TRAPDOOR TESTS FOR THE EVALUATION OF EARTH PRESSURE ON BURIED STRUCTURE

盛土内埋設構造物の作用土圧の評価のための移動床実験

Earth pressures acting on underground structures are highly dependent on the interaction between ground and structure. Increase in the vertical earth pressures acting on a buried structure in high embankment should be, therefore, considered, depending on the size and depth of structure and type of foundation, since differential settlements are often expected in such conditions. However, in practice, the increment of vertical earth pressures on underground structures is estimated in the empirical manner, mainly based on the information of past earth pressure measurements in the limited number of sites. In such estimation, the degree of settlement and/or mechanical properties of backfill materials are not always taken into account.

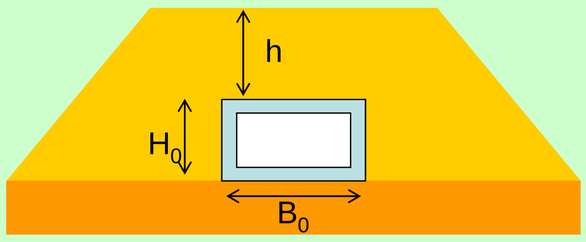
In this study, a trap door test apparatus was developed to evaluate the change in earth pressures acting on a buried structure in an embankment due to differential settlements. Base of a soil chamber consists of five separated blocks, any combination of those can move downward, in order to simulate the uneven settlement.

盛土内に埋設されたカルバートなどの構造物に作用する鉛直土圧は、周辺地盤の沈下が予想される場合は、埋設構造物の規模、土かぶり、基礎の支持条件等に応じて増分を見込む必要があります。しかしながら、鉛直土圧増分の目安については、過去の限られた実績等の経験値に頼っているのが実情で、近年の多様な盛土・埋設状況に合理的に対応できるとは言いがたいところがあります。

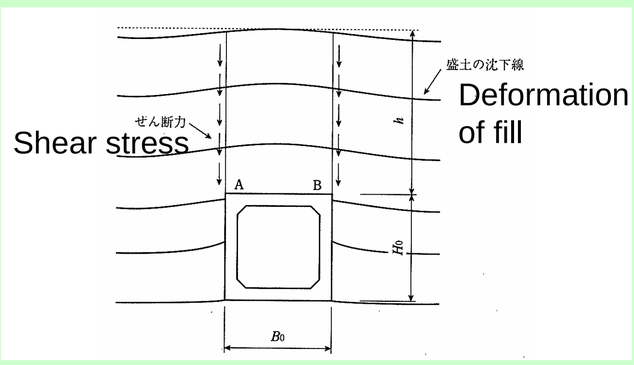
本研究では、盛土の沈下に伴う埋設模型への作用土圧の変化を調べる基礎的検討として、任意の分割底版を昇降できる移動床土槽を製作し、移動・固定床への作用土圧分布を詳細に計測すると共に、その簡易算定手法を提案しました。

盛土の沈下と埋設構造物を想定した移動床実験

Trapdoor test for simulating settlement of embankment and a buried structure



盛土の沈下に伴う埋設構造物の作用土圧の変化を、中央床を固定し両側の床を降下させた移動床実験で計測します。



Vertical earth pressure increases as the filling material settles, caused by downward shear forces.

道路土工指針による鉛直土圧増分の目安

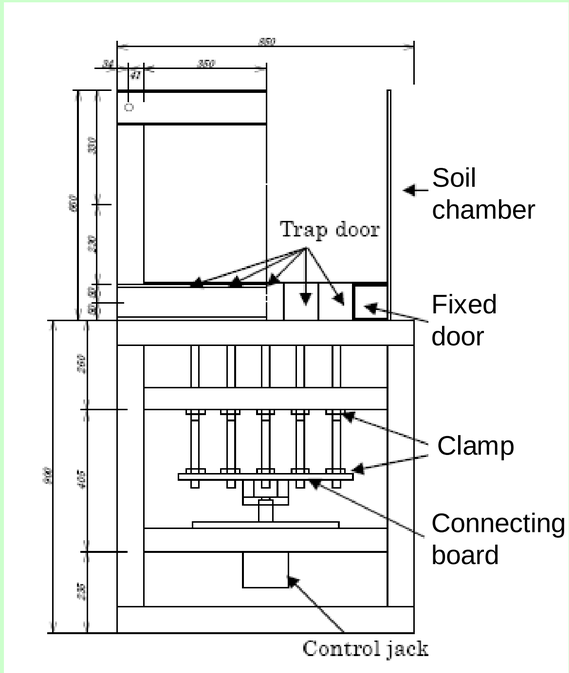
$p=\alpha\gamma h$

α depends on the width of box, B_0, and burial depth, h

h/B_0	鉛直土圧係数 Vertical earth pressure coefficient
$h/B_0<1$	1.0
$1\leqq h/B_0<2$	1.2
$2\leqq h/B_0<3$	1.35
$3\leqq h/B_0<4$	1.5
$4\leqq h/B_0$	1.6

