

1. Standard compaction on volcanic ash (USCS classification: MH,  $G_s=2.69$ ) produced the following results:

$\rho_d$ (t/m <sup>3</sup> )	1.27	1.31	1.35	1.32	1.29	1.24
$\omega$ (%)	25.8	27.3	30.0	32.0	34.0	36.1

- a. Plot these results on a conventional  $\rho_d$  versus  $\omega$  diagram.
- b. Plot the results again on a void ratio  $e$  versus water void ratio  $e_w$  diagram. Show lines of 80, 90, and 100% saturation as well as lines defining 0, 10, and 20% air voids.  
(Note:  $e_w = V_w/V_s$  and  $e_a = V_a/V_s$ ).
2. To what depth is heavy tamping effective for:
- a. A 10 t mass dropping 10 m?
- b. A 170 t mass dropping 22 m?
3. A 5 m deep deposit of sand and silt containing organic layers is to be compacted using explosives placed in boreholes located 8 m apart on a square grid. It is intended to create pore pressures which are at least equal to 80% of the effective overburden pressure. Estimate how many kilograms of TNT have to be distributed in each borehole in order to achieve this degree of liquefaction? How much is that per cubic meter of compacted soil?
4. Estimate the "safe" distance from an underground explosion of 10 kg of TNT, beyond which little or no soil liquefaction is likely to occur.