

urpose the fill *ghmw* must be placed before the backfill *ijkl* is put
e and must be secure against later removal by scour or other means
hout the lifetime of the wall. If these conditions are not met, it is
not to count on the additional resistance of the passive pressure.
the required sliding resistance cannot be developed by these means,
wall *cdef* can be used to increase horizontal resistance. In this case
s, if it occurs, takes place along the planes *ad* and *tf*. While along
d *ef* the friction coefficient *f* applies, sliding along *te* occurs within
oil mass. The coefficient of friction that applies in this portion is
quently $\tan \phi$, where the value of ϕ may be taken from the next to
olumn in Table 7.1. In this situation sliding of the front soil occurs
d along *tn'* so that, if the front fill is secure, the corresponding
ance from passive soil pressure is represented by the pressure triangle
f doubt exists as to the reliability of the fill above the toe, the free
e should more conservatively be assumed at the top level of the foot-
a which case the passive pressure is represented by the triangle *s'tg*.
ext, it is necessary to ensure that the pressure under the footing does
xceed the *permissible bearing pressure* for the particular soil. Let
g. 7.4) be the distance from the front edge *b* to the intersection of
esultant with the base plane, and let R_v be the vertical component
(This intersection need not be located beneath the vertical arm,
own, even though an economical wall generally results if it is so
d.) Then the base plane *ab*, 1 ft wide longitudinally, is subject to
mal force R_v and to a moment about the centroid $(l/2 - a)R_v$.
these values are substituted in the usual formula for bending plus
force

$$.2 = \frac{N}{A} \pm \frac{Mc}{I} \tag{7.8}$$

l be found that if the resultant is located within the middle third
 $l/3$), compression will act throughout the section, and the maximum
imum pressures can be computed from the equations in Fig. 7.5a.
e resultant is located just at the edge of the middle third ($a = l/3$),
pressure distribution is as shown in Fig. 7.5b, and Eq. (7.8) results
e formula given there.
the resultant were located outside the middle third ($a < l/3$), Eq.
would indicate tension at and near point *a*. Obviously, tension can-
e developed between soil and a concrete footing which merely rests
Hence, in this case the pressure distribution of Fig. 7.5c will develop,
implies a slight lifting off the soil of the rear part of the footing.
ilibrium requires that R_v pass through the centroid of the pressure-
oution triangle, from which the formula for *p* for this case can easily
rived.

It is good practice, in general, to have the resultant located within the
middle third. This will not only reduce the magnitude of the maximum
bearing pressure but will also prevent too large a nonuniformity of pres-
sure. If the wall is founded on a highly compressible soil, such as certain
clays, a pressure distribution as in Fig. 7.5b would result in a much larger
settlement of the toe than of the heel, with a corresponding tilting of the
wall. In a foundation on such a soil the resultant, therefore, should strike
at or very near the center of the footing. If the foundation is on very
incompressible soil, such as well-compacted gravel or rock, the resultant
can be allowed to fall outside the middle third (Fig. 7.5c).

A third mode of failure is the possibility of the wall *overturning* bodily
around the front edge *b*. For this to occur, the overturning moment
 $H P_h$ about point *b* would have to be larger than the restoring moment
 $(Wg + P_v l)$ in Fig. 7.4, which is the same as saying that the resultant
would have to strike outside the edge *b*. If, as is mostly the case, the
resultant strikes within the middle third, adequate safety against over-
turning exists, and no special check need be made. If the resultant is
located outside the middle third, a factor of safety of at least 1.5 should
be maintained against overturning; i.e., the restoring moment should be
at least 1.5 times the overturning moment.

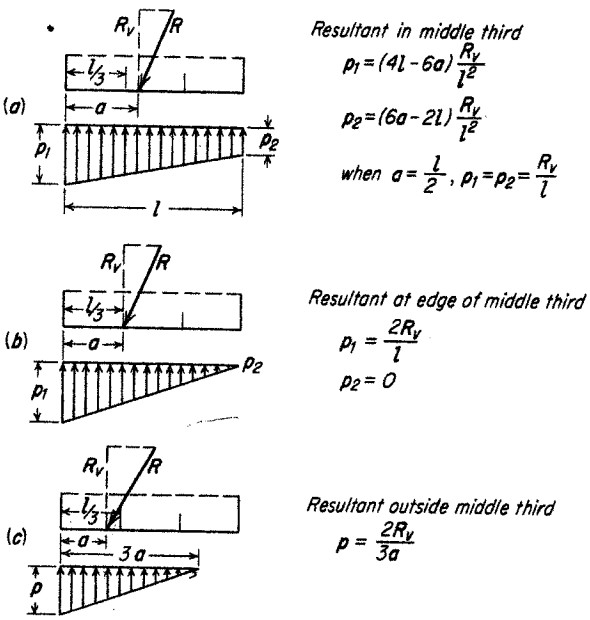


Fig. 7.5 Bearing pressures for different locations of resultant.