Final Examination Stability Analysis in Geotechnical Engineering

(by Dr J. Takemura)

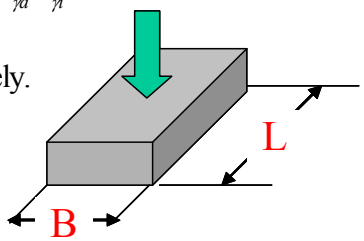
14th February 2005

1. The photo below shows damages observed along a sidewalk after Niigataken-Chuetsu Earthquake.
   1) Find typical damages or phenomena of structures caused by soil liquefaction induced by earthquake motion as many as possible,
   2) Explain the mechanism of the damages, that is, how the soil liquefaction causes the phenomena, and then
   3) Discuss the effective countermeasures for prevention of these damages

2. In the general bearing capacity equation for shallow foundations, shape factors (F_{cs}, F_{qs}, $F_{\gamma s}$) are included to take the effect of foundation shape into account.

General bearing capacity Eq.: $q_{ult} = cN_c F_{cs} F_{cd} F_{ci} + q_s N_q F_{qs} F_{qd} F_{qi} + \frac{\gamma B}{2} N_\gamma F_{\gamma s} F_{\gamma d} F_{\gamma i}$

Meyerhof and Hansen proposed the following shape factors for N_γ value, $F_{\gamma s}$, respectively.



$$F_{\gamma s} = 1 + 0.1 \tan^2\left(\frac{1}{4}\pi + \frac{1}{2}\phi\right)\frac{B}{L}$$ Meyerhof

$$F_{\gamma s} = 1 - 0.4\frac{B}{L}$$ Hansen

The effects of shape considered in the two equations are inconsistent.

Explain the reason of this inconsistency and the conditions for which these equations can be used.