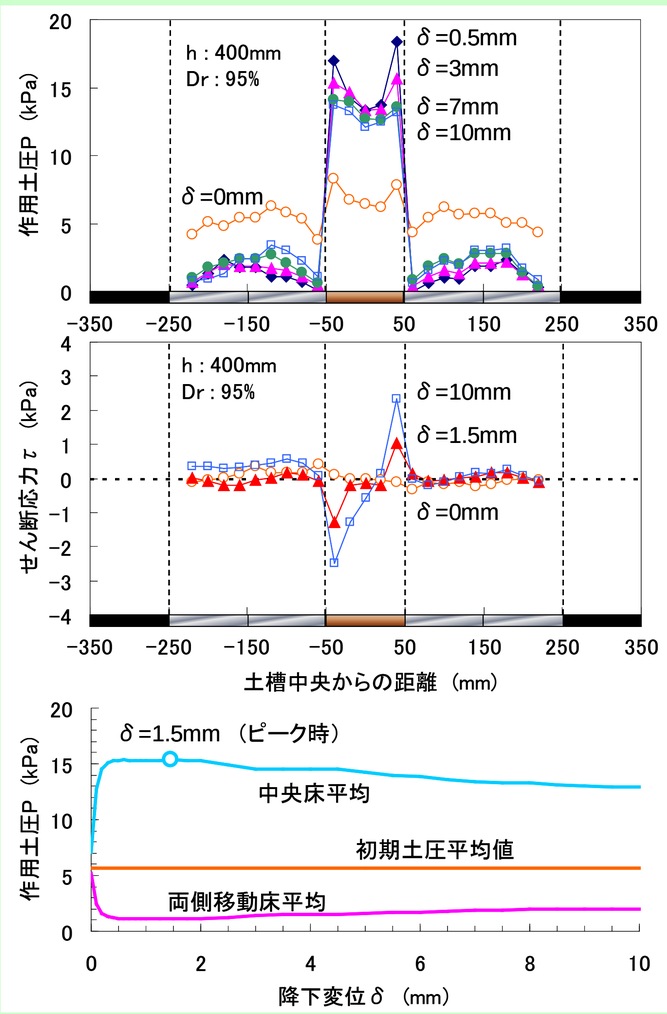
移動床実験土槽

Trapdoor testing chamber

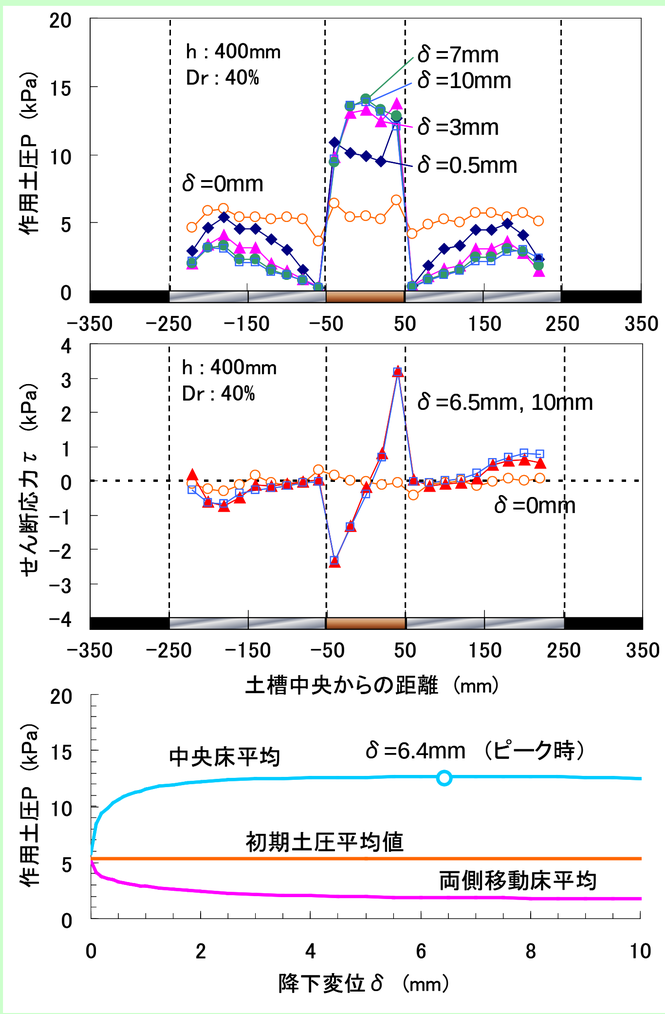


移動床の降下と作用土圧の変化

Displacement of trapdoor and change of earth pressure



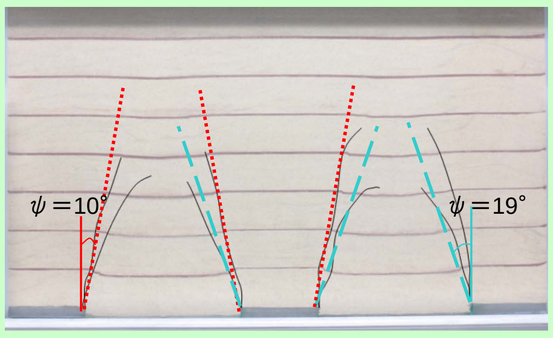
密詰地盤(豊浦砂)
Densely compacted Toyoura sand ground

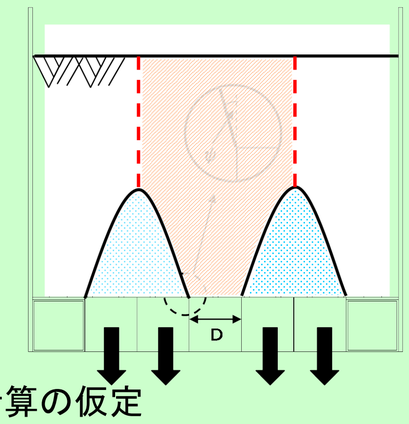


ゆる詰地盤(豊浦砂)
