DIAGRAM FOR DIVIDING SOILS INTO ORDINARY, SLUMPING, AND SWELLING

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According to SNiP II-BJ-62, paragraph 2.9, slumping soils include clays having a water content \( G \leq 0.6 \) at a value of

\[
\frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} > -0.1,
\]

where \( \varepsilon_0 \) is the void ratio of an undisturbed sample and natural water content; \( \varepsilon_L \) is the void ratio of the same sample corresponding to the water content at the liquid limit \( W_L \).

Swelling soils include clays for which the value

\[
\frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} < -0.4.
\]

As is known

\[
\varepsilon_0 = \frac{\gamma_p - \gamma_{sk}}{\gamma_{sk}},
\]

and

\[
\varepsilon_L = \frac{\gamma_p W_L}{\gamma_w},
\]

where \( \gamma_p \) is the specific gravity of particles; \( \gamma_{sk} \) is the bulk specific gravity of the skeleton; \( \gamma_w \) is the specific gravity of water.

Substituting \( \varepsilon_0 \) and \( \varepsilon_L \) from (3) and (4) into formulas (1) and (2), after transformations we obtain the new expressions which are convenient for compiling the diagrams:

for slumping soils

\[
1 - \frac{\gamma_{sk}}{\gamma_p} - \frac{\gamma_{sk}}{\gamma_p W_L} > -0.1;
\]

for swelling soils

\[
1 - \frac{\gamma_{sk}}{\gamma_p} - \frac{\gamma_{sk}}{\gamma_w W_L} < -0.4.
\]
Graphs plotted by formulas (1') and (2'). 1) Swelling soils for \( W_0 < W_{sw} \) and \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} <-0.4 \); 2) ordinary for \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} \), from 0.1 to 0.4; 3) slumping for \( G \leq 0.6 \) and \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} > -0.1 \).

From formulas (1') and (2') we plot the diagrams (figure). Both formulas, depending on the numerical values of the specific gravity \( \gamma_p \), yield a family of curves.

All curves of the lower family, plotted from formula (1'), correspond to the condition \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} = -0.1 \)

and below these curves \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} > -0.1 \).

All curves of the upper family, plotted from formula (2') correspond to the condition \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} = -0.4 \)

and above them \( \frac{\varepsilon_0 - \varepsilon_L}{1 + \varepsilon_0} < -0.4 \).