Impact of Grain Size and Inclination on Liquefaction Induced Lateral Ground Displacement for Sands Subjected to Simulated Seismic Shock

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Lateral ground displacement is a very dangerous soil phenomenon that occurs in small slopes. Lateral ground displacement can cause excessive damage to buildings and infrastructure but the exact slope at which it will occur is not well investigated. Computer-generated models with extreme boundary conditions have concluded that lateral ground displacement can occur at slopes as small as 0.2°. This conclusion is leading to billions of dollars being spent to mitigate lateral spread in situations where it may not be necessary. This experiment focused on how grain size and slope affected the amount and type of lateral ground displacement. The prediction was that grain size would not affect the slope at which lateral ground displacement occurred, but that it would affect the type. The experiment used a specially designed chamber to simulate worst possible conditions in the tested sand, by creating an extremely loose, heavily saturated sand, subjected to 30 blows of a hammer to simulate the energy from an earthquake. Four sand grain sizes (50-200 mesh) were tested at seven different angles (0°-10°). The results supported the prediction, grain size did not affect the slope at which lateral ground displacement occurred, but it did change the type. The minimum slope at which lateral ground displacement occurred was at 2°. However, grain size affected whether the sand experienced bulk sliding or lateral spread. These findings show that mitigating for lateral ground displacement in slopes less than 2° is over conservative and is a waste of resources.

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