} \qquad (3)$$

and that this concentration will occur at:

$$x_{max} = \left(\frac{h^2}{Cz^2}\right)^{0.57} \qquad (4)$$

Figure 3 presents equation 1 in graphic form for stacks of various heights. These curves were drawn from data given by Sutton.[1] The marked influence of stack height on the maximum concentration is quite apparent, and it is seen that the maximum concentration occurs at distances of 15 to 30 stack heights.

For distance beyond the maximum concentration, the expotential factor in equation 1 approaches unity and the equation may be written:

$$\chi = \frac{2000\, Q}{\pi\, Cy\, Cz\, u\, x^{1.75}} \qquad (5)$$

This equation suffices for many purposes.