Loosely compacted Toyoura sand ground

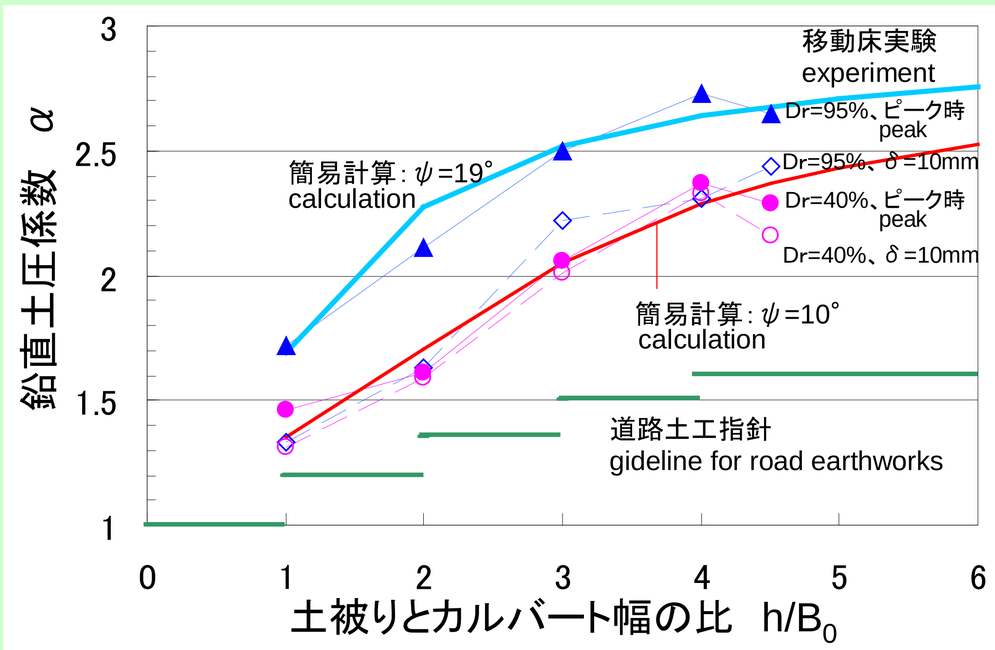
作用土圧の簡易計算

Estimation of earth pressure





実験で観察されたすべり線と簡易計算の仮定
Shear plane observed in experiment and assumption in calculation



鉛直土圧係数の比較
Comparison of vertical earth pressure coefficient

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