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Improvement of the cavity expansion theory for the measurement of strain softening in over consolidated saturated clay

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Abstract: In this paper, considering the strain softening effect, the cavity expansion theory is improved for over-consolidated soil. Based on the theory of cavity expansion model, the soil around the pile is divided into three zones namely damage zone, plastic zone and elastic zone. This is divided according to the distance from pile. Considering the strain softening effect of over-consolidated soil, cavity cylinder balance equation is modified in the damage zone. The residual shear strength is introduced instead of the conventionally adopted peak shear strength. The effect of shear stress on excess pore water pressure is ignored in the plastic zone. With this development, large deformation plasticity theory was applied to modify the equation. Expressions and relations were derived to consider pile expansion stress of the damaged zone, excess pore water pressure, the radius of the damaged zone and plastic zone. Based on newly proposed model, it can be concluded that (1) With the increase of the pile expansion stress, plastic flow and strain softening appear in the damage zone, and there are rotations of principal stresses; (2) For the normally consolidated soil, the radius of the damage zone is about

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